

COAG Standing Council on Environment and Water

Study into domestic and international fate of endof-life tyres

Final Report



Study into domestic and international fate of end-of-life tyres – Final Report Hyder Consulting Pty Ltd – ABN 76 104 485 289 AA003649 Hyder Consulting Pty Ltd ABN 76 104 485 289 Level 16, 31 Queen Street Melbourne VIC 3000 Australia Tel: +61 3 8623 4000 Fax: +61 3 8623 4111 www.hyderconsulting.com



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Final Report

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EXECUTIVE SUMMARY

In 2009 Hyder Consulting prepared a report for the Environment Protection and Heritage Council which collected baseline data for 2007-08 on end of life tyre destinations – *Study into End of Life Tyres, 23 March 2009, Hyder.* In 2010 Hyder Consulting was commissioned to update this study to inform the deliberations of the Tyres Implementation Working Group in developing a voluntary industry-led product stewardship scheme for end-of-life tyres.

In this study the destinations for end-of -life tyres have been categorised as follows:

- Domestic: recycling, energy recovery, civil engineering, licensed landfill and unknown.
- International: reuse and retreading, recycling and energy recovery.

It is noted that data categorised as "unknown" represents the balance of tyres which have not been recycled or recovered for energy domestically or internationally, used in civil engineering or deposited in licensed landfill.

Findings from the latest study show there were approximately 48.5 million tyre equivalent passenger units (EPU) tyres entering the waste stream in 2009-10 (compared to 41.8 million EPU tyres entering the waste stream in 2007-08). Of these, approximately 66% were disposed either to landfill, stockpiled, illegally dumped or categorised as unknown compared to 64% in 2007-08; 16 % were domestically recycled compared to 11% in 2007-08 and 18% were exported compared to 10% in 2007-08. Approximately 67% of all exported tyres were going to Vietnam in 2009-10 which is similar to 2007-08. 8.5 million EPU was exported in 2009-10 compared with approximately 1.5 million in 2006-07.

The major determinates of the fate of end-of-life tyres from Australian sources are:

- the type of tyre and where it reaches end-of-life
- local landfill prices and controls
- global commodity prices and demand, and
- the availability of cost effective transportation to an end market.

The recycling of passenger and truck tyres into tyre derived product (TDP) for sale into domestic and international markets has experienced modest growth between the Hyder (2009) study and this present study. A greater proportion of passenger tyres and, to a lesser extent, truck tyres are sold into the domestic or international markets as recycled material or for use as a fuel. Passenger and truck tyres are more viable for recycling or export because more of them are in or near metropolitan areas where recyclers are located and where the landfilling of tyres is more likely to be costly, controlled or prohibited. Passenger and truck tyres are also of a relatively consistent and smaller size, making their conversion into a TDP more viable.

Recycling industry representatives continue to report that, based on their experience, there is an increasing trend to export whole baled tyres. The export of whole baled tyres is being assisted by a deficit in outward container movements between Australia and East Asia decreasing the cost of shipping.

Conversely, off-the-road (OTR) tyres continue to nearly all be landfilled or stockpiled, most often at mines or quarries. Less than 3% are recorded as being recycled. A significant proportion of OTR tyres are generally used at mines or quarries, and, as such, reach end-of-life at a disposal site. Further, the fact that these sites are usually long distances from tyre recyclers or ports serves to encourage local disposal of OTR tyres.

The volume of tyres being recycled in Australia has grown approximately 5% between the Hyder (2009) study and this study, however several tyre recyclers reported operating at between 50% and 60% capacity. Furthermore, Australian tyre industry reports that there is a trend of having to compete in the domestic market with TDP imported from countries where there is some form of subsidy for the collection and recycling of tyres.

		Passeng	er	Truck		Passeng <mark>e</mark> r &	Truck	OTR		Total	
	Recycling	1,853,750	14.0%	2,999,750	20.4%	4,853,500	17.4%	75,000	0.4%	4,928,500	10.2%
	Energy recovery	250,000	1.9%	-	0.0%	250,000	0.9%	-	0.0%	250,000	0.5%
estic	Civil engineering	1,016,625	7.7%	1,276,375	8.7%	2,293,000	8.2%	500,000	2.4%	2,793,000	5.8%
Dom	Licensed landfill	1,450,073	11.0%	161,119	1.1%	1,611,192	5.8%	-	0.0%	1,611,192	3.3%
	Unknown ¹	1,865,043	14.1%	9,078,286	61.9%	10,943,329	39.3%	19,400,840	94.2%	30,344,169	62.6%
	SUB TOTAL	6,435,491	48.8%	13,515,530	92.1%	19,951,021	71.6%	19,975,840	97.0%	39,926,862	82.4%
	Reuse and retreading	45,758	0.3%	56,281	0.4%	102,038	0.4%	8,448	0.0%	110,486	0.2%
ational	Recycling	3,261,175	24.7%	522,350	3.6%	3,783,525	13.6%	218,900	1.1%	4,002,425	8.3%
Interna	Energy recovery	3,455,180	26.2%	579,721	4.0%	4,034,901	14.5%	393,704	1.9%	4,428,605	9.1%
	SUB TOTAL	6,762,113	51.2%	1,158,352	7.9%	7,920,464	28.4%	621,052	3.0%	8,541,516	17.6%
	TOTAL	13,197,603		14,673,882		27,871,485		20,596,893		48,468,378	

Table 1: Domestic and international destination of end-of-life tyres (2009–10)

All units are in Equivalent passenger unit (EPUs).

¹ Data categorised as Unknown represents balance of tyres which have not been recycled, recovered for energy, used in civil engineering or deposited in licensed landfil

GLOSSARY

This section provides a definition for terms commonly used in this report. In some cases a more detailed explanation is provided at the relevant point elsewhere in this report, and in particular the Appendix A: Method for collecting and calculating data.

Casing:	The rigid, inner of a tyre upon which a tread is placed.
Civil engineering:	In the context of end-of-life tyres, this is a form of recycling in which tyres are used as an appropriate fill material in construction works.
Disposal	Solid waste that is disposed of to landfill, incinerated or destroyed without energy recovery, or is unrecovered litter.
End-of-life:	Products and materials that have become a waste.
Energy recovery:	The combustion of solid waste or the combustion of methane collected from landfill as a fuel for an industrial process and/or electricity generation
Equivalent passenger unit (EPU):	A standard measure for the quantity of tyres (see section 2 for further explanation).
Illegal dumping:	The unlawful disposal of tyres to land or water; littering.
In-use:	Tyres that are in demand for the purpose for which they were originally made.
Landfill:	A site used for the controlled and legal deposit of solid waste onto or into land.
Recycling:	A set of processes (including biological) that converts solid waste into useful materials or products, net of contaminants/residuals disposed. In the context of end-of-life tyres, recycling is tyre re- processing without breaking the tyre down into its constituent materials, whereas material recycling covers the recycling of these components.
Retreading:	The replacement of the outer tread on used tyres.
Re-use:	In the context of end-of-life tyres, the use of discarded tyres for the purpose for which they were originally made.
Stockpiling:	In the context of end-of-life tyres, the storage of used tyres for an undetermined use, either lawfully or unlawfully.
Tyre derived fuel (TDF):	The use of tyres as a fuel; tyres that have been converted into a product for use as a fuel, in particular liquid fuels.
Tyre derived product (TDP):	Crumbed, granulated or powdered material, or steel, created during the recycling of end-of-life tyres.

1 INTRODUCTION

Representatives from the tyre industry and government met early in 2010 and indicated their commitment to develop a management strategy for end-of-life tyres, including an industry led product stewardship scheme. This follows the decision of the Environment Protection and Heritage Council (EPHC) in November 2009 to support the development of a new industry led approach for handling end-of-life tyres.

The renewed commitment of industry and government comes in the context of the commencement of the *Product Stewardship Act 2011*. This is a key priority of the *National Waste Policy: Less Waste, More Resources* also agreed to by the EPHC in November 2009.

Central to the development of a management strategy and a product stewardship scheme is an understanding of the current sources and fate of end-of-life tyres, and the future trends in the sources and fate of end-of-life tyres. This *Study into the source and fate of end-of-life tyres* seeks to inform these processes by:

- Developing the method and tools to update tyres data and trends on an annual basis.
- Consistent with the developed method, obtaining data on, and analysing the trends in the sources and fate of end-of-life tyres.
- Analysing the domestic market and developing an understanding of the international market for end-of-life tyres and tyre derived products.

This report brings together the outcomes from the data collection and calculation, and the trends analysis and market assessment.





For the purposes of this study, tyres that are exported from Australia for reuse or retreading are considered to be endof-life tyres.

2 DATA COLLECTION & CALCULATION

This section provides the outcomes of the data collection study. A detailed explanation of the method used to collect and calculate data is provided in Appendix A.

Tyre types and sizes

Data on tyres in this section are expressed in equivalent passenger units (EPUs). EPUs are a standardised measure for the quantity of tyres. For this study, an EPU has been taken to be 9.5 kg for a new tyre, and 8.0 kg for a used tyre. Accordingly, the EPU for a tyre in-use, and for a tyre put into re-use, has been taken to be the mid-point between the EPU for a new tyre and the EPU for a used tyre, being 8.75 kg.

Table 2 shows the EPU that have been used for tyres at different stages in the lifecycle of a tyre.

Stage of use		EPU
	New	9.5 kg
Consumption	Second-hand	8.75 kg
	Retreads	9.5 kg
In-use		8.75 kg
Intermediate destination		8.0 kg
End-of-life destination		8.0 kg

Table 2: EPU of tyres by lifecycle point

Tyres are classified as being:

- Passenger tyres, including those used on passenger vehicles, motorcycles and caravans, as well as trailers for domestic use
- Truck tyres, including those used on buses, light and heavy commercial vehicles, prime movers, trailers and semi-trailers, and fire fighting vehicles
- Off-the-road (OTR) tyres, including those used on machinery or equipment used in areas such as agricultural, mining and construction and demolition.

The calculation of EPUs per vehicle has been made on the assumption that all vehicles, either assembled or unassembled, have a full complement of tyres fitted, including spare tyres. The calculation of EPUs through the lifecycle of tyres includes both the outer tyre and the inner tube for pneumatic tyres.

During the course of the study, the average weight of a passenger tyre was examined. Due to higher SUV sales, industry reports are that the average weight of a new passenger tyre is now in the order of 10.5kg, but that the average weight of standard truck tyres has remained unchanged. Irrespective, the EPUs stated above have been retained for the purposes of this study.

N.B. This study does not cover tyre types smaller than those classified as passenger tyres. Examples of tyres excluded from the study are tyres from bicycles and other cycles; mowers and wheelbarrow; carriages for disabled persons; baby carriages; etc.

Geographic distribution of tyres

Remoteness classifications have been made using the Remoteness Structure from the *Australian Standard Geographical Classification 2005 (Cat. No. 1216)* published by the Australian Bureau of Statistics (ABS). For this study, the Remoteness Structure has been refined to a three-tiered classification as shown in Table 3.

Table 3: Remoteness classification

ABS Remoteness Structure	Remoteness classification for tyres
Major cities	Metropolitan
Inner regional	Regional
Outer regional	_
Remote	Remote
Very Remote	

2.1 Consumption

Figure 2 and Figure 3 show the consumption of tyres by type using the findings of this study and the Hyder (2009) report. Data for these figures is provided in Table 4.

Consumption of passenger and truck tyres dropped during 2008–09. This drop in consumption corresponds with the global financial crisis (GFC) and a significant drop in GDP growth over this period.

Truck tyre sales per capita in 2008–09 were 14% less than the average of 2007–08 and 2009– 10 sales.

Per capita passenger tyre sales in 2008–09 were 13% less that the midpoint of 2007–08 and 2009–10 sales. However, this figure is distorted by the rise in per capita passenger tyre sales to well above pre-GFC levels in 2009–10. This may represent the delayed purchases as a result of the GFC.

OTR tyre sales dropped in 2009–10. This is also possibly the result of the global financial crisis, but is delayed in its reporting as a result of the longer lead time between the order and the purchase of OTR tyres.

Figure 2: Tyre Consumption







Table 4: Tyre Consumption

	(Consumption (EPU)	Per Capita Consumption (EPU)		
	Passenger	Truck	OTR	Passenger	Truck	OTR
2007-08	15,403,000	15,338,000	19,605,000	0.72	0.72	0.92
2008-09	14,348,657	13,606,309	21,222,273	0.66	0.62	0.97
2009-10	17,779,029	16,431,037	18,250,723	0.80	0.74	0.82

2.2 In-use

Despite the dip in the consumption of tyres, corresponding with the global financial crisis, the number of tyres in-use stayed steady during the 2008–09 and 2009–10 financial years. Figure 4 shows the number of tyres in-use by jurisdiction, Figure 5 shows the number of tyres in-use by jurisdiction per capita and Figure 6 shows the number of tyres in use by tyre type.









The spike in the number of tyres in-use in the NT and ACT around 2005–06 and 2006–07 is a result of an increase in the reported number of registrations of passenger vehicles and trucks over this period in ABS publication *Motor vehicle census (Cat. No. 93090)*. The reason for this spike in reported registrations of passenger vehicles and trucks in the NT and ACT is unknown.

Figure 6: In-use by tyre type



Figure 7 and Table 5 show the distribution of tyres in-use by remoteness for each state and territory, while Figure 8 and Table 6 show the distribution of tyres in-use by tyre type for each state and territory.



Figure 7: In-use by jurisdiction and remoteness (2009–10)

Location	Metropolitan (EPU)	Regional (EPU)	Remote (EPU)	Total (EPU)
ACT	1,280,427	12,628	-	1,293,055
NSW	20,636,700	6,837,534	3,625,818	31,100,052
NT	-	-	1,298,236	1,298,236
QLD	13,083,971	5,506,772	6,613,433	25,204,176
SA	5,514,829	1,167,758	1,871,836	8,554,423
TAS	-	1,823,586	1,104,033	2,927,619
VIC	19,321,491	6,103,388	1,909,617	27,334,496
WA	9,040,428	1,999,890	5,430,504	16,470,822
Total	68,877,846	23,451,555	21,853,477	114,182,878

Table 5: EPU in use by jurisdiction and remoteness (2009-10)

Figure 8: In use by jurisdiction and tyre type (2009-10)



Location	Passenger	Truck	OTR	Total
ACT	1,026,126	152,667	114,262	1,293,055
NSW	19,063,267	7,086,056	4,950,729	31,100,052
NT	551,863	406,578	339,795	1,298,236
QLD	14,031,326	6,528,477	4,644,372	25,204,175
SA	5,002,191	2,094,045	1,458,186	8,554,422
TAS	1,704,154	707,618	515,846	2,927,618
VIC	16,795,660	7,258,905	3,279,931	27,334,496
WA	7,691,668	4,319,984	4,459,170	16,470,822
Total	65,866,257	28,554,331	19,762,291	114,182,879

Table 6: EPU in use by jurisdiction and tyre type (2009-10)

2.2.1 Retreads

A major difference in the approach taken to this study and that taken for the Hyder (2009) study is the treatment of the retreading of tyres.

For the purposes of calculating the number of tyres in-use, tyres that are retreaded can be considered to be a subset of the number of tyres that are in-use (see Figure 1). All things being equal, the number of tyres that are retreaded does not change the number of tyres in-use. Subsequently, the number of tyres that are retreaded has no bearing on the method that has been used to calculate the lifespan of tyres or, subsequently, the number of end-of-life tyres.

As such, and different to the approach of the Hyder (2009) study, data on retreaded tyres has not been included in the calculation of tyres in-use or end-of-life tyres. This method is comparable with that used by the Rubber Manufacturers Association in the United States, but not to that used by the European Tyre and Rubber Manufacturers Association and the Japan Automobile Tyre Manufacturers Association.

Irrespective, an appraisal of the retread market helps inform a study into the source and fate of end-of-life tyres. Furthermore, buffings collected during the process of retreading are a source of TDP. Data on buffings is included in the data on the domestic and international destination of end-of-life tyres.

A summary of data ranges obtained from the survey of retreaders on the number of tyres retreaded is provided in Table 7.

Table 7: Range estimates of retreading (2009–10)

Tyre type	Passenger	Truck	OTR
EPUs (thousands)	200–250	4,500–5,000	100–300

2.3 End-of-life arisings

Figure 9 provides the end of life arisings by tyre type using the findings of this report and those from the Hyder (2009) study.



Figure 9: End-of-life arisings by tyre type

Figure 10 and Figure 11 illustrate the calculation of the lifespan of passenger tyres and truck tyres.





Figure 11: Calculation of the lifespan of truck tyres



The lifespan of OTR tyres was not able to be calculated in the same way as passenger and truck tyres because of the absence of registration data. Tyre industry sources provided a wide range of expected life for OTR tyres depending on the particular tyres and its place of use. These ranged from three months to five years and more.

For the purposes of this study the lifespan of OTR tyres was taken to be twelve months. As such, the end-of-life arisings for OTR tyres in 2009–10 was determined to be the consumption of new OTR tyres in 2008–09.

Figure 12 shows the distribution of end-of-life tyres by remoteness for each state and territory, and Figure 13 shows the distribution of end-of-life tyres by tyre type for each state and territory. Data for these figures is presented in Table 8 and Table 9.



Figure 12: End-of-life arisings by jurisdiction and tyre type (2009-2010)



Figure 13: End-of-life arisings by jurisdiction and remoteness (2009–10)

Table 8: End-of-life arisings by jurisdiction and tyre type (2009-2010)

	Passenger (EPU)	Truck (EPU)	OTR (EPU)	Total (EPU)
ACT	119,087	78,455	205,605	403,147
NSW	5,159,808	3,641,477	3,819,701	12,620,986
NT	354,145	208,938	110,577	673,660
QLD	4,840,513	3,354,941	2,811,453	11,006,907
SA	1,519,768	1,076,116	1,002,288	3,598,172
TAS	537,631	363,640	341,461	1,242,732
VIC	3,418,449	3,730,303	3,365,342	10,514,094
WA	4,647,490	2,220,011	1,541,177	8,408,678
Total	20,596,893	14,673,882	13,197,603	48,468,378

Table 9: End-of-life arisings by jurisdiction and remoteness (2009–10)

	Metropolitan (EPU)	Regional (EPU)	Remote (EPU)	Total (EPU)
ACT	399,209	3,937	-	403,146
NSW	8,374,762	2,774,800	1,471,425	12,620,987
NT	-	-	673,660	673,660
QLD	5,713,897	2,404,860	2,888,150	11,006,907
SA	2,319,654	491,184	787,334	3,598,172
TAS	-	774,086	468,646	1,242,732
VIC	7,431,927	2,347,641	734,526	10,514,094
WA	4,615,316	1,020,983	2,772,379	8,408,678
Total	28,854,765	9,817,492	9,796,121	48,468,378

2.4 Domestic destination of end-of-life tyres

Figure 14 and Table 10 provide an overview of the domestic destination of end-of-life tyres and TDP. Data of adequate quality was obtained on the recycling, recovery for energy, and use in civil engineering for end-of-life tyres. The amount of tyres that are being disposed of to landfills, illegally dumped or stockpiled, including at mine sites or on farms, was determined as the balance of those which had not been recycled, recovered for energy or used in civil engineering.



Figure 14: Domestic destination of end-of-life tyres by tyre type (2009–10)

Table 10: Domestic destination of end-of-life tyres by tyre type (2009–10)

Туре	Recycling (EPU)	Energy recovery (EPU)	Civil engineering (EPU)	Licensed Iandfill (EPU)	Unknown data (EPU)	Total (EPU)
Passenger	1,853,750	250,000	1,016,625	1,450,073	1,865,043	6,435,491
Truck	2,999,750	-	1,276,375	161,119	9,078,286	13,515,530
OTR	75,000	-	500,000	-	19,400,840	19,975,840
Total	4,928,500	250,000	2,793,000	1,611,192	30,344,169	39,926,862

A breakdown of the recycling and energy recovery of end-of-life tyres by jurisdiction has not been provided as it could reveal commercially sensitive information.

2.4.1 Licensed landfill and Unknown data

While some data exists for licensed landfill disposal of end-of-life tyres the extent of available data has resulted in a large "unknown" category. It was not possible to make an accurate distinction between a number of possible disposal routes.

2.5 Export destination for tyres and TDP

This section presents data on the export of all tyres and TDP under AHECC chapters 40, 87 & 88 as outlined in Appendix A. Data on the export of *all* tyres, including new, in-use and retreaded tyres, has been included in this section to provide an overview of the profile of exported tyres and TDP. In particular, this section presents data on the export of all tyres and TDP to inform the analysis into the under-reporting of the export of whole tyres.

Note: There are instances where data presented in this section on end-of-life tyres is inconsistent with that presented in earlier sections of this report. This is a result of different data sets being used for the 2008–09 and 2009–10 financial years in some instances. Different data sets have been used in this section to allow a comparison with data for the financial years 2003–04 to 2007–08, which were collected during the production of the Hyder (2009) report. While inconvenient, it should be noted that the difference between the data on the export of end-of-life tyres for the 2008–09 and 2009–10 financial years is less than 1%. However, data presented in this section for the 2007–08 financial years and earlier does differ from that presented in the Hyder (2009) report. This has resulted from the different methods applied to the calculation of EPUs from the raw export data.

2.5.1 Type and state of exported tyres

Figure 15 shows the export of all tyres, and TDP over the past seven years and illustrates the strong growth since 2007–08.



Figure 15: Export of all tyres and TDP by tyre type

The growth over recent years is even more apparent when outlying values from the 2004–05 and 2005–06 financial years are taken into account. Figure 16 shows the export of all tyres and TDP following the removal of AHECC 87091900².

² AHECC 87091900 – Non-electrical self-propelled work trucks, not fitted with lifting or handling equipment, of the type used in factories, airports or the like for short distance transport of goods and tractors used on railway station platforms. During 2004–05 and 2005–06 the quantities of AHECC 87091900 were, respectively, 8,650 and 5,840 times greater

Figure 16: Export of tyres and TDP by tyre type with outlying values removed



Figure 17 shows all exported tyres and TDP by state of usage, Figure 18 shows all exported tyres and TDP as being either loose or fitted to a vehicle, and Figure 19 combines these factors. Data for these figures is presented in Table 11, Table 12 and Table 13 respectively.

than in 2003–04. In 2006–07, the quantities of AHECC 87091900 returned to below 2003–04 levels, and have remained relatively steady since. The destination of this extraordinary increase in export of AHECC 87091900 in was 2004–05 and 2005–06 the United States.

Figure 17: Export of all tyres and TDP by state of usage



Table 11: Export of all tyres and TDP by state of usage

Total	4,644,806	3,067,914	7,092,371	9,712,393	10,378,978
In use & used	1,522,277	1,674,900	4,632,491	7,954,443	8,543,435
New	3,122,529	1,393,014	2,459,880	1,757,950	1,835,543
	2005-06 (EPU)	2006-07 (EPU)	2007-08 (EPU)	2008-2009 (EPU)	2009-10 (EPU)

Note: 'In use & used' includes TDP and tyres that are in-use (fitted), retreaded and used (loose or baled).



Figure 18: Export of all tyres and TDP

Note: For the purposes of this figure 'Loose' includes TDP.

2005-06 2006-07 2007-08 2008-2009 2009-10 (EPU) (EPU) (EPU) (EPU) (EPU) (EPU) (EPU) Fitted 2,631,375 222,706 410,433 419,230 296,969 Loose 2,013,431 2,845,208 6,681,938 9,293,162 10,082,009	Total	4,644,806	3,067,914	7,092,371	9,712,392	10,378,978	
2005-06 2006-07 2007-08 2008-2009 2009-10 (EPU) (EPU) (EPU) (EPU) (EPU) (EPU) Fitted 2,631,375 222,706 410,433 419,230 296,969	Loose	2,013,431	2,845,208	6,681,938	9,293,162	10,082,009	
(EPU) (EPU) (EPU) (EPU) (EPU)	Fitted	2,631,375	222,706	410,433	419,230	296,969	
		2005-06 (EPU)	2006-07 (EPU)	2007-08 (EPU)	2008-2009 (EPU)	2009-10 (EPU)	

Table 12: Export of all tyres and TDP

Figure 19: Export of all tyres and TDP by state of usage



Table 13: Export of all tyres and TDP by state of usage

Total	4,644,806	3,067,914	7,092,371	9,712,392	10,378,978
In – use & used - loose	1,469,443	1,659,662	4,573,249	7,861,265	8,520,395
In – use & used - fitted	52,834	15,238	59,242	93,178	23,040
New - loose	543,988	1,185,546	2,108,689	1,431,898	1,561,614
New - fitted	2,578,541	207,468	351,191	326,052	273,929
туре	(EPU)	(EPU)	(EPU)	(EPU)	(EPU)
Turne	2005-06	2006-07	2007-08	2008-2009	2009-10

2.5.2 Jurisdiction of export

Figure 20 shows the export of all tyres and TDP by jurisdiction. Figure 21 shows the same data on a per capita basis.



Figure 20: Export ports by jurisdiction.





2.5.3 Export codes and destination countries

The main codes used for the export of tyres and TDP in recent years are:

- AHECC 40040000 Waste, parings and scrap of rubber (excl. hard rubber) and powders and granules obtained therefrom
- AHECC 40122000 Used pneumatic rubber tyres

For the three years from 2007–08 to 2009–10, these two codes accounted for 55.7% and 16.4% respectively of all tyres and TDP exported. The next highest code, AHECC 40111000³, accounted for 5.6% of all exports over this period.

Figure 22 and Table 14 show the dominance of these two codes over the past three years, as well as the shift in the use of export codes from 40122000 to 40040000.



Figure 22: Export of all tyres by major export codes

Table 14: Export of all tyres by major export codes

Total	4,644,806	3,067,914	7,092,371	9,712,392	10,378,978
All other codes	3,691,688	1,878,028	3,045,433	2,030,589	2,181,260
40122000 – Used pneumatic rubber tyres	894,787	1,077,296	2,597,811	1,194,105	745,406
40040000 - Waste, parings and scrap of rubber	58,331	112,590	1,449,128	6,487,699	7,452,313
Туре	2005-06 (EPU)	2006-07 (EPU)	2007-08 (EPU)	2008-2009 (EPU)	2009-10 (EPU)

Figure 23 shows the top ten destination countries for the export of tyres and tyre derived product for new and used tyres. 92.3% of all tyres and TDP exported during 2009–10 went to these ten countries.

³ AHECC 40111000 New pneumatic rubber tyres for motor cars (incl. station wagons and racing cars).

Figure 23 also illustrates the dominance of Vietnam as an export destination for tyres and TDP.





Accordingly, the major destination country for export codes 40040000 and 40122000 over the past three years has been Vietnam. The export to Vietnam under these two codes accounted for 66.81% of *all* exported tyres and TDP in 2009–10.

Figure 24 shows the significance of the export of tyres and TDP to Vietnam under AHECC 40040000 and 40122000 to the growth in the export of tyres and TDP since 2007–08.





Figure 25 and Figure 26 provide separated data on the export of AHECC 40122000 and 40040000 respectively, showing the total amount and the major export destination countries, and, again, emphasising the shift in the use codes from AHECC 40122000 to 40040000.



Figure 25: Export of AHECC 40122000 – Used pneumatic rubber tyres (monthly)

Figure 26: Export of AHECC 40040000 - Waste, parings and scrap or rubber (monthly)



2.5.4 Under-reporting of the export of whole baled tyres to Vietnam

AHECC 40040000 & 40122000

There are obvious inconsistencies between the findings from the survey of recyclers and the reported export of recycled tyres and whole baled tyres. Table 15 shows the findings of the survey and the reported export values for the relevant codes.

According to the survey of recyclers, 4.0 million EPUs were exported as granulated, crumbed or powdered material during 2009–10. However, none of this material was exported to Vietnam. This is in stark comparison to the 7.5 million EPUs exported under AHECC 40040000 – Waste, parings and scrap of rubber – 90.7% of which went to Vietnam.

Conversely, the survey of recyclers found that 5.5 million EPUs were being exported as whole baled tyres, all of them to Vietnam. Yet only 23,000 EPUs were recorded as being exported to Vietnam under AHECC 4012200 – Used pneumatic rubber tyres – out of a total of only 0.7 million EPUs under this code to all countries.

Tyre state	Data source	AHECC or survey description	Exported to Vietnam	Total exports
	Export data	40040000 - Waste, parings and scrap of rubber	6,759,834	7,452,313
IDP	Survey findings	Granulated, crumbed or powdered	-	4,002,363
Whole,	Export data	40122000 – Used pneumatic rubber tyres	23,043	745,406
used tyres	Survey findings	Baled tyres	5,540,825	5,540,825

Table 15: Comparison of the findings of the survey of recyclers and reported exports (EPUs, 2009–10)

The recent increase in exports under AHECC 40040000 accords with the reported growth in the export of whole baled tyres by the tyre industry. The tyre industry also provided anecdotal evidence that AHECC 40040000 is being used for the export of whole baled tyres.

Further reason to suspect that AHECC 40040000 is being used to disguise the export of whole baled tyres is that it is one of only five codes examined for the export of tyres and TDP that are measured by weight (see Table 16). Using export codes that are recorded by weight for whole baled tyres would obviate the need to count and record the number of tyres being exported, and, in doing so, conceal the extent of the activity. Whole baled tyres are also traded by weight, so using AHECC 40040000 would make the transactions of whole baled tyres more convenient.

In Hyder's view AHECC 40040000 is being used to disguise the export of whole baled tyres to Vietnam. For the purposes of this report, exports under AHECC 40040000 to Vietnam have been assumed to be whole baled tyres. AHECC 40122000 other than that going to Vietnam should be considered as being for reuse.

Table 16: Export codes that are recorded by weight

AHECC	Description
40030000	Reclaimed rubber in primary forms or in plates, sheets or strip
40040000	Waste, parings and scrap of rubber (excl. hard rubber) and powders and granules obtained therefrom
40061000	'Camel-back' strips for retreading rubber tyres, unvulcanised
40069000	Forms (e.g. rods, tubes and profile shapes) and articles (e.g. discs and rings), of unvulcanised rubber
40129000	Solid or cushion tyres, interchangeable tyre treads and tyre flaps of rubber

AHECC 40129000

A significant amount of material was exported to Vietnam under AHECC 40129000 in 2008–09 and 2009–10. Table 17 shows the export to Vietnam and total exports under this code from 2005–06 to 2009–10 and illustrates the recent growth in exports under this code to Vietnam.

Table 17: Export of AHECC 40129000 – Solid or cushion tyres, interchangeable tyre treads and tyre flaps of rubber (EPUs)

Destination	2005-06	2006-07	2007-08	2008-09	2009-10
Vietnam		2,500		32,785	89,868
Total	227,346	241,549	315,186	100,963	233,312

Figure 27 shows the monthly export of AHECC 40129000 during the 2008–09 and 2009–10 financial years.

Figure 27: Export of AHECC 40129000 – Solid or cushion tyres, interchangeable tyre treads and tyre flaps of rubber (monthly)



The recent growth in the export of AHECC 40129000 to Vietnam corresponds with the reported increase in the export of whole baled tyres. Further, as shown in Table 16, AHECC 40129000 is one of the five codes examined that is recorded by weight, providing further reason to suspect its use to disguise the export of whole baled tyres.

For the purposes of this report, the export of AHECC 40129000 to Vietnam during 2008–09 and 2009–10 has been assumed to be whole baled tyres.

Other AHECC chapters 40, 87 & 88

To determine if they might also be being used to disguise the export of whole baled tyres, all 86 eight-digit export codes under AHECC chapter 40 (Rubber and articles thereof) were examined for the size and trends of exports to Vietnam between 2005–06 and 2009–10.

The 17 four-digit chapters covering these 86 eight-digit codes are presented in Table 18.

Table 18 Other AHECC chapters examined

Code	Description
4001	Natural rubber, balata, gutta-percha, guayule, chicle and similar natural gums, in primary forms or in plates, sheets or strip
4002	Synthetic rubber and factice derived from oils, in primary forms or in plates, sheets or strip; mixtures of any product of 4001 with any product of this heading, in primary forms or in plates, sheets or strip
4003	Reclaimed rubber in primary forms or in plates, sheets or strip
4004	Waste, parings and scrap of rubber (other than hard rubber) and powders and granules obtained therefrom
4005	Compounded rubber, unvulcanised, in primary forms or in plates, sheets or strip
4006	Other forms (for example, rods, tubes and profile shapes) and articles (for example, discs and rings), of unvulcanised rubber
4007	Vulcanised rubber thread and cord
4008	Plates, sheets, strip, rods and profile shapes, of vulcanised rubber other than hard rubber
4009	Tubes, pipes and hoses, of vulcanised rubber other than hard rubber, with or without their fittings (for example, joints, elbows, flanges)
4010	Conveyor or transmission belts or belting, of vulcanised rubber
4011	New pneumatic tyres, of rubber
4012	Retreaded or used pneumatic tyres of rubber; solid or cushion tyres, tyre treads and tyre flaps, of rubber
4013	Inner tubes, of rubber
4014	Hygienic or pharmaceutical articles (including teats), of vulcanised rubber other than hard rubber, with or without fittings of hard rubber
4015	Articles of apparel and clothing accessories (including gloves, mittens and mitts), for all purposes, of vulcanised rubber other than hard rubber
4016	Other articles of vulcanised rubber other than hard rubber
4017	Hard rubber (for example, ebonite) in all forms, including waste and scrap; articles of hard rubber

Besides those codes already included in this study, only four eight-digit codes were found to account for a significant amount of material being exported to Vietnam. These codes, each of which is measured by weight are:

- AHECC 40121100 Retreaded tyres of rubber, of a kind used on motor cars (incl. station wagons and racing cars)
- AHECC 40012200 Technically specified natural rubber (TSNR) in primary forms or in plates, sheets or strip (excl. latex)
- AHECC 40059900 Compounded, unvulcanised rubber nes in primary forms
- AHECC 40101990 Vulcanised rubber conveyor belts or belting, (excl. those reinforced with metal, textile materials and plastics)

It is Hyder's view that the export to Vietnam under these four codes is being used to disguise the export of whole, baled tyres to Vietnam.

However, the amount of material being exported under these codes does not account for a significant proportion of the overall export of whole, baled tyres to Vietnam. 43,168 EPUs were exported to Vietnam under the four codes during the 2009–10 financial year whereas 6,759,834 EPUS were exported under AHECC 40040000 during the same period.

Export of AHECC 40121100 – Retreaded tyres of rubber, of a kind used on motor cars (incl. station wagons and racing cars)

As shown in Table 19, over 91,000 EPUs were exported in 2007–08 to Vietnam as retreaded tyres. However, the reported export of retreaded tyres to Vietnam in 2008–09 and 2009–10 was not significant.

Table 19: Export of AHECC 40121100 – Retreaded tyres of rubber, of a kind used on motor cars (incl. station wagons and racing cars) (EPUs)

Destination	2005-06	2006-07	2007-08	2008-09	2009-10
Vietnam	-	8,100	91,744	1,843	2,155
Total	123,932	106,101	133,891	45,120	18,136

Export of AHECC 40012200 – Compounded, unvulcanised rubber nes in primary forms (EPUs)

As shown in Table 20 and Figure 28, the export of AHECC 40012200 to Vietnam accounts for just about all of the growth in export that occurred during the 2007–08 and 2008–09 financial years.

Table 20: Export of AHECC 40012200 – Compounded, unvulcanised rubber nes in primary forms (EPUs)

Destination	2005-06	2006-07	2007-08	2008-09	2009-10
Vietnam	-	-	33,339	9,375	-
Total	23	3	33,348	12,397	604

Figure 28: Export of AHECC 40012200 – Compounded, unvulcanised rubber nes in primary forms (EPUs)



Export of AHECC 40059900 – Compounded, unvulcanised rubber nes in primary forms (EPUs)

As shown in Table 21 and Figure 29, the export of AHECC 40059900 to Vietnam accounts for 65% of the growth during the 2009–10 financial years, almost all of which occurred during April and May 2010.

Table 21: Export of AHECC 40059900 – Compounded, unvulcanised rubber nes in primary forms (EPUs)

Destination	2005-06	2006-07	2007-08	2008-09	2009-10
Vietnam	357	703	-	-	21,000
Total	10,396	7,120	865	7,329	32,404



Figure 29: Export of AHECC 40059900 – Compounded, unvulcanised rubber nes in primary forms (EPUs)

Export of 40101990 – Vulcanised rubber conveyor belts or belting (EPUs)

The export of AHECC 40101990 to Vietnam corresponds to an increase in the overall export of this code. However, as shown in Table 25 and Figure 30, there are a number of months where

exports to Vietnam account for a significant proportion of the total exports, which is consistent with other codes being used to disguise the export of whole, baled tyres.

Table 22: 40101990 – Vulcanised rubber conveyor belts or belting (EPUs)

Destination	2005-06	2006-07	2007-08	2008-09	2009-10
Vietnam	-	2,350	15,700	27,461	20,013
Total	-	43,642	88,174	88,532	83,329





It has also been concluded that AHECC 40069000 – Forms and articles of unvulcanised rubber – should be excluded from the calculation of the export of tyres and TDP. The description of this code does not relate to the export of tyres or TDP. Further, 98.8% of this code was exported to New Zealand and there is no evidence to suggest that it is anything other than the goods described in the AHECC definitions. However, given that AHECC 40069000 is measured by weight, it should remain within the scope of future studies examining the under-reporting of the export of whole baled tyres. The total export of AHECC 40069000 in 2009–10 was 1.7 thousand tonnes.

AHECC sub-chapter 3915

Data on the export of waste, parings and scrap of plastics (AHECC sub-chapter 3915) was also analysed to attempt to ascertain if these codes are being used to disguise the export of whole baled tyres. The export codes that were examined were:

- AHECC 39151000 Waste, parings and scrap of polymers of ethylene
- AHECC 39152000 Waste, parings and scrap of polymers of styrene
- AHECC 39153000 Waste, parings and scrap of polymers of vinyl chloride
- AHECC 39159092 Waste, parings and scrap of plastics (excl. plastics of polymers of ethylene, styrene or vinyl chloride)

Exports under AHECC 39159092 accounted for 97.5% of waste plastic exports to Vietnam during 2009–10. Figure 31 shows the export of this code over the financial years 2005–06 and 2009–10 to Vietnam. It shows growth in the export of AHECC 39159092 to Vietnam above the trend in the growth this code to all countries.



Figure 31: Export of AHECC 39159092 – Waste, parings and scrap of plastics (monthly)

2.7 thousand tonnes (equal to 337,000 EPUs) of waste, parings and scrap of polymers and plastics was exported to Vietnam during 2009–10. By way of comparison, 54 thousand tonnes (6,750,000 EPUs) of AHECC 40040000 – Waste, parings and scrap of rubber – was exported to Vietnam during the same period. While there has been significant and above trend growth in the export of scrap plastic to Vietnam, the volumes of export are not large enough to be able to conclude that AHECC 39159092 is being used to disguise the export of whole baled tyres. However, there has not been sufficient analysis during the course of this study to conclude that AHECC 39159092 is not being used to disguise the export of whole baled tyres. Material exported under AHECC 39159092 is recorded by weight as so lends itself to being used to disguise the export of whole baled tyres.

2.5.5 Collation of export data

Figure 32 and Table 23 show the collated data on the export of all tyres and TDP. Figure 33 and Table 24 provide the subset of this data that relates to end-of-life tyres.





Table 23: Export of tyres and TDP by state and as being loose or fitted (2009–10)

Type	Passenger	Truck	OTR
.,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,,	(EPU)	(EPU)	(EPU)
New - loose	144,633	31,548	1,385,433
New – fitted	221,829	18,919	33,068
In – use - fitted	21,121	-	
Retreaded - loose	18,136	49,780	8,448
Used - loose	6,501	6,501	
Used - baled	3,455,180	579,721	393,704
TDP	3,261,175	522,350	218,900
Total	7,128,574	1,208,819	2,039,554


Figure 33: Export of end-of-life tyres by lifecycle pathway and tyre type (2009–10)

Table 24: Export of end-of-life tyres by lifecycle pathway and tyre type (2009–10)

Tupo	Passenger	Truck	OTR	Total	
Туре	(EPU)	(EPU)	(EPU)	(EPU)	
Reuse	27,622	6,501		34,123	
Retreading	18,136	49,780	8,448	76,364	
Recycling	3,261,175	522,350	218,900	4,002,425	
Energy recovery	3,455,180	579,721	393,704	4,428,605	
Total	6,762,112	1,158,352	621,052	8,541,516	

The port of export for end-of-life tyres and TDP is shown in Figure 34 and Table 25.

Figure 34: Export of end-of-life tyres by lifecycle pathway and jurisdiction (2009–10)



	NSW & ACT	NT	QLD	SA	TAS	VIC	WA
	(EPU)	(EPU)	(EPU)	(EPU)	(EPU)	(EPU)	(EPU)
Reuse	5,369	278	18,148	80	2	9,759	486
Retreading	12,357	-	44,838	-	-	19,149	20
Recycling	1,577,125	-	-	-	-	522,000	-
Energy recovery	2,026,005	133	294,027	703,543	124,206	719,940	560,750
Total	3,620,856	411	2,260,313	703,623	124,208	1,270,848	561,256

Table 25: Export of end-of-life tyres (EPU) by lifecycle pathway and jurisdiction (2009–10)

The inconsistencies between the export data and the survey of recyclers were particularly large with respect to the port of export. As such, the calculation of the proportion of whole baled tyres exported from each jurisdiction was derived on the basis of the portion of AHECC 40040000 from each jurisdiction. These calculated proportions are shown in Figure 35 and Table 26.

Figure 35: Export of end-of-life tyres for energy recovery by tyre type and jurisdiction (2009–10)



Table 26: Export of end-of-life tyres for energy recovery by tyre type and jurisdiction (2009–10)

Total	3,527,929	578,889	321,785	
WA	446,707	73,299	40,744	
VIC	573,521	94,108	52,311	
TAS	98,946	16,236	9,025	
SA	560,458	91,964	51,120	
QLD	234,229	38,434	21,364	
NT	106	17	10	
NSW & ACT	1,613,962	264,831	147,211	
Туре	(EPU)	(EPU)	(EPU)	
Turne	Passenger	Truck	OTR	

The export of TDP product for recycling has not been provided at a jurisdictional level as the data contained at this point could reveal commercially sensitive information. The amount tyres exported for re-use or as retreaded tyres has not been considered significant enough to warrant being reported at a jurisdictional level.

2.6 Summary charts

This section provides summary charts and a summary table on the domestic and international destination of end-of-life tyres for the 2009–10 financial year.

Figure 35: Domestic and international destination of end-of-life tyres (2009–10)





Figure 36: Domestic and international destination of end-of-life passenger tyres (2009–10)

Figure 37: Domestic and international destination of end-of-life truck tyres (2009–10)



EPUs

- Domestic Recycling
- Domestic Energy recovery
- Domestic Civil engineering
- Domestic Licensed landfill
- Domestic Unknown
- Export Reuse and retreading
- Export Recycling
- Export Energy recovery

Figure 38: Domestic and international destination of end-of-life OTR tyres (2009–10)



EPUs

Domestic - Recycling

Domestic - Energy recovery

Domestic - Civil engineering

Domestic - Licensed landfill

Domestic - Unknown

Export - Reuse and retreading

Export - Recycling

Export - Energy recovery

3 QUALITATIVE ANALYSIS OF DATA

A qualitative assessment of the data gathered for this study has been undertaken to provide an overview of the data quality.

An assessment such as this is by definition subjective, but nevertheless it provides an overview of the data quality covering factors such as:

- Reliability or credibility of the source.
- Consistency between multiple data sources.
- Presence of data gaps
- The need to invoke assumptions or interpolate.
- The need to extrapolate.

Data was scored according to the following attributes: method, accuracy, credibility, sample size, consistency, appropriateness, comparability and sensitivity to dependent calculations. The scores for End-of-Life arisings were determined by averaging all corresponding scores under the domestic and international categories. Weightings were applied to each score and the weighted scores were then added to provide an overall quality indicator for each data set. Results are summarised in Table 26.

The results show a high degree of confidence in most data. Notably domestic civil engineering applications of tyres together with landfill, stockpiling and unlicensed disposal of all tyres represented data sets of "below average" data quality. The latter was discussed earlier in Section 2.4.1.

												Domestic destination							International destination															
		Co	nsump	otion		In-use	9	Ei A	nd-of-li Arising	ife s	l r	Vateria ecyclir	al 1g	en	Civil Igineer	ing	r	Energy ecover	/ y	l st & u c	andfill. ockpilin nlicen lisposa	, ng sed al		Reuse	•	R	letrea	ds	R	ecycli	ng	r	Energy ecover	y y
Weighting	Field	Pas.	Tru.	OTR	Pas.	Tru.	OTR	Pas.	Tru.	OTR	Pas.	Tru.	OTR	Pas.	Tru.	OTR	Pas.	Tru.	OTR	Pas.	Tru.	OTR	Pas.	Tru.	OTR	Pas.	Tru.	OTR	Pas.	Tru.	OTR	Pas.	Tru.	OTR
30%	Method	4	4	3	4	4	2	4	4	4	5	5	5	3	3	1	5	5	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4	4
10%	Accuracy	5	5	5	5	5	5	4	4	3	4	4	2	3	3	1	5	5	4	1	1	2	5	5	5	5	5	5	4	4	4	4	4	4
10%	Credibility	5	5	5	5	5	5	3	4	4	3	4	3	3	3	3	4	4	4	2	2	4	4	4	4	4	4	4	3	4	3	3	4	3
10%	Sample size	5	5	5	5	5	5	4	4	4	4	4	3	2	2	1	5	5	4	1	1	3	5	5	5	5	5	5	5	5	5	5	5	5
10%	Consistency	5	5	5	5	5	5	4	4	4	5	5	3	3	3	2	5	5	5	0	0	3	5	5	5	5	5	5	5	5	5	5	5	5
10%	Appropriateness	5	5	5	4	4	2	5	5	5	5	5	5	5	5	4	5	5	5	1	1	4	5	5	5	5	5	5	5	5	5	5	5	5
10%	Comparability	5	5	5	5	5	5	5	5	5	5	5	5	5	5	4	5	5	5	3	3	4	5	5	5	5	5	5	5	5	5	5	5	5
10%	Sensitivity to dependent calculations	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	5	3	3	5	5	5	5
100%		4.7	4.7	4.4	4.6	4.6	3.8	4.2	4.2	4.1	4.6	4.7	4.1	3.5	3.5	2.3	4.9	4.9	4.4	2.5	2.5	3.7	4.6	4.6	4.6	4.6	4.6	4.6	4.2	4.3	4.4	4.4	4.5	4.4
Reporting commer	limitations due to cial sensitivities										Yes	Yes	Yes																					

Score

0.0 - 3.0 3.0 - 3.5 3.5 - 4.0 4.0 - 4.5 4.5 - 5.0 Poor data quality. Potential inconsistency or significent reliance on assumptions.

Sub-standard data quality. Some data gaps. Assumptions required.

Average quality data. Sources are reputable, however potential for data gaps and the need for assumptions.

Good reliability. Data from reputable sources. Few data gaps. Low reliance on assumptions.

Very high reliability. Data from highly trusted sources. Minimal data gaps. Minimal reliance on assumptions.

Study into domestic and international fate of end-of-life tyres – Final Report Hyder Consulting Pty Ltd – ABN 76 104 485 289 AA003649

4 MARKET ASSESSMENT & TRENDS ANALYSIS

This section contains an analysis of trends in the diverse markets for end-of-life tyres. It then subjects these trends to an assessment against economic factors that influence market decision making both here and in other countries.

4.1 International trends analysis

4.1.1 Destination of end-of-life tyres

Table 27 provides data on the destination of end-of-life tyres from selected OECD countries.

	Recycling	Civil engineering	Energy recovery	Export	Total recovery	Disposal
United States ⁱ	17%	15%	55%	2%	89%	11%
Europe ⁱⁱ	43%		47%	5%	94%	6%
Japan ⁱⁱⁱ	9%		64%	17%	91%	9%
Mexico ^{iv}	90)%			90%	10%
South Korea ^{iv}	16	3%	77%		93%	7%
Canada ^{iv}	75	5%	20%		95%	5%
New Zealand ^{iv}	15	5%			15%	85%
Australia (total)	10%	6%	<1%	18%	34%	66%
Australia (ex OTR)	17%	8%	1%	29%	55%	45%

Table 27: Destination of end-of-life tyres in select OECD countries and regions

i. Rubber Manufacturers Association (RMA, 2009)

ii. European Tyre and Rubber Manufacturers Association (ETRMA, 2010); adjusted to remove re-use and retreading

iii. Japan Automobile Tyre Manufacturers Association (JATMA, 2010); adjusted to remove re-use and retreading

iv. World Business Council for Sustainable Development (WBCSD, 2008)

NB: Care should be taken when making comparisons using these figures given the different methods and time periods used to generate the data.

The recovery of end-of-life tyres has generally grown in each region, for instance from 55% in the United States in 1994 (RMA,2009) and from 21% in Europe in 1994 (ETRMA, 2007). The recovery of end-of-life tyres in Japan was already at 90% in 1994, and has remained steady around that rate for nearly 20 years (JATMA, 2010).

Figure 39 shows trends over the last decade for the United States, Europe and Japan, using the ongoing studies by, respectively, the RMA, ETRMA and JATMA.



Figure 39: Trends in the recovery rate of end-of-life tyres in select OECD countries and regions⁴

NB: Care should be taken when making comparisons using these figures given the different methods and time periods used to generate the data.

In Europe, the rise in recovery over the last decade is almost in equal part due to increases in recycling of tyres and the recovery of energy from tyres. However, between 2008 and 2009 the share of tyres going to energy recovery grew at the expense of the share of tyres going to material recovery. The main markets for material recovery in Europe, as reported by the ETRMA (2010), are whole tyres used in civil engineering applications, Tyre Derived Aggregate used as foundation for roads or fill material, crumb and powdered rubber used to manufacture moulded rubber products, flooring, matting and rubber modified asphalt. Shredded tyres have also been reportedly used in steelworks equipped with electric arc furnaces as a substitute for anthracite and scrap metal (ETRMA, 2010).

The Rubber Manufacturers Association (2009) attribute the more recent rises in the utilisation of end-of-life tyres in the United States to increasing energy prices and an increase in the demand for TDP for mulch, playgrounds and synthetic sport surfacing. This also reflects a decrease in the amount of tyres being used for civil engineering, from 19% in 2003 to 12% in 2007, despite the overall increase in the recovery of end-of-life tyres.

In comparison with the other OECD countries, the fate of end-of-life tyres in Australia is different for a number of reasons. Firstly, mining is a much more significant component to the Australian economy than it is to other OECD countries, accounting for approximately 9% of Australia's GDP⁵, in comparison for example to 1.6% in the Unites States⁶. As a result, it is likely that the number and size of OTR tyres in Australia is much greater than other OECD countries.

Secondly, a much higher proportion of tyres are exported from Australia (excluding OTR) than other countries. This is likely to reflect Australia having access to a market in its immediate region.

 $^{^{\}rm 4}$ Data sourced from ETRMA, 2007, ETRMA, 2010, JATMA, 2010 and WBCSD, 2008

⁵ Bureau of Resources and Energy Economics, *Resources and Energy Quarterly*, September Quarter 2011, Canberra, September 2011.

⁶ Pricewaterhouse Coopers, prepared for the National Mining Association, *The Economic Contributions of U.S. Mining in 2008*, October 2010.

Thirdly, the domestic use of tyres for energy recovery in Australia is virtually non-existent, whereas around half, or more, of end-of-life tyres in the United States, Europe and Japan are used in energy recovery. This may reflect the relative low prices of coal, oil and gas in Australia. However, it may also reflect lower rates of incineration of waste in Australia. Cheaper sources of fuel and low levels of established infrastructure remove the drivers which normally encourage energy recovery from tyres.

Product stewardship

There are various product stewardship schemes currently implemented internationally. Table 28 is based on data published by the UNEP⁷. While an exhaustive review of these schemes is beyond the scope of this report, following are some examples of the types of schemes which have been implemented.

Directive 2008/98/EC of the European Union establishes a legislative framework for the handling of waste, including major principles that encourage the application of:

... the waste hierarchy and, in accordance with the polluter-pays principle, a requirement that the costs of disposing of waste must be borne by the holder of waste, by previous holders or by the producers of the product from which the waste came. (L 312/3)

Accordingly, most European countries have a product stewardship scheme, levy or advanced disposal fee in place to subsidise the cost of collecting and recycling end-of-life tyres, and this is counted as being primarily responsible for the growth in the recovery of end-of-life tyres (ETRMA, 2010). Many European countries also have a product stewardship scheme for end-of-life vehicles, which accounts for around 10% of arisings of end-of-life tyres.

In South Korea a deposit is placed on the sale of new tyres which is redeemed when tyres reach end-of-life. South Korea achieves a 93% total recovery for tyres.

The Canadian province of British Columbia has a product stewardship scheme run by an industry association under the auspices of government. Other Canadian provinces and most of the United States apply a disposal fee to subsidise the recovery of end-of-life tyres.

Table 28: Summary of systems for managing end-of-life tyres in OECD countries and the European Union

Producer responsibility	Tax-based system	Free market system
Europe: Belgium, Finland, France, Greece, Hungary, Italy, Norway, Netherlands, Poland,	Europe: Denmark , Latvia, Slovak Republic North America: Canada (other	Europe: Austria, Germany, Ireland, Switzerland, United Kingdom
Portugal, Romania, Spain, Sweden, and the Czech Republic	provinces), United States (most states)	North America: United States (some states), Mexico
North America: Canada (British Columbia)		Asia: Japan
Middle East: Israel, Turkey		Australia
Asia: Taiwan, South Korea		
South Africa		

⁷ UNEP Revised technical guidelines on the environmentally sound management of used tyres, 2011

4.1.2 Export of end-of-life tyres and TDP from OECD countries

A comprehensive analysis of export market activities in OECD countries is beyond the scope of this report. Following are examples of the type of activities undertaken in selected countries.

The Rubber Manufacturers Association (2009) reported a total of 2% of scrap tyres were exported from the United States in 2007, slightly down on 2005 figures. However, they also stated that there is a "significant likelihood that more tires are exported than reported ." (p. 53)

There is a large trade in used tyres between the United States and Mexico. This market is driven by the demand for used tyres for re-use on vehicles in Mexico (California Integrated Waste Management Board, 2009).

There is also a growing market in the export of tyres and TDP from California to Asia. The California Integrated Waste Management Board (CIWMB, 2009) indicates that the principal end markets for these exports are "tire-derived fuel, manufactured products, and ground-rubber" (p.37). The export of tyres and TDP from California to Asia grew 400–500% over a six month period around the beginning of 2008.

The California Integrated Waste Management Board (2009) notes:

Anecdotal evidence indicates that used and waste tires are hauled to California ports where they are loaded into empty shipping containers returning to Asia. The haulers are not charged a tipping fee due to the excess capacity of ships and containers returning to Asia. This provides a strong incentive for tire haulers to participate in this trade by avoiding the tipping fee charged at U.S. or California landfills. (p.37)

The observed growth of exports from the US coincides with a decrease in exports from the EU. The ETRMA (2010) reported a total of 4% of used tyres as reused or exported, down from 9% in 2006 (ETRMA, 2007), The EU has exerted strict control procedures for the movement of waste into and out of the EU, through European Regulation 1013/2006/EC on the shipment of waste (the Waste Shipment Regulation). The export of non-hazardous waste for recovery can only proceed under notification or green list controls, and, while end-of-life tyres constitute "green list waste" (European Regulation 1013/2006/EC, L 190/49), export to non-OECD countries depend on whether the importing country accepts them. The regulation providing control measures for the export of green waste came into force in November 2007 and amendments in July 2008 and October 2009 have been made according to responses received from importing countries. Export of end-of-life tyres to non-OECD countries is generally only by written notification and consent and in many cases, for example China and Vietnam, entirely prohibited (360 Environmental Limited, 2009).

A similar situation has been observed in Japan. Japan Automobile Tyre Manufacturers Association (JATMA, 2010) reports the export of tyres and TDP from Japan to be 16%, but that this has been in a continued period of decline. This is stated to be "because most of the rubber wastes for alternative fuel in foreign countries moved to domestic supply for scrapped tyre users" (JATMA, 2010, p. 14).

4.1.3 Landfill and stockpiling

The border region between the United States and Mexico has been a site of stockpiling large quantities or tyres, with some stockpiles reportedly over 1,000,000 tyres. The USA and Mexico have recently entered into an agreement to clean-up used tyres stockpiles and to prevent the creation of further stockpiling along the border between the two countries. The RMA (2009) noted an 87% reduction in the amount of stockpiles in the United States since 1997.

JATMA (2010) reported a reduction in the number of stockpiled or dumped scrap tyres, with the figures indicating that well less than 10% of scrap tyres are disposed of illegally.

Landfill bans

The approach to landfill bans for end-of-life tyres is not uniform within the OECD. Some nations have imposed complete bans, while others have done so to varying degrees. The following examples of the EU and USA demonstrate the broad range of responses to this issue.

Members of the European Union are required to be in compliance with Council Directive 1999/31/EC which prohibited the disposal of whole used tyres (less than 1.4m in diameter) from landfill from July 2003 and banned the disposal of shredded tyres from landfill from July 2006. As shown in Figure 39, significant increases in the recovery rate of end-of-life tyres have been achieved since the introduction of landfill bans in the EU.

North American regulations are not uniform. Some North American states and provinces also have in place landfill bans, and often as an accompaniment to disposal fees. The RMA (2009) itemised the regulation of the disposal of tyres in the United States as:

- 38 states ban whole tires from landfills
- 36 states allow shredded tires to be placed in landfills
- 20 states allow processed tires to be placed into monofills
- 12 states prohibit all landfilling and monofilling.

4.2 End-of-life tyres in Australia

Figure 40 and Table 29 show the domestic and international destination of end-of-life tyres originating in Australia from the Hyder (2009) study (for 2007-08) and this study. Notable trends include:

- An increase in domestic recycling and export of TDP.
- A decrease in domestic energy recovery from passenger tyres.
- An increase in the export of passenger tyres for energy recovery (whole, baled tyres).
- A continuation of a large amount of OTR tyres being landfilled, illegally dumped or stockpiled.



Figure 40: Domestic and international destination of Australian end-of-life tyres

Care should be taken in using the data presented in Figure 40 given the methodological differences between this report and the Hyder (2009) report.

	Pass	enger	Τι	ıck	0	TR
	(EF	PU)	(EF	PU)	(E	PU)
	2007-08	2009-10	2007-08	2009-10	2007-08	2009-10
Domestic - Recycling	1,550,125	1,853,750	2,979,250	2,999,750	54,000	75,000
Domestic – Energy Recovery	825,000	250,000				
Domestic – Civil Eng.	685,875	1,016,625	513,750	1,276,375		500,000
Domestic – Licensed landfill	4,794,000	1,450,073	4,851,000	161,119	14,832,000	
Domestic – Other disposal/ stockpiling	1,788,000	1,865,043	4,715,000	9,078,286	2,531,000	19,400,840 ⁸
Internat'l – Reuse & Retread	2,644,000	45,758	330,000	56,281	307,000	8,448
Internat'l – Recycling	1,714,000	3,261,175	241,000	522,350	224,000	218,900
Internat'l – Energy Recovery		3,455,180		579,721		393,704
Total	14,001,000	13,197,603	13,630,000	14,673,882	17,948,000	20,596,893

Table 29: Domestic and international destination of Australian end-of-life tyres

Figure 41 presents the same data as given in Figure 40, with slightly different categorisations of exported end-of-life tyres and with end-of-life destinations as a proportion of total end-of-life arisings. This allows for a better comparison of the results of this study and the Hyder (2009) study.

⁸ Some disparity between years is noted in the domestic disposal data for OTR tyres. This is due to methodological differences between this report and the Hyder (2009) report.



Figure 41: Domestic and international destination of Australian end-of-life tyres

Care should be taken in using the data presented in Figure 41 given the methodological differences between this report and the Hyder (2009) report.

4.2.1 Landfilling, illegal dumping and stockpiling

As noted in section 2.4, the landfilling, illegal dumping and stockpiling of tyres remains the most common disposal route for end-of-life tyres in Australia. However, this disposal route accounts for markedly different proportions for different tyre types, as is illustrated in Figure 42.



Figure 42: Proportion of end-of-life tyres landfilled, illegally dumped and stockpiled by tyre type (2009–10)

The collection and recycling of passenger and truck tyres is much more prevalent in Australia for two main reasons. Firstly, passenger and truck tyres are of a more uniform composition, a more uniform size, and often smaller than OTR tyres, all of which makes large scale reprocessing less expensive.

Secondly, a higher proportion of passenger and truck tyres are in-use and reach end-of-life in metropolitan areas, reducing the transportation costs to the large tyre recyclers located in capital cities. Furthermore, passenger and truck tyres are often replaced at a central location –

tyre retailers or retreaders – which provides a readymade point of collection of large and regular volumes.

Truck tyres are less likely to be limited in their disposal route to licensed landfill. Truck tyre retailers and retreaders are more likely to be located in outer metropolitan regions, or in regional areas, and closer to unlicensed landfill and stockpiling sites. Further, trucks may have spare capacity to transport end-of-life tyres from these retailers and retreaders to unlicensed disposal sites.

Similarly, OTR tyres are almost entirely disposed of to landfill or stockpiled given their proximity to available sites. Most tyres used in mining operations reach end-of-life adjacent to large holes or areas of barren land which they were used in the creation of.

The transport of OTR tyres from mining sites to recyclers is likely to have to cover the full cost of a return trip, often over a very long distance, and, as such, the mining industry generally considers the cost of transporting OTR tyres for recovery is prohibitive (Sustainable Strategic Solutions, 2005).

Landfill pricing and controls

Table 30 shows the increase and/or introduction of landfill levies over time in the five largest Australian states. Landfill levies have had the effect of contracting any price advantage of landfill as a disposal route for tyres.

State	NSW	Victoria	Qld	SA	WA	
Waste classification	Sydney metropolitan	Metropolitan - industrial	Commercial & industrial	Solid waste	Putrescible landfills	
2004–05		\$9				
2005–06		\$11				
2006–07		\$13			\$6	
2007–08		\$15				
2008–09	\$46.70	\$15			\$7	
2009–10	\$58.80	\$15			\$8	
2010–11	\$70.30	\$30		\$26	\$28	
2011–12	\$80.30	\$40	\$35	\$26	\$28	
Data for other states/territories is either unavailable or considered not relevant.						

Table 30: General landfill levy rates in select Australian states (per tonne)

Controls on the disposal of tyres to landfill also have an effect on the transportation and disposal route of passenger tyres and, to a lesser extent, truck tyres. Table 31 sets out the policies and controls that state and territory governments have in place on the disposal and transportation of tyres.

Table 31: Controls on the disposal and transporting of tyres

New South Wales	Whole tyres are not permitted to be landfilled in the Sydney and surrounding metropolitan areas. In regional and rural areas, the disposal of tyres to landfill is at the discretion of local government.					
	Licensing is required to transport tyres for loads of 2 tonnes or more to and from other states and territories that require tracking of the transportation of tyres.					
	 Protection of the Environment Operations Act 1997 					
Victoria	Tyres are considered a solid inert waste from an industrial source. Whole tyres are banned from landfill. Shredded tyres must be disposed of at a site which is licensed to receive shredded tyres.					
	There are not controls on the transport of tyres in Victoria.					
	 Environment Protection Act 1970 – Waste Management Policy (Siting, Design and Management of Landfills), Victorian Government Gazette, No S 264 14 December 2004 					
	 EPA, Industrial Waste Resources Guidelines, Waste Categorisation 					
Queensland	Whole tyres are listed as a regulated waste but are permitted to be disposed at landfill. It is noted that permitted disposals are not contained in legislation and are determined on a site-by-site basis as part of development approval conditions or waste acceptance criteria. Dedicated storage sites and stockpile sizing are also not legislated however information relating to this is contained within landfill guidelines (currently under review). The guidelines indicate that tyres at landfills must be stored at dedicated locations in a way that does not harbour mosquitoes and that stockpiles of tyres at landfill must not exceed 5m in width, 45m in length and 2m in height, and must be kept 10m from any other flammable or combustible material. Tyres are a trackable waste and movement both intra- and inter-state must be tracked.					
	Tyre storage and tyre recycling is also regulated as an Environmentally Relevant Activity under the Environmental Protection Regulation 2008.					
	Specific guidelines are available relating to the disposal of tyres at mine sites.					
	 Queensland Environmental Protection Act 1994 – Environmental Protection Regulation 2008 Guideline ERA 60 – Waste disposal: Landfill siting, design, operation and rehabilitation 					
	 Environmental Protection (Waste Management) Regulation 2000 					
South Australia	The disposal of whole tyres at waste depots in South Australia has generally been prohibited through license conditions from 1992 for metropolitan waste depots, and from 1995 for country waste depots. A more widespread ban on the disposal of whole tyres to landfill came into place on 1 September 2010.					
	Authorisation is required to transport tyres if done so for a fee or reward. Licensed transporters must identify where tyres are collected and where they are taken. Licensed transporters must take waste tyres to a licensed waste or recycling depot, or depot that can receive the tyres under exempted circumstances.					
	The Environment Protection Authority (EPA) ensures that tyres are stored, transported and disposed of in a manner that minimises their negative effects on the environment.					
	 Environment Protection Act 1993 (Version: 2.9.2010) Environment Protection (Waste to Resources) Policy 2010 EPA 183/10: Waste guidelines – Waste tyres, updated September 2010 					

Western Australia	Used, rejected or unwanted tyres (including shredded tyres or tyre pieces) are classed as an inert waste and when not disposed or managed through another approved method must be disposed of in licensed landfills.
	A tyre landfill exclusion zone operates in and around the Perth Metropolitan Area, which restricts landfill of used tyres unless specific approval has been obtained.
	The storage of tyres is regulated, with premises storing more than specified thresholds of used tyres requiring a works approval to set up and a licence to operate.
	Carriers, drivers and vehicles involved in the transportation of controlled wastes, including tyres, must be licensed.
	 Environmental Protection Act 1986 Environmental Protection Regulations 1987 Environmental Protection (Controlled Waste) Regulations 2004 Landfill Waste Classification and Waste Definitions 1996 (As amended December 2009) in accordance with Part V of the Environmental Protection Act 1986.
Tasmania	Whole tyres are a prescribed waste and are only allowed at landfills that have specific approval.
	Standards for landfills states that tyres can be stockpiled and managed separately provided the number does not exceed 500 and stored in individual lots of 150 or less.
	 Environmental Management and Pollution Control Act and Environmental Management and Pollution Control (Waste Management) Regulations 2000 Landfill Sustainability Guide 2004
Northern Territory	Tyres are a listed waste which required that all tyres to be shredded prior to placement in landfill. In practise this requirement has not been practical or possible in the many remote landfill locations. As a result Darwin and Alice Springs are the only two centres where tyres are shredded prior to sending to landfill. In other places tyres are segregated from other waste prior to placement in landfill.
	Tyres are a listed waste which requires a license to collect, transport, treat and dispose of the waste.
	 Waste Management and Pollution Control (WMPC) Act 1994 Guide to Environment Protection Approvals and Licences under the Waste Management and Pollution Control Act, February 2010
Australian Capital Territory	There are no legislative constraints to the placement of tyres in landfill in the ACT. However an operational ban was implemented so that tyres will not be placed in landfill in ACT. All tyres that are collected at waste transfer stations or landfill sites are sent to Sydney for recycling.
	 ACT's Environmental Standards: Assessment & Classification of Liquid & Non- liquid Wastes June 2000

As can be seen from the table above, the approach of the various jurisdictions is not consistent, While there are measures in place to restrict landfill disposal of tyres and to track their transport, the absence of a nationwide approach will serve to dilute the drivers for recovery of resources.

4.2.2 Export of whole baled tyres to Vietnam

Figure 43 and Figure 44 show the value and amount of used pneumatic tyres (AHECC 40122000) and waste, parings and scrap of rubber (other than hard rubber) and powders and granules obtained therefrom (AHECC 40040000) exported between 2005–06 and 2009–10. The quantity and value of used pneumatic tyres (AHECC 40122000) exported to countries other than Vietnam remained relatively steady between 2005–06 and 2009–10. However, during the

period of significant export (roughly corresponding to the 2007 and 2008 calendar years), while the value of used pneumatic tyres (AHECC 40122000) exported to Vietnam remained steady, it was noted to be significantly less than the value of tyres exported to other countries. The observed disparity in the value of material exported reinforces the conclusion that tyres exported to Vietnam under used pneumatic tyres (AHECC 40122000) during this period were whole baled tyres.





The export of AHECC 40040000 to countries other than Vietnam grew significantly between 2005–06 and 2009–10, and accelerated sharply around December 2008. After this time, the value of AHECC 40040000 exported to countries other than Vietnam dropped significantly.

The value of AHECC 40040000 exported to Vietnam was relatively high at the beginning of the rise in quantities, around June 2007. It then dropped to levels comparable with the export of AHECC 40122000 to Vietnam around January 2008, being around \$0.25 per tonne. The value of 40040000 to Vietnam then dropped further around April 2008 to less than \$0.10 per tonne on average.

Value of 40040000 is likely to reflect a more mature international market for TDP. However, the increase may also reflect an increase in the production of TDP from other countries (see further discussion in section 4.2.3).

Figure 44: Value and amount of waste, parings and scrap of rubber (other than hard rubber) and powders and granules obtained there from (tariff code AHECC 40040000) exported from Australia



Industry experts report that whole baled tyres exported to Vietnam from Australia have an end market in China. Anecdotal evidence suggests that whole baled tyres unloaded in Vietnam are transported by river and overland into China. Once in China, whole baled tyres are used as an energy source, either directly in cement kilns or power plants. Some tyres are also reported to be undergoing pyrolysis in China to manufacture liquid fuel for use in ceramic kilns.

The decision on whether to bale end of life tyres for export, or to first process them into TDP will generally be a financial one. Tyre recyclers report the price being paid for exported TDP as being around \$85 per tonne from Melbourne and Sydney. By comparison, the price paid for exporting a 40-foot container of whole, baled tyres to Vietnam from Melbourne is currently between \$1,000 and \$1,200. A 40-foot container holds around 24 tonnes of whole baled tyres, giving a per tonnage cost of between \$42 and \$50. These prices are reportedly equivalent to those prior to the global financial crisis. Balers are relatively mobile and only require minimal capital investment to establish operations. Balers cost between \$10,000 and \$100,000, depending on capacity and quality. Irrespective, the establishment cost of baling is negligible compared to that of tyre recyclers.

The growth in the export of whole baled tyres to Vietnam corresponds with the spike in commodity prices immediately prior to the global financial crisis. Although declining sharply at the onset of the global financial crisis, the export of whole baled tyres has rebounded strongly since.

The availability of containers returning and departing Australia has also been a major factor in the establishment of the trade in whole baled tyres. The *Waterline 48* report, prepared by the Department of Infrastructure and Transport (2010) indicated that, during 2009–2010, 46% more container were loaded inwards than outwards from the five major Australia docks. Inward container movements were 12,017 Twenty-foot Equivalent Units (TEUs), whereas outwards container movements were only 8,246 TEUs (DIT, 2010).

Furthermore, four of the top five countries of origin for imports to Australia are located in East Asia, being China, Japan, Thailand and Singapore, and relatively close to Vietnam for returning ships.

4.2.3 Import of TDP

Figure 45 provides figures on the quantity and value of tariff code 40040000 imported to Australia between 2005–06 and 2009–10.

The value of tariff code 40040000 imported to Australia dropped sharply around January 2008 and remained steady thereafter.

The importation of TDP to Australia under the tariff code 40040000 increased notably between December 2009 and February 2011, with major imports originating from Greece, New Zealand, Singapore and Thailand.

Figure 45: Import of waste, parings and scrap of rubber (other than hard rubber) and powders and granules obtained therefrom (tariff code AHECC 40040000) to Australia



The spike in the import of TDP to Australia between December 2009 and February 2011 may be attributed to a couple of factors. This spike might reflect the 'dumping' of TDP in Australia after the global financial crisis. International tyre recyclers may have continued to process material while their usual end market contracted, and may subsequently have sold product into Australia at lower than usual market rates.

Another explanation for the spike in the import of TDP to Australia between December 2009 and February 2011 is the introduction of restrictions on the export of waste pneumatic tyres from the European Union. Commission Regulation (EC) No. 1418/2007 came into force on 29 November 2009 and set out the controls on the export of tyres to non-OECD countries.

Australian tyre industry reports that there is a larger trend of having to compete in the domestic market with TDP imported from countries where there is some form of subsidy for the collection and recycling of tyres. One tyre recycler noted that their customers are being offered "cheaper, imported crumb from countries that ... have product stewardship schemes, [including] Europe, which offsets their selling price".

4.2.4 Recycling and energy recovery

Hyder conducted a survey of Australian tyre collectors and recyclers, data was received for a total of 13 facilities. A copy of the survey template is presented in Appendix A.

<u>TDP</u>

As shown in Figure 46 the volume of tyres being recycled into TDP in Australia has grown modestly between this study and the Hyder (2009) study, both for sale into the domestic and the international market. Anecdotal evidence suggests that this shift is being driven by demand, and policy and regulations (such as landfill restrictions) supporting the recovery of end-of-life tyres, both domestically and internationally.



Figure 46: Quantity of domestic tyre recycling in 2007-08 and 2009-10

Nonetheless, tyre recyclers surveyed reported operating at between 50% and 60% capacity. Table 32 provides detail on the estimated latent and total capacity of the Australian tyre recycling industry. Nearly 80% of all recycling of tyres occurs in Victoria.

Australian TDP	production	EPUs (thousands)	% of end-of-life tyres (passenger and truck)	% of end-of-life tyres (total)
	Sold domestically	4,929	18%	10%
Current output	Exported	4,002	14%	8%
	Total	8,931	32%	17%
Estimated latent	capacity	7,559	27%	16%
Estimated total c	apacity	16,490	59%	34%

Table 32: Capacity of the A	ustralian tyre recycling	industry in 2009-10
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Whereas previously there was little competition for the supply of tyres, tyre recyclers now report having to compete with balers for access to passenger tyres from retailers.

Tyre recyclers with more secure arrangements with retailers and/or with their own collection infrastructure have reported being able to ride out the highs and low of competition from baling. Irrespective, many recyclers themselves have resorted to selling tyres to balers for export.

TDP is principally used in:

- Floor surfacing and matting, including playground cover, safety matting, sporting surfaces and acoustic insulation;
- Road surfacing;
- Tile adhesive;
- Energy recovery; and
- Civil engineering.

The data supplied to Hyder by tyre recyclers was not sufficient for an in-depth analysis of the markets that are currently buying TDP.

4.2.5 Retreading

The numbers of tyres being retreaded in Australia is in a long period of decline. The most popular reason attributed to the decline in retreading by industry is the decrease in the price of new tyres imported to Australia, principally from China.

Furthermore, tyre retreaders report that the prices being paid for the buffings produced during the retread process has decreased significantly.

Passenger

Modern tyres are often less suitable for retreading and/or more variable in size, which further compounds the decrease in the retreading of tyres. One industry report was that the market was down 40–50% in the last 8 years.

The major market for retreaded passenger tyres in metropolitan areas is taxis. Most taxis have the same sized rims (16"). This allows tyre retreaders to retread and stock and sell a set size of tyres.

Some tyre retreaders stated the need to have adequate on-site storage capacity is a significant cost to serving the passenger market.

<u>Truck</u>

Truck tyres are more suited to retreading for a number of reasons. Truck tyres are of a relative uniform size and composition, which makes the tooling for and sale of them more feasible. Tyres are also rotated in use through the truck, with retreads from lower quality casings able to be used in trailers.

However, a number of truck retreaders stated that the market was struggling, again with the price of imported tyres becoming very competitive. Industry reports were that a number of large trucking companies had ceased retreading.

Again, industry reports were of a decline in the demand for retreaded OTR tyres. The retreading of OTR tyre is particularly difficult given the variability in the size of tyres and the distribution of their point of use.

One retreader reported landfilling about 90% of the casings that they receive because they were unsuitable for retreading or because there was a lack of demand for retreaded tyres.

4.3 Commodity prices

It is expected that the market will dictate that maximising the overall economic return will determine the fate of end-of-life tyres. A comparison of the trends in the fate of end-of-life tyres was made with economic factors, such as commodity prices and the price of shipping, in order to assess which economic factors are likely to have an effect on the demand for and transportation of end-of-life tyres.

Figure 47 provides a breakdown of the composition of an average passenger tyre. Natural rubber, oil, coal and steel are the source commodities for around 90% of the materials used in the composition of an average passenger tyre. Natural rubber, oil and coal are also often the raw commodities that compete with, or constitute other products or material that compete with the sale of used tyres into end markets.



Figure 47: Composition of average passenger tyres (WBCSD, 2010)

Assuming that end-of-life tyres being exported to Vietnam are being transported to China for use in as an energy source and in tyre pyrolysis facilities, as discussed in Section 4.2.2, the price of oil is an important economic factor to consider. Further economic indicators to consider are the prices of materials that compete with the by-products of the pyrolysis system, including off-specification carbon black, charcoal and waste oils.

Data was collected over the time period from July 2005 until June 2010 for the following economic factors, which, in Hyder's view, combine to affect the domestic TDP market:

- The price of oil, the price of natural rubber, the price of coal, the price of steel and the price of new tyres.
- The value of the Australian dollar, the US dollar and the currency in major end market destinations, i.e. Vietnam and China.
- Economic growth (percent change in real GDP) in Australia and China.
- The cost of shipping from Australia.

Monthly data was available for most currency values and commodity prices, however only quarterly and annual data was available for GDP, and only bi-annual data was available for shipping costs. All data is presented in Appendix B.

Figure 48 shows the quantity of end-of-life tyres exported to Vietnam and the price of natural gas, oil and coal. The commodity prices peaked in July 2008, followed by a sharp decline coinciding with the global financial crisis. The volume of end-of-life tyres exported to Vietnam declined similarly. However this decline was delayed, with exports of whole, baled tyres to Vietnam peaking in October 2008.



Figure 48: Export of end-of-life tyres to Vietnam and commodity prices

The data was subjected to statistical analyses which indicated a strong relationship between the export of end-of-life tyres to Vietnam with the following economic factors:

- import and export shipping costs;
- price of coal;
- price of steel;
- price of new tyres (when adjusted for time lag);
- strength of the Chinese and Vietnamese currency; and
- growth rate of China's GDP.

The results of the statistical analyses, including output summaries, methodology and interpretation of the results are presented in Appendix C.

5 CONCLUSIONS

This report details the sources and fate of end-of-life tyres in Australia for the period 2009-10. 75% of passenger tyres were recovered through recycling, energy recovery and exports, in comparison to 37% of truck tyres. Off-the-road (OTR) tyres continue to nearly all be landfilled or stockpiled, most often at mines or quarries.

The volume of tyres being recycled into TDP in Australia has grown modestly between this study and the Hyder (2009) study. However, a dramatic impact to the fate of end-of-life passenger tyres and, to a lesser extent, truck tyres has been the advent of the export of whole baled tyres to China, via Vietnam, for use as a fuel. This practice has grown from being almost non-existent three years ago to accounting for the fate of 26% of end-of-life passenger tyres in 2009–10. Whereas previously there was little competition for the supply of tyres, tyre recyclers now report having to compete with balers for access to passenger tyres from retailers.

Hyder recommends the introduction of a product stewardship scheme in Australia that has the effect of addressing, at the point-of-sale, any cost difference between least desirable disposal routes and the most desirable disposal routes.

Commodity supply and demand

As has been shown in section 4.3 there is a strong correlation between commodity prices, shipping prices and overall economic conditions on the export of whole baled tyres. Further increases in the price of oil and coal are likely to lead to increases in the worldwide demand for end-of-life tyres for use as a fuel. The ETRMA (2010) states that:

Ever spiralling energy and raw material costs could have a positive impact on the end of life market, especially for tyre derived products used as raw materials for recycling and/or as alternative fuel (p.16).

The supply of oil is likely to play a crucial role in the international demand for end-of-life tyres and tyre derived product in future years. The worldwide production of oil is widely forecast to be near or already past its peak, and is at the beginning of a period of decline. However the demand for oil is likely to remain strong given its important role in modern industrial economies. Under this scenario, both the supply of and demand for oil are relatively inelastic. Subject to no viable alternative being available, this will result in an increase in the price of oil and an increase in the price and demand for end-of-life tyres.

However, there may also be a number of countering effects. A decline in the supply of oil is likely to have wide reaching economic implications that may destabilise the overall demand for commodities. An increase in oil prices is also likely to lead to a decrease in the use of motor vehicles, and, consequently, the number of end-of-life tyres. JATMA (2010) notes that:

Regarding the situation in scrapped tyre recycling, rise in prices of crude oil and coal originated brisker demand for scrapped tyres as well as those for other alternative fuels, i.e. wood shavings and RPF (new-type solid fuel made from waste paper and scrapped plastics, abbreviation for Refuse Paper & Plastic Fuel). However, due to the decreased total amount of scrapped tyre generation, many users could not complete the scheduled amount to be used... (p. 14)

The availability of convenient and cost effective transport is likely to be a strong determinant to the market's choices for the fate of end-of-life tyres, especially in the context of rising oil prices. The recovery of end-of-life tyres in Australia is already heavily influenced by the proximity and availability of transport. In the case of passenger and truck tyres, recycling is more likely given the proximity of their use to major tyre recyclers. In the case of whole, baled tyres transportation costs are lower because of the opportunity afforded by an excess of shipping containers returning to East Asia from Australia.

Product stewardship schemes and landfill bans

The Basel Convention *Technical guidelines on the identification and management of used tyres* (1999) states that:

Landfilling and stockpiling are the least desired options. Landfilling should be adopted only when no viable alternatives exist. In order to assess the necessary measures when applying these options, the last part of this section deals with minimising the impact on the environment of storage or landfill of end-of-life tyres. (p.11).

As noted in section 4.1.3, the European Union has placed a ban on the disposal of used tyres to landfill. However, controls on the disposal to landfill in isolation of a product stewardship scheme may be exacerbating the unlicensed landfilling and stockpiling of end-of-life tyres in Australia, especially for truck and OTR tyres.

Most European countries have taken a two tiered approach to the management of tyres by introducing or supporting product stewardship scheme, or advanced disposal fees, in combination with landfill bans. Such product stewardship schemes or advanced disposal fees have the effect of shifting any cost to subsidise the recovery of end-of-life tyres upstream into the price of new tyres. In effect, consumers pay for recovery of end-of-life tyres at the point-of-sale rather than at the point-of-disposal.

The combination of product stewardship and landfill bans both removes the major disincentive to the more desired option (recovery of costs at the point-of-disposal) as well as providing a disincentive on the least desired disposal (prohibition on disposal to landfill).

Some tyre retailers, in effect, operate a quasi- product stewardship scheme by charging a disposal fee to subsidise the recycling of end-of-life tyres.

Prior to the introduction of landfill bans and/or product stewardship scheme, monofills should be considered as means of preserving tyres as a resource in the immediate future, particularly for truck and OTR reaching end-of-life in more remote locations. The report for the Western Australian Department of Environment and Conservation, prepared by Sustainable Stategic Solutions (2006), suggested that:

As an interim measure until market demand increases, a requirement that tyres must only be stored baled in a monofill could be considered. This could possibly also be applied to country landfills. (p.48).

Control on the export of whole baled tyres

Australia is a signatory to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and Their Disposal, negotiated under the auspices of the United Nations Environment Programme. Signatories to the Basel Convention are able to identify and register end-of-life tyres as a hazardous waste and to restrict their import and export.

However, such restrictions do not necessarily prohibit the movement of part-worn tyres that are, ostensibly, for reuse. This has created a loophole whereby whole, baled tyres have been shipped using AHECC 40122000 (or equivalent) under the premise that they were available for reuse.

It is understood that the shift in the use of AHECC 40122000 to AHECC 40040000 reflects a tightening of the import of tyres labelled for reuse by Vietnamese authorities. At the same time, China specifically prohibited the import of waste tyres under chapter 40040000 from 1 March 2008.

Most other countries in East Asia also have tight restriction on the importation of whole, baled tyres. For example, Singapore indentifies the importation under codes 40040000 and 40122000

as classified wastes under the Basel Convention that require oversight by the Pollution Control Department.

The United Kingdom has banned the export of whole, used tyres. Under the Transfrontier Shipment of Waste Regulations 2007, only non-hazardous wastes can be exported to non-OECD countries. The Environment Agency has recently undertaken prosecutions on companies for exporting baled tyres to Vietnam.

The growth in the export of whole, baled tyres represent is part of the shift in the perception of end-of-life tyres from being a waste to being a resource.

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APPENDIX A

Method for Collecting and Calculating Data

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COAG Standing Council on Environment and Water

Study into domestic and international fate of endof-life tyres

Method for collecting and calculating data

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This report has been prepared for the COAG Standing Council on Environment and Water in accordance with the terms and conditions of appointment for the 'Study into domestic and international fate of end-of-life tyres' dated 5 October 2010. Hyder Consulting Pty Ltd (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.



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1 INTRODUCTION

Representatives from the tyre industry and government met early in 2010 and indicated their commitment to develop a management strategy for end-of-life tyres, including an industry led product stewardship scheme. This follows the decision of the Environment Protection and Heritage Council (EPHC) in November 2009 to support the development of a new industry led approach for handling end-of-life tyres.

The renewed commitment of industry and government comes in the context of the impending National Product Stewardship Framework legislation. This is a key priority of the *National Waste Policy: Less Waste, More Resources* also agreed to by the EPHC in November 2009.

Central to the development of a management strategy and a product stewardship scheme is an understanding of the current sources and fate of end-of-life tyres, and the future trends in the sources and fate of end-of-life tyres. The *Study into the source and fate of end-of-life tyres* seeks to inform these processes by:

- Developing the method and tools to update tyres data and trends on an annual basis.
- Consistent with the developed method, obtaining data on, and analysing the trends in the sources and fate of end-of-life tyres.
- Analysing the domestic market and developing an understanding of the international market for end-of-life tyres and tyre derived products.

This report outlines the method that Hyder Consulting will use to collect and calculate up-to-date data on the lifecycle of tyres for the *Study into the source and fate of end-of-life tyres* (the Study). This report also outlines the qualitative analysis Hyder will undertake during the collection and calculation of data for the Study.

This method will be refined during the course of the data collection and calculation, and the subsequent trends analysis and market assessment. A finalised method will be presented in full as a component of the final Study report.

This finalised method will also be used to build a *Tyres Data Aggregation* model for the collection and calculation of data in future years on the source and fate of end-of-life tyres.

2 REPORTING OF DATA

2.1 Tyre types and sizes

Data on tyres will be expressed in equivalent passenger units (EPUs). EPUs are a standardised measure for the quantity of tyres. Where data collected is provided by weight, data will be converted into EPUs for reporting.

For this study, an EPU will be taken to be 9.5 kg for a new tyre, and 8.0 kg for a used tyre. Accordingly, the EPU for a tyre in-use, and for a tyre put into re-use, will be taken to be the midpoint between the EPU for a new tyre and the EPU for a used tyre, being 8.75 kg.

Retread tyres will be assumed to enter their intermediate destination at an EPU of 8.0kg. It is assumed that this EPU will then be reduced by a further 0.5kg during the buffing of tyres prior to retreading. This 0.5kg of buffings will be attributed to an end-of-life destination. It will then be assumed that 2.0kg will be added back onto the tyre as retread casing. These assumptions will be tested during the course of the survey of tyre retreaders.

Table 1 shows the EPU that will be used for tyres at different stages in the lifecycle of a tyre.

Stage of use		EPU	
	New	9.5 kg	
Consumption	Second-hand	8.75 kg	
	Retreads	9.5 kg	
In-use		8.75 kg	
Intermediate destination		8.0 kg	
End-of-life destination		8.0 kg	

Table 1: EPU of tyres by lifecycle point

There is a possibility that the weight of an average passenger tyre is now higher than 9.5kg as a result of increases in the size of an average passenger tyre. During the course of the study, the weight of an average passenger tyre will examined. This will include the examination of specification sheets on common passenger tyres and input from the tyre industry.

Irrespective, the EPUs stated above will be retained for the purposes of this study. However, the conversion of some data on tyre numbers into EPUs may be adjusted if it is found that there has been a change in the weight of an average passenger tyre.

Tyres will be classified as being passenger, truck or off-the-road (OTR) tyres. Passenger tyres include those used on passenger vehicles including motorcycles and caravans, as well as trailers for domestic use. Truck tyres are those used on buses, light and heavy commercial vehicles, prime movers, trailers and semi trailers, and fire fighting vehicles. OTR tyres are those used on machinery or equipment used in areas such as agricultural, mining and construction and demolition.

Table 2 shows the classification of tyres for vehicle types taken from the Draft *Tyres Product Stewardship Agreement* (May 2008) published by EPHC.

The number of tyres per vehicle type and the indicative EPUs per vehicle is shown in Table 2. The values and terminologies shown in Table 2 will be verified and refined during the course of data collection for this study. This will include an evaluation of average weight of tyres for

different vehicle types during the survey of the tyre industry, in particular truck tyres and passenger vehicle tyres (as noted above).

The calculation of EPUs per vehicle will be made on the assumption that all vehicles, either assembled or unassembled, have a full complement of tyres fitted, including spare tyres. The calculation of EPUs through the lifecycle of tyres will include both the outer tyre and the inner tube for pneumatic tyres.

N.B. This study does not cover tyre types smaller than those classified as passenger tyres. Examples of tyres excluded from the study are tyres from bicycles and other cycles; mowers and wheelbarrow; carriages for disabled persons; baby carriages; etc.

Tyre classification	Vehicle/tyre type		EPU per tyre	Industry
	Motor cycles		0.5	
5	Passenger vel	hicles	1	
Passenger	Campervans		1.5	
	Light commerce	cials	1.5	
	Light truck		2	
Truck	Truck		5	
	Super Single		10	
		Small	3	
	Colid	Medium	5	
	50110	Large	7	
		Extra-large	9	
	Tractor	Small	15	
		Large	25	Agriculture
	Fork-lift	Small	2	
		Medium	4	Wholesale and retail trade
		Large	6	
Off-the-road	Grader	Grader		
		Small	20	
		Medium	50	
	Earth Mover	Large	100	
		Extra-large	200	Mining
		Giant	400	
	Bobcat		2	
		Small	2	
	Aircraft	Medium	4	
		Large	10	

Table 2: EPU values for tyre types

2.2 Geographic distribution of tyres

Data on the consumption and use of tyres, and the domestic source and fate of end-of-life tyres will be reported by jurisdiction (state or territory) and by remoteness classification (metropolitan, regional or remote).

Remoteness classifications will be made using the Remoteness Structure from the *Australian Standard Geographical Classification 2005 (Cat. No. 1216)* published by the Australian Bureau of Statistics (ABS). For this study, the Remoteness Structure will be used for local government areas, and will be refined to a three-tiered remoteness classification as shown in Table 3.

Table 3: Remoteness classification

ABS Remoteness Structure	Remoteness classification for tyres
Major cities	Metropolitan
Inner regional	Regional
Outer regional	_
Remote	Remote
Very Remote	

The remoteness classification for each local government area in Australia has been mapped and is shown in Appendix 1.

Details on the method for attributing data according to jurisdictions and by remoteness at each stage in the life cycle of a tyre are provided in section 3. Details on export destination of tyres are given in section 3.6.

2.3 Confidentiality of data

Companies and organisations that provide data or assistance during the course of this study will be acknowledged in the Study report. However, company specific data will not be reported at any stage during this study u

nless express permission is given.

Consideration will also be given to the share of the market held by any particular company at any particular stage in the lifecycle of tyres, or in any geographic area, during the reporting of data. Where a particular company has a share of the market such that the reporting of data at that stage or for that area would reveal commercially sensitive information, data will be collated so as to protect commercial confidentiality.

2.4 Data Outputs

Table 4 provides an overview of the data outputs to be generated for this study. As previously stated, all data will be expressed in EPUs. Furthermore, all data fields will be further broken down by geographical distribution where possible.

Table 4: Data output categories

Life cycle p	hase		Breakdown
		Domestic manufacture	
		Net importation	Loose / fittedNew / second-hand
Consumption	า	Second-hand	
		Retread	
		Total	Loose / fittedNew / second-hand
In-use			
	Domestic destination	Recycling	 Tyre derived product
		Energy recovery	Whole / shredded
		Landfill	Whole / shredded
End of life		Illegal dumping	
End-of-life		Reuse	
	Export	Retreading	Destination
	destination	Recycling	 Baled / shredded/ crumbed / powdered
		Energy recovery	Destination

3 COLLECTION & CALCULATION OF DATA

Data will be collected and calculated for the 2008–09 and 2009–10 financial years on the consumption and use of tyres, and domestic and export fate of end-of-life tyres.

3.1 Consumption of tyres

For the purposes of this study, consumption refers to the sale of whole tyres for the purpose for which they were designed.

Also for the purposes of this study, it will be assumed that all tyres made available for purchase during the period of study were also sold during the period of study. That is, tyres will be considered to be either in-use or at end-of-life. The holding of tyres before, or in between these two stages in the lifecycle of a tyre will be considered only for the purpose of data collection on the number of tyres in-use or at end-of-life.

3.1.1 Domestic manufacture

Since the period of study for the Hyder (2009) report, domestic manufacture of tyres in Australia has ceased. South Pacific Tyres closed its manufacturing facility in Melbourne at the end of 2008, and Bridgestone closed its manufacturing facility in Adelaide in early 2010.

Given that data is being collected for tyres for both 2008–09 and 2009–10 financial years, it is assumed that there will still be some domestically manufactured tyres entering the market during the period of study.

Both South Pacific Tyres and Bridgestone will be contacted regarding their manufacturing activity in Australia during this period.

3.1.2 Net importation

Data on the net importation of loose and fitted tyres entering Australia will be sourced from the Department of Foreign Affairs and Trade (DFAT). The net import of tyres will be calculated by balancing the import of loose and fitted tyres with the export of loose and fitted tyres in corresponding import and export product categories.

Data on the import of loose and fitted tyres will be obtained for the relevant categories in Schedule 3 of the *Combined Australian Customs Tariff Nomenclature and Statistical Classification* (Working Tariff). Import data will be requested for both the 2008–09 and 2009–10 financial years. Hyder is already in the possession of relevant import data for the financial years 2003–04 to 2007–08.

The broad, four-digit categories that cover the relevant codes are shown in Table 5. The highest level of detail within these categories is the ten-digit statistical codes. These codes have been assessed to determine their relevance to this study. The relevant ten-digit statistical codes have also been assessed to determine:

- which classification of tyre the code relates to
- the EPU for a typical tyre
- the number of tyres to be attributed to each unit within the code

The full list of the relevant ten-digit statistical codes and the assessment of them is provided in Appendix 2. Statistical codes that were not considered relevant to this study include those that relate to vehicle parts, rather than whole vehicles.

Table 5: Relevant four-digit import and export data codes

Code	Goods
4011	New pneumatic tyres, of rubber
4012	Retreaded or used pneumatic tyres of rubber; solid or cushion tyres, tyre treads and tyre flaps, of rubber
8426	Ships' derricks; cranes, including cable cranes; mobile lifting frames, straddle carriers and works trucks fitted with a crane
8427	Fork-lift trucks; other works trucks fitted with lifting or handling equipment
8429	Self-propelled bulldozers, angledozers, graders, levellers, scrapers, mechanical shovels, excavators, shovel loaders, tamping machines and road rollers
8430	Other moving, grading, levelling, scraping, excavating, tamping, compacting, extracting or boring machinery, for earth, minerals or ores; pile-drivers and pile-extractors; snow-ploughs and snow-blowers
8432	Agricultural, horticultural or forestry machinery for soil preparation or cultivation; lawn or sports- ground rollers
8433	Harvesting or threshing machinery, including straw or fodder balers; grass or hay mowers; machines for cleaning, sorting or grading eggs, fruit or other agricultural produce, other than machinery of 8437
8701	Tractors (other than tractors of 8709)
8702	Motor vehicles for the transport of ten or more persons, including the driver:
8703	Motor cars and other motor vehicles principally designed for the transport of persons (other than those of 8702), including station wagons and racing cars
8704	Motor vehicles for the transport of goods
8705	Special purpose motor vehicles, other than those principally designed for the transport of persons or goods (for example, breakdown lorries, crane lorries, fire fighting vehicles, concrete-mixer lorries, road sweeper lorries, spraying lorries, mobile work
8708	Parts and accessories of the motor vehicles of 8701 to 8705
8709	Works trucks, self-propelled, not fitted with lifting or handling equipment, of the type used in factories, warehouses, dock areas or airports for short distance transport of goods; tractors of the type used on railway station platforms; parts of the foregoing vehicles
8710	Tanks and other armoured fighting vehicles, motorised, whether or not fitted with weapons, and parts of such vehicles
8711	Motorcycles (including mopeds) and cycles fitted with an auxiliary motor, with or without side-cars; side-cars
8716	Trailers and semi-trailers; other vehicles, not mechanically propelled; parts thereof
8801	Balloons and dirigibles; gliders, hang gliders and other non-powered aircraft
8802	Other aircraft (for example, helicopters, aeroplanes); spacecraft (including satellites) and suborbital and spacecraft launch vehicles
8803	Parts of goods of 8801 or 8802
_	

Data on the export of loose and fitted tyres will also be requested from DFAT for the relevant codes used in the Australian Harmonized Export Commodity Classification (AHECC). Schedule 3 of the Working Tariff and AHECC use the same statistical codes.

However, the highest level of detail in the AHECC is an eight-digit statistical code. As such, data on the import on tyres will be aggregated to an eight-digit statistical code to allow for the calculation of the net import of whole and fitted tyres. Import and export data will be adjusted for eight-digit statistical codes where the not all of the ten-digit statistical codes within a particular eight-digit statistical code are relevant to this study.

A more detailed account on the method for the collection of data on the export of tyres and tyres derived product in provided in section 3.6.

3.1.3 Second-hand sales

Data on the domestic sales of second-hand tyres will be collected during the survey of tyre industry groups and tyre retailers, retreaders and recyclers. Details on the survey method are provided in section 3.3.

Data on the net importation of second-hand tyres will be calculated using the method outlined in section 3.1.2.

3.1.4 Retread sales

Data on the domestic sales of retreaded tyres will also be obtained during a survey of industry groups, major national retailers and retreaders. Details on the survey method are provided in sections 3.3 and 3.5.

3.1.5 Total sales

The total number of new and retreaded tyre sales in Australia will be calculated by adding:

- the number of domestically manufactured tyres
- the net number of tyres imported
- the number of tyres retreaded

The number of new and retreaded tyre sales will include imported second-hand tyres included in the calculation of the net importation of tyres. As such, and for the purposes of this study, the number of new and retreaded tyre sales is the number of tyres entering the Australian market for the first time.

The calculation of the total sales of tyres in Australia will be made by adding the number of new and retreaded tyre sales to the number second-hand tyres sold.

The distribution of the sales of passenger and truck tyres between each state and territory will be assumed to be the same as that for the distribution of tyres in-use, being aligned to the distribution of vehicle registrations (see section 3.2).

The distribution of the sales of OTR tyres will be also be done on the basis of the distribution of the OTR tyres in-use (see section 3.2).

3.2 Tyres in-use

Passenger and truck tyres

The total number of tyres in-use for passenger and truck tyres will be determined by the extrapolation of data on the number of passenger vehicles and trucks registered for use in each state and territory. This extrapolation will be undertaken using the classification of tyres and indicative EPUs for vehicle types shown in Table 2.

Passenger vehicle and truck registration data will be built using the ABS publication *Motor vehicle census (Cat. No. 93090)* to 31 March 2009. Data from the *Motor vehicle census* will be cross checked and updated with vehicle registration data from individual states and territories where it is available.

Data from the 31 March 2009 census, and individual states and territories will then be used, in combination with ABS's *Australian Demographic Statistics (Cat. No. 3101)*, to generate figures for the number of passenger vehicles and trucks in-use for the entirety of the study period.¹

As stated in section 3.1.5, the distribution of passenger and truck tyres in-use between states and territories will be done on the basis of vehicle registrations in each state and territory. The distribution of passenger and truck tyres in-use by remoteness will also be done on the basis of population distribution by remoteness within each state, using the ABS publication *Regional Population Growth (Cat. No. 3218)*.

It will be assumed that the distance travelled by passenger vehicles and trucks does not differ between states and territories.²

Off-the-road tyres

Data on the number of OTR tyres in-use will be calculated using the average lifespan of OTR tyres and historic sales figures for OTR tyres.

The average lifespan of OTR tyres will be determined during the course of the survey of industry. Different lifespans may be determined for different types of OTR vehicles.

The average lifespan will be used to determine the point in time which is equal to the average lifespan of tyres prior to the end of the study period (31 July 2010). A normal distribution of the expected lifespan of OTR tyres will be generated around annual data sets. This distribution will minimise the impact of any short term fluctuations in OTR tyre sales. The proportion of each distribution which falls within the study period will then be added together to determine the number of OTR tyres considered to be in-use.

Figure 1 gives an example of the use of a normal distribution to determine the number of end-oflife tyres arising from an annual data set.

The distribution of OTR tyres between states and territories, and by remoteness, will be done on the basis of population distribution, using the ABS's *Australian Demographic Statistics (Cat. No. 3101),* except for tyres identified as being used in a particular industry (see Table 2). The distribution of OTR tyres used in a particular industry between states and territories will be done on the basis of the distribution of that particular industry between jurisdictions taken from the ABS publication *Australian Industry (Cat. No. 8155)*.

¹ Data on motor vehicle registration for the entirety of the study period will be built using this method as it provides a less volatile indication of any changes in the number of vehicles in-use that the ABS's *Sales of New Motor Vehicles (Cat. No. 9314)*.

² The ABS publication *Survey of Motor Vehicle Use (Cat. No. 92090),* which contained data on distance travelled in each state and territory, has been discontinued. However, historic versions of this survey showed a very high correlation between vehicle registrations and distance travelled.

All OTR tyres used in mining will be assumed to be in-use in remote locations.

OTR tyres used in agriculture will be assumed to be in-use in regional or remote locations. The remoteness distribution for OTR tyres used in agriculture on the basis of the population distribution between regional and remote areas within a jurisdiction.

OTR tyres used in wholesale and retail trade will be assumed to be distributed to the same extent as population across all remoteness classifications.



Figure 1: Example of the use of a normal distribution to determine the number of end-oflife tyres from an annual data set (2007–08) for a given time period (2006–07)

3.3 Intermediate destination

The intermediate destination for tyres refers to points of collection of used tyres prior to them being either resold as second-hand tyres, retreaded, or sent to an end-of-life destination. Data from intermediate destinations will assist in the calculation of the number of tyres entering specific disposal pathways.

3.3.1 Retailers, retreaders and recyclers

Tyre retailers, retreaders and recyclers, and industry groups will be surveyed on the fate of tyres that they collect. A copy of survey forms to be used is provided in Appendix 3.

Data will be collected on the amount of used tyres being resold as second-hand tyres, retreaded, or sent to an end-of-life destination.

3.3.2 Stockpiles

For the purposes of this study stockpiling will be considered to be the collection of tyres on private land for undefined purposes. This does not include the routine storage of tyres by retailers, retreaders or recyclers during the course of conducting their business.

The total amount of stockpiled tyres will be derived using figures on tyres in-use and end-of-life tyres unaccounted for. Data on the amount of tyres being stockpiled will be determined by a survey of state and territory government departments and agencies, select local governments, and major anti-littering organisation on the extent of stockpiling. This will be done in conjunction with the survey to determine the amount of illegal dumping. A determination will then be made of the balance of tyres that are unaccounted for that are being stockpiled or illegally dumped.

A copy of the survey form for stockpiling and illegal dumping is provided in Appendix 3.

3.4 End-of-life tyres

Passenger and truck tyres

The total number of end-of-life tyres will be calculated for passenger vehicle and truck tyres using the average lifespan of tyres and new and retreaded tyre sales. The average lifespan of passenger and truck tyres will be determined to be the ratio between the number of tyres in-use and the number of new and retreaded tyre sales. The number of end-of-life tyres will then be determined to be the number of new and retreaded tyre sales at the point in time which is equal to the average lifespan of tyres prior to the end of the study period (31 July 2010).

The calculation of the average lifespan of passenger and truck tyres will be undertaken separately using a process of optimisation, using Microsoft Excel Solver, so as to provide input values that are not subject to distortion by aberrant individual values. In particular, the process of optimisation will minimise the impact of any short term variations in new and retreaded tyre sales as a result of fluctuations in the price of new tyres.

Figure 2 provides an example of how the calculation of the number of end-of-life passenger and truck tyres for a given time period (2009/10) will be made, assuming that a process of optimisation has been applied to the values shown. In this example the average lifespan of the tyre is three years, which was determined by dividing the number of tyres in-use in 2009/10 by the number of new and retreaded tyre sales in 2009/10. The number of end-of-life tyres is then the number of new and retreaded tyre sales at the point in time three years prior to the study period; the number of end-of-life tyres is the number of new and retreaded tyre sales at the point in time three years prior to the study period; the number of end-of-life tyres is the number of new and retreaded tyre sales at the point in time three years prior to the study period; the number of end-of-life tyres is the number of new and retreaded tyre sales in 2006/07.

The figures for new and retreaded tyre sales for 2008–09 and 2009–10 will be generated during the course of this study (see section 3.1.5). The figures for new and retreaded tyre sales for 2007–08 will be taken from the Hyder (2009) report. The figures for new and retreaded tyre sales for the years prior to 2007–08 will be generated, where required, using the trend in growth of new and retreaded tyre sales for the time period 2007–08 to 2009–10, and the trend in motor vehicle registration over the necessary time period.



Figure 2: Example of the relationship between new and retreaded tyre sales, tyres in-use, the lifespan of tyres and the number of end-of-life tyres for a given time period (2009–10)

Off-the-road tyres

The number of end-of-life OTR tyres will also be determined to be the number of new and retreaded tyre sales at the point in time which is equal to the average lifespan of tyres prior to the end of the study period (31 July 2010). Details on the calculation of the average lifespan of tyres are provided in section 3.1.5.

The number of end-of-life OTR tyres will be calculated using estimates provided during the survey of industry on the average lifespan of OTR tyres, and an estimate of the annual change in the sales of new OTR tyres

All tyres

Lifespan figures for all tyre types will be confirmed during the survey of industry. This will include an examination of what particular tyres are used for, and how this affects their lifespan.

As explained in section 3.1.5, the number of new and retreaded tyre sales includes some second-hand tyres entering the Australian market for the first time. As such, and for the purposes of this study, the lifespan of tyres refers to the time a tyre is in-use in the Australia market.

Furthermore, the number of end-of-life tyres will be used to calculate the total of the number of end-of-life tyres reaching final destination in Australia, and the number of tyres and tyre derived product being exported from Australia. As such, and for the purposes of this study, the number of end-of-life tyres will include used tyres that are exported for reuse and retreading.

The source of end-of-life tyres will be assumed to be distributed geographically and by remoteness in the same proportions as tyres in use.

3.5 Domestic destination of end-of-life tyres

Data will be collected on the fate of tyres reaching an end-of-life destination in Australia. Data will also be collected on the state of tyres reaching an end-of-life destination, being either whole tyres or tyre derived product (shredded, crumbed or powdered). Data on the state of end-of-life tyres will be used to confirm findings on the fate of end-of-life tyres, given that particular states

of end-of-life are associated with particular uses. These associations will be confirmed during the course of the Study.

During the collection of data on the destination of end of life tyres to landfill, information will also be collected that will inform the subsequent trends analysis and market assessment of the source and fate of end-of-life tyres.

3.5.1 Recycling

Data will be collected for tyres reprocessed into a tyre derived product, and for whole tyres used for a purpose other than for which they were designed, specifically, civil works.

Data will be collected through a structured survey of the tyre industry associations and major tyre recyclers. This survey will ascertain information about the source and form of tyres received for recycling, and the destination and form of tyres being recycled and reprocessed, including for export. A copy of the survey form to be used is provided in Appendix 3.

Industry associations and recyclers to be contacted will include:

- Australian Tyre Recycling Association
- Australian Tyre Industry Association
- Tyre Cycle
- Reclaim
- Chip
- Aus Tyre Crumb
- EcoFlex

An estimate will be made of the proportion of the Australian market covered by the survey for both the recycling of whole tyres and the reprocessing of tyres. Data collected will then be adjusted to account for that component of the market not covered by the survey.

3.5.2 Energy recovery

Data on the use of tyres as an energy source in cement kilns will be collected through a survey of the Cement Industry of Australia and cement kilns identified as using tyres for an energy source. Data on the pathway of end-of-life tyres used for energy recovery will also be collected during the collection of data on the retreading and recycling of tyres.

To date, the use of end-of-life tyres as an energy source has been limited to cement kilns. This will be confirmed during the course of the survey of the tyre industry regarding the fate of end-of-life tyres.

The survey of cement kilns will be done on an *ad hoc* basis as it is understood that there are only a small number that use tyres for energy recovery. As such, it is also anticipated that the entirety of the domestic use of end-of-life tyres for energy will be accounted for during this study.

3.5.3 Landfilling

Data will be collected on the disposal of tyres to landfill as whole tyres, shredded tyres, and as shredder flock from the disposal of whole vehicles.

Relevant state and territory departments and agencies, major landfill operators, and the Waste Management Association of Australia will be contacted to determine the number of tyres disposed of to landfill.

Waste audit data will also be used to confirm the proportion of material being disposed of to landfill which is tyres.

The Minerals Council of Australia will be contacted regarding the landfilling of OTR tyres.

3.5.4 Illegal dumping

As noted in section 3.3.2, data on the amount of tyres being stockpiled will be determined by a survey of state and territory government departments and agencies, select local governments, and major anti-littering organisation on the extent of stockpiling. A determination will then be made of the balance of tyres that are unaccounted for that are being stockpiled or illegally dumped.

3.6 Export destination for tyres and tyre derived products

As noted in section 3.1.2, data on the amount of tyres and tyre derived products exported from Australia will be collected for the relevant AHECC categories. The four-digit categories for the import and export of tyres and tyre derived products are shown in Table 5. The relevant eight-digit statistical codes for the export of tyres and tyres derived product are provided in Appendix 2, along with the determination of the average EPU where tyres are exported as loose or fitted whole tyres.

Data collected will be broken down by the port of export and the destination country, and the stated purpose of the exported product. Data will also be collected on the state of the product being exported, being either whole tyres (fitted, loose or baled) or tyre derived product (shredded, crumbed or powdered). Again, the state in which tyres are exported will be important in confirming the fate of end-of-life tyres exported from Australia, and this will be confirmed during the course of the Study.

During the collection on the destination of exported tyres and tyre derived products, information will also be collected to inform the latter trends analysis and international market assessment.

3.6.1 Re-use and retreading

The number of tyres exported for reuse and retreading will be determined to be the total number of tyres exported as whole tyres either fitted to a vehicle or loose. Baled whole tyres will not be considered to be tyres exported for re-use or retreading.

3.6.2 Recycling and energy recovery

The number of tyres exported for recycling or energy recovery will be determined to be the total number of tyres exported as whole baled tyres or as a tyre derived product.

An estimate of the breakdown between tyres exported for recycling and energy recovery will be made taking into account the state of the tyre or tyre derived product, and the export destination.

3.6.3 Under-reporting of export of whole tyres

There is a widespread suspicion within government and the tyre industry that the number of whole tyres being exported from Australia is being under-reported. A number of measures will be taken to determine the existence and extent of this phenomenon.

Data from DFAT on the amount of tyres and tyre derived products exported will be compared with survey results from the tyre industry on the amount of tyres and tyre derived product being exported from Australia to identify any obvious inconsistencies.

The state of end-of-life tyres being exported to major destination countries, which is anticipated to include Vietnam, will also be examined to determine if there are any obviously inconsistencies with the domestic industry's understanding of the state of end-of-life tyres exported from Australia.

Export data will be collected for particular waste plastics codes which may be being used to disguise the export of whole tyres. Data for these statistical codes will used to assist in the assessment of any under-reporting of the amount of tyre derived product being exported from Australia. The particular statistical codes for plastics are provided along with other export codes in Appendix 2.

State and territory environmental protection agencies, or the like, will be contacted regarding their oversight of end-of-life tyre collection and disposal sites. Agencies will be queried as to their knowledge of the activity of tyre balers, their estimates of the quantities of whole baled tyres being exported and approximate numbers of balers and recyclers in their respective states. If possible, this information will be used to track the movement of baled tyres through customs to identify any misrepresentation of export codes.



Figure 3: Life cycle pathway of tyres including data collection fields

4 QUALITATIVE ANALYSIS OF DATA

A qualitative analysis of the reliability of the data sets will be undertaken during the process of data collection and collation.

4.1 Data entry

All data collected will be requested in, or entered into Microsoft Excel. This will include the use of formal templates for the surveys of industry (see Appendix 3). All subsequent calculations of data will also be made using Microsoft Excel.

Data entry will be cross checked by different project team members. A preliminary data validation process will be undertaken during the entry and cross checking of data to confirm that the results are within the expected range of findings.

Data collection and calculation will be undertaken with the intention of building the *Tyres Data Aggregation* model around the worksheets developed for the collection and calculation of data for this study.

4.2 Qualitative confidence rating

A quality confidence rating will be developed to identify and manage any areas of weakness in the data collected, or the method of data collection and calculation.

The quality confidence rating will use a multi-criteria decision analysis (MCDA) to provide an overall confidence rating for data sets at each stage in the lifecycle of tyres, for different tyre types and for different geographic distributions.

The MCDA will score data sets for their performance against the following key characteristics:

- Accuracy
- Credibility
- Sample size
- Consistency
- Appropriateness
- Comparability
- Sensitivity of dependent calculations
- Reporting limitations due to commercial sensitivities

The score against each of these key characteristic will be weighted. Scores will then be added to provide an overall quality confidence rating. The weighting of the key characteristics will be determined during the course of the study.

A summary of the data collection fields, the proposed data sources and method, and the expected precision for the data sets is provided in Table 6.

Life cycle	phase		Breakdown	Summary of data source	Expected precision
		Domestic manufacture		Survey of former manufacturers.	High
		Net importation	Loose / fittedNew / second-hand	Import data from the DFAT on loose tyres and vehicles.	High
Consumpti	on	Second-hand		Survey of tyre industry and retailers.	High
		Retread		Survey of tyre industry and retreaders.	High
		Total Loose / fitted New / second-hand		Collation of data on domestic manufacture, net importations, second-hand sales, and retread sales.	High
In-use				Vehicle registration data from the ABS.	High
		Retailers			
Intermediate _ destination _	Retreaders		Survey of industry groups, retailers, retreaders and recyclers.	Medium	
	Recyclers		-		
	Stockpiles		State and territory government departments and agencies, select local governments, and major anti-littering organisation.	Low	
		Recycling	 Tyre derived product 	Survey of industry groups and major tyre recyclers.	High
		Energy recovery	 Whole / shredded 	Survey of tyre and cement industry groups, and cement kilns.	High
	Domestic destination	Landfill	 Whole / shredded 	State and territory departments and agencies, major landfill operators, and the Waste Management Association.	Medium
End-of-		Illegal dumping		State and territory government departments and agencies, select local governments, and major anti-littering organisation.	Low
Export destina		Reuse			High
	Export	Retreading	 Destination 	Export data from DFAT on loose and fitted whole tyres.	
	destination	Recycling	 Baled / shredded/ crumbod / powdered 	Export data from DFAT on baled whole tyres, and tyre derived product, and survey	
		Energy recovery	 Destination 	of industry groups and major tyre recyclers.	

Appendix A1

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Table 6: Summary of data collection fields and proposed data sources and method



Appendix 1: Remoteness classification map

Remoteness classification by local government area

Appendix 2: Relevant import and export codes

Relevant import codes: Working Tariff

Ten digit statistical code	Relevance	Tyre classification	Number of tyres per unit	EPU per tyre			
Chapter 40: Rubber and articles thereof							
4011100098	Included	Passenger	1	1			
4011100005	Included	Passenger	1	1			
4011100006	Included	Passenger	1	1			
4011200081	Included	Truck	1	1.5			
4011200020	Included	Truck	1	1.5			
4011200086	Included	Truck	1	5			
4011200021	Included	Truck	1	2			
4011300011	Included	OTR	1	4			
4011400012	Included	Passenger	1	0.5			
4011610031	Included	OTR	1	15			
4011610032	Included	OTR	1	15			
4011610035	Included	OTR	1	15			
4011620037	Included	OTR	1	20			
4011620038	Included	OTR	1	15			
4011620043	Included	OTR	1	15			
4011630050	Included	OTR	1	50			
4011630051	Included	OTR	1	15			
4011630056	Included	OTR	1	50			
4011690058	Included	OTR	1	15			
4011920060	Included	OTR	1	15			
4011920061	Included	OTR	1	25			
4011920064	Included	OTR	1	20			
4011930065	Included	OTR	1	20			
4011930066	Included	OTR	1	15			
4011930071	Included	OTR	1	15			
4011940073	Included	OTR	1	50			
4011940074	Included	OTR	1	15			
4011940079	Included	OTR	1	20			
4011990081	Included	OTR	1	20			
4012110083	Included	Passenger	1	1			

Ten digit statistical code	Relevance	Tyre classification	Number of tyres per unit	EPU per tyre
4012120085	Included	Truck	1	5
4012130086	Included	OTR	1	4
4012190089	Included	OTR	1	4
4012202231	Included	Passenger	1	1
4012202232	Included	Truck	1	5
4012202233	Included	OTR	1	5
4012900027	Included	OTR	1	1
4012900028	Excluded			
4012900029	Included	Undefined	1	1

Chapter 84: Nuclear reactors, boilers, machinery and mechanical appliances; parts thereof

8426120010	Included	OTR	8	4
8426410014	Included	OTR	8	4
8426410015	Included	OTR	8	6
8427100020	Included	OTR	4	2
8427100021	Included	OTR	4	4
8427100022	Included	OTR	4	2
8427100023	Included	OTR	4	4
8427100024	Included	OTR	4	6
8427100025	Included	OTR	4	6
8427100026	Included	OTR	4	4
8427200001	Included	OTR	4	2
8427200002	Included	OTR	4	4
8427200003	Included	OTR	4	6
8427200004	Included	OTR	4	6
8427200005	Included	OTR	4	6
8427200006	Included	OTR	4	6
8427200007	Included	OTR	4	6
8427200008	Included	OTR	4	6
8427900009	Included	Truck	4	2
8427900010	Included	Truck	4	2
8429110038	Included	OTR	4	15
8429190039	Included	OTR	4	15
8429200040	Included	OTR	6	15

Ten digit statistical code	Relevance	Tyre classification	Number of tyres per unit	EPU per tyre
8429300028	Included	OTR	4	20
8429400029	Included	OTR	8	5
8429511041	Included	OTR	4	15
8429519036	Included	OTR	4	15
8429521038	Included	OTR	6	15
8429529039	Included	OTR	6	15
8429591036	Included	OTR	4	15
8429599004	Included	OTR	4	15
8429599040	Included	OTR	4	15
8430100006	Included	OTR	4	15
8430200007	Included	OTR	4	5
8430310008	Included	OTR	4	5
8430390009	Included	OTR	4	5
8430410041	Included	OTR	4	5
8430410042	Included	OTR	4	5
8430410014	Included	OTR	4	5
8430490043	Included	OTR	4	5
8430490019	Included	OTR	4	5
8430490044	Included	OTR	4	5
8430500045	Included	OTR	4	5
8432100008	Included	OTR	4	2
8432210009	Included	OTR	6	2
8432290047	Included	OTR	6	2
8432300012	Included	OTR	6	2
8432400013	Included	OTR	6	2
8432800014	Included	OTR	6	2
8433110055	Included	OTR	4	0.1
8433110056	Excluded			
8433110060	Excluded			
8433110057	Excluded			
8433190062	Included	OTR	4	0.1
8433190063	Excluded			
8433190066	Excluded			
8433200026	Excluded			

Ten digit statistical code	Relevance	Tyre classification	Number of tyres per unit	EPU per tyre
8433300049	Included	OTR	4	1
8433401036	Included	OTR	6	2
8433409037	Included	OTR	6	2
8433510029	Included	OTR	6	2
8433520030	Included	OTR	6	2
8433530001	Included	OTR	6	2
8433591039	Included	OTR	6	2
8433599043	Included	OTR	6	2

Chapter 87: Vehicles other than railway or tramway rolling-stock, and parts and accessories thereof

8701100001	Included	OTR	4	5
8701200002	Included	OTR	4	15
8701200003	Included	OTR	4	15
8701200004	Included	OTR	4	15
8701300071	Included	OTR	4	15
8701300078	Included	OTR	4	25
8701901140	Included	OTR	4	15
8701901141	Included	OTR	4	15
8701901142	Included	OTR	4	15
8701901143	Included	OTR	4	25
8701901144	Included	OTR	4	25
8701901145	Included	OTR	4	25
8701901146	Included	OTR	4	25
8701901115	Included	OTR	4	15
8701901939	Included	OTR	4	15
8701902079	Included	OTR	4	15
8701909035	Included	OTR	4	15
8702101074	Included	Truck	6	5
8702109075	Included	Truck	6	5
8702901076	Included	Truck	6	5
8702909077	Included	Truck	6	5
8703100001	Included	OTR	4	1
8703211102	Included	Passenger	5	1
8703211903	Included	Passenger	5	1

Ten digit statistical code	Relevance	Tyre classification	Number of tyres per unit	EPU per tyre
8703211923	Included	Passenger	5	1
8703212004	Included	Passenger	5	1
8703219070	Included	Passenger	5	1
8703221105	Included	Passenger	5	1
8703221906	Included	Passenger	5	1
8703222007	Included	Truck	5	1.5
8703229080	Included	Passenger	5	1
8703231108	Included	Passenger	5	1
8703231126	Included	Passenger	5	1
8703231921	Included	Passenger	5	1
8703231909	Included	Passenger	5	1
8703232011	Included	Passenger	5	1
8703239085	Included	Passenger	5	1
8703241111	Included	Passenger	5	1
8703241126	Included	Passenger	5	1
8703241912	Included	Passenger	5	1
8703242083	Included	OTR	5	5
8703242084	Included	Passenger	5	1
8703242013	Included	Passenger	5	1
8703249090	Included	Passenger	5	1
8703311114	Included	Passenger	5	1
8703311915	Included	Passenger	5	1
8703312016	Included	Passenger	5	1
8703319095	Included	Passenger	5	1
8703321117	Included	Passenger	5	1
8703321919	Included	Passenger	5	1
8703322020	Included	Passenger	5	1
8703322021	Included	Passenger	5	1
8703329099	Included	Passenger	5	1
8703331122	Included	Passenger	5	1
8703331924	Included	Passenger	5	1
8703332002	Included	Passenger	5	1
8703332023	Included	Passenger	5	1
8703339020	Included	Passenger	5	1

Ten digit statistical code	Relevance	Tyre classification	Number of tyres per unit	EPU per tyre
8703901101	Included	Passenger	5	1
8703901902	Included	Passenger	5	1
8703902003	Included	Passenger	5	1
8703909010	Included	Passenger	5	1
8704100017	Included	OTR	6	20
8704100018	Included	OTR	6	50
8704100004	Included	OTR	6	100-400
8704100024	Included	OTR	6	5
8704211007	Included	Truck	4	2
8704211008	Included	Truck	4	2
8704211077	Included	OTR	4	20
8704211078	Included	Truck	4	2
8704219079	Included	Truck	4	2
8704220007	Included	Truck	8	2
8704220029	Included	Truck	8	2
8704220030	Included	Truck	8	2
8704230008	Included	Truck	8	5
8704230033	Included	Truck	8	5
8704311009	Included	Truck	4	2
8704311010	Included	Truck	4	2
8704311080	Included	OTR	4	20
8704311081	Included	Truck	4	1.5
8704319082	Included	Truck	4	2
8704320011	Included	Truck	4	2
8704901039	Included	Truck	4	2
8704909040	Included	Truck	4	2
8705100010	Included	OTR	6	5
8705100050	Included	OTR	6	5
8705200024	Included	OTR	8	5
8705300025	Included	Truck	10	5
8705400026	Included	Truck	10	5
8705900027	Included	OTR	8	5
8708703001	Excluded			
8708703002	Excluded			

Ten digit statistical code	Relevance	Tyre classification	Number of tyres per unit	EPU per tyre
8708709178	Excluded			
8708709980	Excluded			
8709110012	Included	OTR	4	1
8709190013	Included	OTR	4	1
8709900054	Excluded			
8710000016	Included	OTR	12	5
8711100055	Included	Passenger	2	0.5
8711200056	Included	Passenger	2	0.5
8711200023	Included	Passenger	2	0.5
8711300024	Included	Passenger	2	0.5
8711400025	Included	Passenger	2	0.5
8711500026	Included	Passenger	2	0.5
8711900027	Included	Passenger	2	0.5
8716100015	Included	Passenger	2	1
8716200016	Included	Passenger	2	1
8716310040	Included	Truck	8	5
8716390041	Included	Truck	8	5
8716400042	Included	Truck	8	5
8716800030	Excluded			
8716800036	Excluded			
Chapter 88: Aircra	ft, spacecraft, aı	nd parts thereof		
8801000001	Included	OTR	2	0.5
8801100001	Included	OTR	2	0.5
8801000002	Included	OTR	2	0.5
8801900002	Included	OTR	2	0.5
8802110003	Included	OTR	4	1
8802120004	Included	OTR	6	2
8802200005	Included	OTR	6	2
8802300006	Included	OTR	6	5
8802400007	Included	OTR	8	10
8802600017	Excluded			
8803200011	Excluded			

Relevant export codes: Australian Harmonized Export Commodity Classification

Code Description

Chapter 39: Plastics and articles thereof

Waste, parings and scrap, of plastics:

39151000 Of polymers of ethylene

39152000 Of polymers of styrene

39153000 Of polymers of vinyl chloride

39159092 Of other plastics

Chapter 40: Rubber and articles thereof

Reclaimed rubber in primary forms or in plates, sheets or strip

40030000

Waste, parings and scrap of rubber (other than hard rubber) and powders and granules obtained therefrom

40040000

Other forms (for example, rods, tubes and profile shapes) and articles (for example, discs and rings), of unvulcanised rubber:

40061000	'Camel-back' strips for retreading rubber tyres
40069000	Other
New pneuma	tic tyres, of rubber:
40111000	Of a kind used on motor cars (including station wagons and racing cars)
40112000	Of a kind used on buses or lorries
40113000	Of a kind used on aircraft
40114000	Of a kind used on motorcycles
40115000	Of a kind used on bicycles
Other, having	g a 'herring-bone' or similar tread:
40116100	Of a kind used on agricultural or forestry vehicles and machines
40116200	Of a kind used on construction or industrial handling vehicles and machines and having a rim size not exceeding 61 cm
40116300	Of a kind used on construction or industrial handling vehicles and machines and having a rim size exceeding 61 cm
40116900	Other
Other:	
40119200	Of a kind used on agricultural or forestry vehicles and machines
40119300	Of a kind used on construction or industrial handling vehicles and machines and having a rim size not exceeding 61 cm

40110400	Of a kind used on construction or industrial handling vehicles and machines and having a
40119400	rim size exceeding 61 cm

40119901 Other

Retreaded or used pneumatic tyres of rubber; solid or cushion tyres, tyre treads and tyre flaps, of rubber:

Retreaded tyres:

Of a kind used on motor cars (including station wagons and racing cars)
Of a kind used on buses or lorries
Of a kind used on aircraft
Other
Used pneumatic tyres
Other
of rubber:
Of a kind used on motor cars (including station wagons and racing cars), buses or lorries
Other

Appendix 3: Survey forms

First contact with survey respondents will be made by phone. Where survey respondents wish to answer questions by phone then survey forms will be used for data entry purposes by Hyder and will not be viewed by the respondent unless requested.

Where survey respondents wish to answer questions in writing, these survey forms will be emailed to survey respondents. However, survey respondents will be given an opportunity to provide information in whatever form suits the respondents. In the case where respondents provide information in a form other than a completed survey form, the survey forms will be used for data entry purposes by Hyder.

TYRE RETAILLERS SURVEY FORM

SECTION 1 - COMPANY DETAILS			
Company Name:			
Company Type:			
City & State of Retail Site*:			
Contact Name:			
Contact Phone Number:			
Contact position/title:			
Survey Date:			

Tyre types	Definition
Passenger	Car, 4WD and motorbike tyres
Truck	Includes all truck and bus tyres
Off-the-road	Includes mining, construction and agricultural vehicles designed for off-road use

* Please fill out a separate form for each retail site

SECTION 2 - USED TYRES RECEIVED AND STOCKPILED

Note: only include waste tyres sourced from within Australia. Do not include any imported tyres (these are included in section 6). Please indicate EPU or tonnes as applicable.

Туге туре		Passenger	Truck	Off-the-road
Do you only receive whole used tyres?				
Who do you receive used tyres from?				
Total used tures received	EPU			
Total used tyres received	tonnes			
Data accuracy	± %			
Stockpile of used tyres at 1 July 2000	EPU			
Stockpile of used tyres at 1 July 2009	tonnes			
Stocknile of used tyres at 30 June 2010	EPU			
Stockpile of used tyres at 50 Julie 2010	tonnes			
Reason for stockpile of used tyres				
Are tonnages os used tyres reported in-the-gate or out-the-gate (recoverd)?				

SECTION 3 - USED TYRE SOURCE - STATE				
State of Origin		Passenger	Truck	Off-the-road
АСТ	EPU			
	tonnes			
NSW	EPU			
NOW	tonnes			
NT	EPU			
	tonnes			
	EPU			
	tonnes			
SA	EPU			
54	tonnes			
TAS	EPU			
140	tonnes			
VIC	EPU			
VIC	tonnes			
WA	EPU			
	tonnes			

SECTION 4 - USED TYRE SOURCE - REMOTENESS				
Estimated proportion of tyres received from:	Passenger	Truck	Off-the-road	
Metropolitan areas (major cities)				
Regional (smaller cities, large towns and surrounds)				
Remote (townships, rural areas)				
Do these proportions apply across all source states? If not, please provide further comments/ explanation				

SECTION 5 - USED TYRE DESTINATIONS				
Tyre type		Passenger	Truck	Off-the-road
Used in Australia for the following purposes:				
Second hand tyres	EPU			
	tonnes			
Destination	I			
Retreadable casings	EPU			
Destination				
	EPU			
Civil engineering applications	tonnes			
Destination				
Please comment on what applications are t being used for	hey			
Granulated as feedstock material for the	EPU			
production of rubber crumb	tonnes			
Destination				
Please comment on the end product				
Energy recovery (e.g. cement production)	EPU			
	tonnes			
Destination				
Please comment on which industries tyres providing fuel for	are			
Landfill	EPU			
	tonnes			
Destination				
Other	EPU			
Destination	tonnes			
Destination				
Please comment on the purpose				
Exported:				
Total amount exported	EPU			
	tonnes			
Export port				
Destination country				
Baled, shredded, crumbed, or powdered?				
Purpose of export				

SECTION 6 - MARKET TRENDS					
Note: Please provide your estimate of trends for the used-tyre recycling market.					
Туге Туре		Passenger	Truck	Off-the-road	
2005-10	± %				
Current	± %				
Anticipated next 1-2 years	± %				

SECTION 7 - MARKET FEEDBACK

Note: Feedback on state of the market for tyre recyclate (availability of material, prices, markets, competitior behaviour and changes in market requirements)

Market Feedback / Other Comments			
Passenger			
Truck			
Off-the-road			

TYRE RETREADERS SURVEY FORM

SECTION 1 - COMPANY DETAILS	
Company Name:	
Company Type:	
City & State of Reprocessing Site*:	
Contact Name:	
Contact Phone Number:	
Contact position/title:	
Survey Date:	

Tyre types	Definition
Passenger	Car, 4WD and motorbike tyres
Truck	Includes all truck and bus tyres
Off-the-road	Includes mining, construction and agricultural vehicles designed for off-road use

* Please fill out a separate form for each reprocessing site

SECTION 2 - TYRES RETREADED						
Note: only include tyres retreaded within Australia. Do not include any tyres imported for retread. Please indicate EPU or tonnes as appropriate.						
	Tyre type	Passenger	Truck	Off-the-road		
Total Turne Descined	EPU					
Total Tyres Received	tonnes					
Material loss - recycled	EPU					
material loss - recycled	tonnes					
Matarial loss landfilled	EPU					
Material loss - landfilled	tonnes					
Data accuracy	± %					

SECTION 3 - TYRE SOURCE - STATE					
Note: Please provide splits for tyre sources by state of tyre	e origin not	reprocessing state.			
State of Origin		Passenger	Truck	Off-the-road	
ACT	EPU				
	tonnes				
NSW	EPU				
	tonnes				
NT	EPU				
	tonnes				
	EPU				
	tonnes				
64	EPU				
34	tonnes				
TAC	EPU				
TAS	tonnes				
VIC	EPU				
VIC	tonnes				
	EPU				
WA	tonnes				

SECTION 4 - TYRE SOURCE - REMOTENESS						
Note: Please provide splits for tyre sources by type of area						
Estimated proportion of tyres received from:	Passenger	Truck	Off-the-road			
Metropolitan areas (major cities)						
Regional (smaller cities, large towns and surrounds)						
Remote (townships, rural areas)						
Do these proportions apply across all source states? If not, please provide further comments/ explanation						

SECTION 5 - SALE DESTINATION - STATE						
Note: Please provide splits for tyre sources by state of tyre destination not reprocessing state.						
State of Destination		Passenger	Truck	Off-the-road		
АСТ	EPU					
	tonnes					
	EPU					
31	tonnes					
NT	EPU					
	tonnes					
ם וכ	EPU					
	tonnes					
24	EPU					
	tonnes					
ras	EPU					
A3	tonnes					
//C	EPU					
	tonnes					
N 0	EPU					
WA	tonnes					

SECTION 6 - TYRE SALE DESTINATION - REMOTENESS				
Note: Please provide splits for tyre sale destination by type of area				
Estimated proportion of tyres sold into:	Passenger	Truck	Off-the-road	
Metropolitan areas (major cities)				
Regional (smaller cities, large towns and surrounds)				
Remote (townships, rural areas)				
Do these proportions apply across all states?				
If not, please provide further comments/ explanation				

SECTION 7 - OVERSEAS IMPORTS OF TYRES FOR RETREADING					
Note: Please identify any waste tyres imported from overseas for retreading. Do not include any imported tyres in the responses above in Sections 2, 3 or 4.					
Tyre type Passenger Truck Off-the-road					
lana anta di Ossantitu	EPU				
Imported Quantity	tonnes				
Country of Origin Name					

SECTION 8 - RETREAD MARKET						
	Tyre type	Passenger	Truck	Off-the-road		
What is your market share of the total Australian tyre retreading market?	%					
Please estimate the average growth in the retread market for the following periods:						
2000 - 2005	±%					
2005 - current	±%					
Anticipated for the next 3 - 5 years	±%					

SECTION 9 - MARKET FEEDBACK					
Note: Feedback on State of the	Note: Feedback on State of the New Tyre Market (availability of material, prices including compared with new tyres, markets, competitior behaviour and changes in market requirements)				
Market Feedback / Other Comments					
Passenger					
Truck					
Off-the-road					

TYRE RECYCLERS SURVEY FORM

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					_
SECTION 1 - COMPANY DE	TAILS		Tyre type	s Defin	ition
Company Name: Company Type:			Passenge Truck	er Car, Inclu	+WD a des al
City & State of Reprocessing Site*:			Off-the-ro	ad Inclu	des m
Contact Name:					
Contact position/title:					
Survey Date:					
Please fill out a separate form for easily	ach reproce				
Note: only include waste tyres source	d from with	in Australia. Do not inclu	ide any imported tyres	(these are include	d in
section 6).		in Australia. Do not incl	de any imported tyres	(mese are moude	2111
Tyre type		Passenger	Truck	Off-the-road	d
What form do you receive the tyres i	in? eg				
Total tyres reserved	EPU				
Total tyres received	tonnes				
Data accuracy	± %				
Stockpile at 1 July 2009	tonnes				
Stockpile at 30 June 2010	EPU				
Posson for stocknilo	tonnes				
Are tonnages reported in-the-gate o	or out-the-				_
gate (recoverd)?					
SECTION 2 TYPE COURC	E CTA	TE			
SECTION 3 - I TRE SOURC		IE	processing state		
State of Origin	531003 Dy 5	Passenger	Truck	Off-the-road	d
ACT	EPU				
	tonnes				
NSW	tonnes				
NT	EPU				
	tonnes				
QLD	tonnes				
SA	EPU				
	tonnes				
TAS	EPU				
VIC	EPU				
VIC	tonnes				
WA	EPU				
	tonnes				
	tonnes				_
SECTION 4 - TYRE SOURC	tonnes	OTENESS			
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv	E - REM	OTENESS Passenger	Truck	Off-the-road	1
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities)	tonnes	OTENESS Passenger	Truck	Off-the-road	t t
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large towns Remote (townshius, rural areas)	tonnes	OTENESS Passenger	Truck	Off-the-road	t.
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large towns Remote (townships, rural areas) Do these proportions apply across a	tonnes	OTENESS Passenger	Truck	Off-the-road	d
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large towns Remote (townships, rural areas) Do these proportions apply across a states? If not, please provide further	tonnes CE - REM ved from: s and all source r	OTENESS Passenger	Truck	Off-the-road	
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large towns Remote (townships, rural areas) Do these proportions apply across a states? If not, please provide further	tonnes CE - REM ved from: s and all source r	OTENESS Passenger	Truck	Off-the-road	d
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large town Remote (townships, rural areas) Do these proportions apply across a states? If not, please provide further SECTION 5 - USED TYRE I	tonnes CE - REM ved from: s and all source r DESTINA	OTENESS Passenger	Truck	Off-the-road	
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large towns Remote (townships, rural areas) Do these proportions apply across a states? If not, please provide further SECTION 5 - USED TYRE I Tyre type Used in Australia for the following p	tonnes CE - REM ved from: s and all source r DESTINA urposes:	OTENESS Passenger TIONS Passenger	Truck	Off-the-road	
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large towns Remote (townships, rural areas) Do these proportions apply across a states? If not, please provide further SECTION 5 - USED TYRE I Tyre type Used in Australia for the following pr Second hand tyres	tonnes CE - REM ved from: s and all source r DESTINA urposes: EPU	OTENESS Passenger TIONS Passenger	Truck	Off-the-road	
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large towns Remote (townships, rural areas) Do these proportions apply across a states? If not, please provide further SECTION 5 - USED TYRE ID Tyre type Used in Australia for the following pu Second hand tyres	tonnes CE - REM <i>red</i> from: all source r DESTINA urposes: EPU tonnes	OTENESS Passenger TIONS Passenger	Truck	Off-the-road	: : :
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large towns Remote (townships, rural areas) Do these proportions apply across a states? If not, please provide further SECTION 5 - USED TYRE ID Tyre type Used in Australia for the following pu Second hand tyres Destination	tonnes CE - REM red from: s and all source r DESTINA DESTINA UUPOSES: EPU tonnes EPU	OTENESS Passenger TIONS Passenger	Truck	Off-the-road	1 1
SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large town Remote (townships, rural areas) Do these proportions apply across a states? If not, please provide further SECTION 5 - USED TYRE I Tyre type Used in Australia for the following pu Second hand tyres Destination Retreadable casings	tonnes CE - REM red from: s and all source r DESTINA Urposes: EPU tonnes EPU tonnes	OTENESS Passenger TIONS Passenger	Truck	Off-the-road	
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SECTION 4 - TYRE SOURC Estimated proportion of tyres receiv Metropolitan areas (major cities) Regional (smaller cities, large towns Remote (townships, rural areas) Do these proportions apply across a states? If not, please provide further SECTION 5 - USED TYRE I Tyre type Used in Australia for the following p Second hand tyres Destination Retreadable casings Destination Civil engineering applications	tonnes CE - REM ved from: s and all source r DESTINA DESTIN	OTENESS Passenger STIONS Passenger	Truck	Off-the-road	
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SECTION	6 - OV	ERSEAS	IMPORTS		
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Note: Please identify any waste tyres imported from overseas for reprocessing. Do not included responses from Sections 2 - 4 here.

Tyre type		Passenger	Truck	Off-the-road
Imported	EPU			
Quantity	tonnes			
Country of Origin Name				

SECTION 7 - MARKET TRENDS							
Note: Please provide your estimate of trends for the tyre recycling market.							
Tyre	Tyre Type Passenger Truck Off-the-road						
2005-10	± %						
Current	± %						
Anticipated							
next 1-2	± %						
years							

SECTION 8 - MARKET FEEDBACK Note: Feedback on state of the market for tyre recyclate (availability of material, prices, markets (location, strength, pressure), competitior behaviour and changes in market requirements) Market Feedback / Other Comments Passenger

 Truck

 Off-the-road

SECTION 9 -		
CONFIDENTIALITY		
Conf	identiality?	
Can we pass on your infor EPHC?	mation to	
Can we include your comp figures in our report?	any	

SECTION 10 - CAPACITY			
At what capacity is your business?			

TYRE ILLEGAL DUMPING SURVEY FORM

SECTION 1 - ORGANISATION DETAILS				
Organisation name:				
Organisation type:				
City & State:				
Contact Name:				
Contact Phone Number:				
Contact position/title:				
Survey Date:				

Tyre types	Definition
Passenger	Car, 4WD and motorbike tyres
Truck	Includes all truck and bus tyres
Off-the-road	Includes mining, construction and agricultural vehicles designed for off-road use

SECTION 2 - TYRE DISPOSAL OPTIONS			
Note: What avenues are available for residents or businesses to dispose or recycle tyres in your area?			
Disposal avenues commonly used			
Passenger			
Truck			
Off-the-road			

SECTION 3 - ILLEGAL DUMPING INCIDENCES					
Tyre type (please specify units)		Units	Passenger	Truck	Off-the-road
	Private land				
Estimated number of tyres megany dumped per year	Public land				
Variation in number of tyres illegally dumped per year. i.e. is this typical or are there large variations year to year?	± %				
Most common location of illegal dumping (e.g. bushland.	Private land				
highways, rural roads, natural reserves, rural properties) Please separate into private and public land	Public land				
Other locations of illegal dumping	Private land				
Please separate into private and public land	Public land				
Are you aware of any stockpiles (other than illegal dumping) on private land? If so, please estimate number of tyres.	Private land				
Trend in illegal dumping over past 1-3 years	± %				

SECTION 4 - COMMENTS				
Note: Comments or	n illegal dumping			
	Other Comments			
Passenger				
Truck				
Off-the-road				

Appendix 4: References

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COAG Standing Council on Environment and Water

Study into domestic and international fate of endof-life tyres

Method for trends analysis and market assessment

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Approver	Peter Allan
Report No	1A
Date	4 January 2011

This report has been prepared for the COAG Standing Council on Environment and Water in accordance with the terms and conditions of appointment for the 'Study into domestic and international fate of end-of-life tyres' dated 5 October 2010. Hyder Consulting Pty Ltd (ABN 76 104 485 289) cannot accept any responsibility for any use of or reliance on the contents of this report by any third party.

1 INTRODUCTION

Representatives from the tyre industry and government met early in 2010 and indicated their commitment to develop a management strategy for end-of-life tyres, including an industry led product stewardship scheme. This follows the decision of the Environment Protection and Heritage Council (EPHC) in November 2009 to support the development of a new industry led approach for handling end-of-life tyres.

The renewed commitment of industry and government comes in the context of the impending National Product Stewardship Framework legislation. This is a key priority of the *National Waste Policy: Less Waste, More Resources* also agreed to by the EPHC in November 2009.

Central to the development of a management strategy and a product stewardship scheme is an understanding of the current sources and fate of end-of-life tyres, and the future trends in the sources and fate of end-of-life tyres. The *Study into the source and fate of end-of-life tyres* seeks to inform these processes by:

- Developing the method and tools to update tyres data and trends on an annual basis.
- Consistent with the developed method, obtaining data on, and analysing the trends in the sources and fate of end-of-life tyres.
- Analysing the domestic market and developing an understanding of the international market for end-of-life tyres and tyre derived products.

This report provides an overview of the method that Hyder Consulting will use to undertake the trend analysis and market assessment for the *Study into the source and fate of end-of-life tyres* (the Study).

This method will be refined during the course of the trends analysis and market assessment. A finalised method will be presented in full as a component of the final Study report.

This report should be read as an accompaniment to the *Method for collecting and calculating data* report.

2 DOMESTIC

2.1 Trends analysis

The *Method for collecting and calculating data* report outlines the approach for attaining the following information that will be used in the domestic trends analysis and market assessment:

- Data on the amount and source of end-of-life tyres and tyre derived product (TDP) in Australia.
- Data on the location, size and capacity of the Australian tyre recycling industry.
- Data on the sale of end-of-life tyres and tyre derived product (TDP) into the Australian and international markets.

Recent trends in the fate of end-of-life tyres from domestic sources will be generated (using Microsoft Excel) on the basis of the findings of this study and the Hyder (2009) study. Any differences in the method between the two studies will either be accommodated for in the development of the trends and/or noted in the final report.

Recent trends in the fate of end-of-life tyres from domestic sources will be analysed to determine what factors, if any, can be identified as having an effect on the fate of end-of-life tyres from domestic sources. The factors that will be analysed can be classed as being either economic or regulatory and policy.

Economic factors

Economic factors will be tested for correlation with recent trends in the fate of end-of-life tyres from domestic sources. The economic factors that have been identified as being most likely to have an effect on the fate of end-of-life tyres from domestic sources are:

- The price of oil, the price of natural and synthetic rubber, and the price of new tyres.
- The value of the Australian dollar, the US dollar and the currency in major end market destinations.
- Economic growth in Australia, internationally and in major end market destinations
- The cost of shipping from Australia into major end market destinations.

Linear and rank correlation tests of economic factors will be undertaken using Microsoft Excel. The level of testing of particular economic factors, and the inter-relationship between factors, will be an iterative process based on the strength of correlation. That is, the higher the correlation of particular factors with trends in the market for end-of-life tyres and tyre derived product, the more investigation will be undertaken.

The data sources used for these factors will be determined during the course of the study, and will be presented in the final report. Good quality data for the period that covers this study and the Hyder (2009) study is expected to easily attainable. The exception is data on the shipping from Australia into major end market destinations. In this case, it is anticipated that good quality data will be available for current prices, but not necessarily for historic prices. In this case, anecdotal evidence attained from the tyre industry may be used instead.

The findings of these correlation tests will then be subject to a qualitative assessment to examine any causality of the factors on the recent trends in the fate of end-of-life tyres from domestic sources.

Regulatory and policy factors

The regulatory and policy conditions in each state and territory will be subject to a qualitative analysis for relationship with recent trends in the fate of end-of-life tyres from domestic sources. The regulatory and policy factors that have been identified as being most likely to have an effect, and that will be examined, are:

- Controls and/or levies on the transportation and disposal of tyres in each state and territory.
- Standards and/or requirements for the use of end-of-life tyres and TDP in each state and territory.

2.2 Market assessment

Domestic price of TDP

An assessment of the pricing of TDP relative to virgin or substitute products in the Australian market will be made primarily on the basis on information attained from industry.

Information on the price of end-of-life tyres and TDP will be attained through discussion with the tyre recycling industry. This will include the price of collecting and processing end-of-life tyres, and the sale price for TDP into end markets. Findings made using this information will be presented with the caveat that they are being made on the basis of industry claims, and have not been independently verified.

Information on the domestic price of virgin or substitute products for end markets will be attained through research of and discussions with the tyre recycling industry and the relevant end market industries. The price of virgin or substitute products will be obtained for:

- Retreading
- Civil engineering
- Energy recovery, including cement kilns and steel arc welding
- Rubber crumb, including playground cover, sporting surfaces and other flooring; acoustic insulation; tile adhesive; road surfacing, brake pads.

This information will be compared with the reported value of imported TDP obtained for the relevant categories in Schedule 3 of the *Combined Australian Customs Tariff Nomenclature and Statistical Classification* (Working Tariff), as set out in the *Method for collecting and calculating data* report.

Tyre industry representatives will be questioned as to whether they believe there are any information asymmetries between tyre recyclers and end markets, both domestically and internationally. This will assist in determining barriers to recycling and recovery of energy from end-of-life tyres additional to the economic and regulatory factors already identified.

Capacity of the TDP market

The method for obtaining information on the existing processing capacity of the domestic tyre recycling industry, and likely future investment by the domestic tyre recycling industry, is outlined in the *Method for collecting and calculating data* report

This will inform a qualitative assessment of the Australian market's capacity to accommodate more domestically sourced end-of-life tyres and TDP. The assessment will centre on the impact that an increase in supply – a positive supply shock – would have on end markets.

This assessment will be limited in its scope given that the specific conditions under which the domestic market would be required to or given an incentive to accommodate more domestically sourced end-of-life tyres or TDP are not known at this stage.

Nonetheless, the assessment will examine the following scenarios, independently of each other, and in combination:

- A product stewardship scheme is introduced that subsidises the sale of end-of-life tyres and/or TDP into end markets.
- A nationwide ban on the disposal of tyres to landfill is introduced.
- The export of whole, baled tyres is prohibited.

3 INTERNATIONAL

The international trends analysis and market assessment will seek to establish and explain any similarities or differences between the fate of end-of-life tyres sourced in Australia and those sourced internationally. This international trends analysis and market assessment will focus on the fate of end-of-life tyres and TDP sourced from countries within the OECD.

OECD countries have been chosen as the focus given the relatively similar economic conditions to those in Australia. Overall economic conditions are important to understanding the source and fate of end-of-life tyres as they have an impact on the number of tyres in circulation.

The figure below¹ illustrates the correlation between motor vehicles ownership and gross domestic product (GDP) for all countries. Motor vehicle ownership per capita is taken to be an accurate indicator of the number of tyres per capita.



N.B. Enlarged data points indicate Australia.

The table below² gives a comparison of motor vehicle ownership per capita in OECD and non-OECD countries.

Countries	Population	Motor vehicles	Vehicles
	ropulation	wotor venicles	(per 1000 people)
OECD	1,184,954,500	632,505,380	534
Non-OECD	4,770,415,829	349,244,454	73

Motor vehicle ownership and GDP rates are also taken to be an accurate indicator of the relative value of tyres within in an economy. As such, it is assumed that the lifespan of tyres within OECD countries is comparable to that of tyres in Australia.

Motor vehicle ownership and GDP rates are also taken to be an accurate indicator of the relative value of end-of-life tyres in an economy. The value of end-of-life tyres, and their constituent resources, within an economy is a major determinant to the disposal pathway of tyres.

¹ Hyder analysis generated using motor vehicles per person from <en.wikipedia.org/wiki/List_of_countries_by_vehicles_per_capita> and GDP per person from <www.cia.gov/library/publications/the-world-factbook/rankorder/2004rank.html>.

² Hyder analysis generated using population from <www.tsm-resources.com/xls/Data/WorldPop.xls> and motor vehicles per person from <en.wikipedia.org/wiki/List_of_countries_by_vehicles_per_capita>.

It is also assumed that there is a greater degree of similarity between Australia and other OECD countries regarding the regulatory conditions for the use and disposal of tyres. Again, this impacts on the number and value of end-of-life tyres within an economy, and the available disposal routes.

3.1 Trends analysis

Source countries

Identified trends in the fate of end-of-life tyres sourced internationally will be documented following a review of international literature. Sources to be reviewed include, but will not be limited to:

- European Tyre & Rubber Manufacturers Association size and trends in end-of-life tyres in the European Union.
- Rubber Manufacturers Association size and trends in the scrap tyre market in the United States.
- Waste and Resource Action Programme (UK) tyre recycling in the UK.
- Tyre Stewardship BC tyre recycling in British Columbia, Canada.
- Japanese Automotive Tyre Manufacturers Association tyre recycling in Japan.
- World Business Council for Sustainable Development global product stewardship approaches for tyres.
- Resource Recovery Forum international network of public domain studies.

A full list of literature drawn upon will be provided in the final report.

Identified trends in the fate of end-of-life tyres sourced internationally will be tested for correlation with economic factors using the method outlined for domestically sourced end-of-life tyres in section 2.

Identified trends in the fate of end-of-life tyres sourced internationally will be also be subject to a qualitative comparison with the regulatory and policy conditions within the relevant jurisdictions, including restrictions on import or the existence of product stewardship schemes, and, again, using the method outlined for domestically sourced end-of-life tyres in section 2.

Export destinations

Identification will be made of the major export destinations for end-of-life tyres and tyre derived product from both Australian and international sources using the findings from the *Method for collecting and calculating data* report and the literature review detailed above.

A literature review will be undertaken to determine any trends in export to these countries. Again, a correlation test will be undertaken to determine any relationship with economic factors. This will take into account the proximity of source countries to export destinations, which will be reflected in shipping costs.

A qualitative assessment will also be undertaken of the regulatory conditions in major export destinations. This will include an exploration of any anticipated changes to the domestic or international regulations, including environmental and hazardous waste policies, which might impact on the export of end-of-life tyres and TDP from Australia to these countries.

3.2 Market assessment

A qualitative assessment will be made of the existing and future international market for end-oflife tyres and TDP, and the factors contributing to these markets. This assessment will focus on the relationship between the market for end-of-life tyres and TDP and the overall demand for commodities.

The market assessment will also focus, in particular, on the possible effects of the price crude oil and other liquid fuels on the use and lifespan of tyres, as well as the market for end-of-life tyres and TDP will be included. A discussion of projections regarding the availability of crude oil, and the possible implications of shortages in the supply will also be included.

Data on the reported export value of TDP will be obtained for the relevant codes used in the Australian Harmonized Export Commodity Classification (AHECC) for the export of loose and fitted tyres, also as set out in the *Method for collecting and calculating data* report. Verification will be requested from the tyre industry of the reported value of TDP for those codes which are suspected of being used to disguise the export of whole, baled tyres.

An assessment will be made to see if any relationship exists between the value of exported endof-life tyres and tyre derived product, and the destination countries for Australian exports. That is, the relative price of end-of-life tyres in destination countries will be examined. This assessment will be made using data on the export value and quantity of the relevant AHECC codes for tyres and tyre derived product.

4 SUMMARY

The findings from the trends analysis and market assessment of the domestic and international fate of end-of-life tyres will be summarised and presented in the final report. This will include a full list of finding from the trends analysis and market assessment on the fate of end-of-life tyres sourced from both the Australian and international market. Any relevant data will be presented within this report, if necessary in a summary, table or graphical form.

A summary of the likely future demand for end-of-life tyres and TDP will be included. Also included will be an outline of the strengths, weaknesses, opportunities and threats for the different components of the end-of-life tyre industry in Australia.

To the extent that it is possible, commentary will also be included on the priorities for the establishment of a sustainable tyres reprocessing industry in Australia.

Projections will also be developed, again, to the extent that is possible, using the findings of this study and the Hyder (2009) study, and underlying data, on the overall demand for tyres, the demand for second hand and retreaded tyres, and the demand for tyre derived products and tyres for energy production.

Appendix: References

Internet reference homepages: www.etrma.org www.jatma.or.jp www.resourcesnotwaste.org www.rma.org www.tirestewardshipbc.ca www.wbcsd.org www.wrap.org.uk www.tirestewardshipbc.ca

APPENDIX B

Economic Factors and Tyre Data

Historical Prices of Commodities Relevant to the Manufacture of Tyres

	Oil Malaysia Tapis Blend Price, US\$ per Barrel	Natural Rubber Price, Maylaysian/Singapore US cents per pound	Coal, Australian thermal coal, 'US\$ per metric tonne	Steel, Wire Rod, US\$ per Tonne	Steel Cold-rolled coil/sheet, US\$ per tonne	Tyre Price, US cents per kg
June 2006	72.96	123.8	56.12	530	650	
July 2006	76.67	114.17	56.52	550	700	
August 2006	79.37	100.37	54.58	495	700	
September 2006	76.26	83.76	50.46	480	700	
October 2006	64.6	84.44	47.2	480	675	
November 2006	61.13	75.26	49.29	480	650	
December 2006	62.82	79.25	53.3	470	650	
January 2007	63.47	95.65	54.95	465	650	411.24
February 2007	60.81	104.96	56.68	510	650	429.07
March 2007	66.37	103.24	59.34	520	650	407.87
April 2007	74.29	106.75	60.13	550	650	436.10
May 2007	74.61	108.6	60	550	650	432.38
June 2007	76.4	102.86	66	580	650	442.02
July 2007	76.26	95.3	72.12	580	650	419.54
August 2007	80.9	96.8	74.3	580	650	409.78
September 2007	79.06	98.91	73.33	600	650	428.38
October 2007	84.04	106.96	80.15	600	650	446.86
November 2007	94.33	113.66	90.64	620	650	452.35
December 2007	94.1	112.95	97.5	630	650	426.57
January 2008	100.53	119.92	98.3	750	687.5	461.98
February 2008	97.13	127.63	141.43	770	800	482.42
March 2008	106.62	127.4	126.7	830	800	496.95
April 2008	109.78	129.51	131.79	950	800	482.45
May 2008	121.02	139.05	142.71	980	800	474.18
June 2008	133	147.04	171.16	1040	1100	481.49
July 2008	148.6	145.96	192.86	1090	1100	524.29
August 2008	135.03	133.78	169.71	1050	1100	439.48
September 2008	117.08	130.61	160.71	900	1100	436.80
October 2008	101.11	88.05	115.71	700	1100	399.94
November 2008	63.96	77.06	98.84	550	1100	403.28
December 2008	48.87	56.7	84.27	480	1100	407.72
January 2009	39.83	68.26	85.71	475	1100	391.62

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	Oil Malaysia Tapis Blend Price, US\$ per Barrel	Natural Rubber Price, Maylaysian/Singapore US cents per pound	Coal, Australian thermal coal, "US\$ per metric tonne	Steel, Wire Rod, US\$ per Tonne	Steel Cold-rolled coil/sheet, US\$ per tonne	Tyre Price, US cents per kg
February 2009	46.96	67.22	80.76	480	1100	360.77
March 2009	48.31	63.84	65.36	420	900	398.29
April 2009	51	73.5	68.1	450	700	437.81
May 2009	52.67	76.39	69.11	475	700	463.72
June 2009	68.71	75.48	76.48	460	700	479.27
July 2009	75.14	79.06	79.07	490	700	472.61
August 2009	76.51	92.86	77.68	500	700	481.90
September 2009	72.91	98.5	72.47	520	700	495.00
October 2009	67.33	106.68	76.15	520	700	495.56
November 2009	79.23	116.74	84.43	500	700	511.72
December 2009	80.96	127.47	89.04	530	700	508.92
January 2010	78.94	139.79	103.93	510	700	508.86
February 2010	76.71	141.87	100.92	540	700	501.96
March 2010	79.67	151.44	101.12	580	775	513.73
April 2010	82.57	179.09	107.3	690	812.5	527.68
May 2010	87.12	166.91	107.28	670	850	480.34
June 2010	75.13	161.74	105.2	600	850	483.88

Historical Prices of Commodities Relevant to the Manufacture of Tyres

Historical Values of Currencies in Major Market Destinations

	CNY/AUD	EUR/USD	AUD/USD	CNY/USD	VND/USD
Jul-05	6.1807	0.83107	1.3296 8.2177		15870
Aug-05	6.1677	0.81313	1.3136	8.1012	15881
Sep-05	6.1799	0.81745	1.3071	8.0773	15864
Oct-05	6.0832	0.83187	1.3272	8.0733	15903
Nov-05	5.9403	0.84837	1.3598	8.0772	15899
Dec-05	5.9991	0.8431	1.346	8.0738	15904
Jan-06	6.0529	0.82475	1.3323	8.0642	15926
Feb-06	5.9695	0.83761	1.3484	8.0491	15924
Mar-06	5.8373	0.83145	1.3769	8.0347	15921
Apr-06	5.9089	0.81432	1.3568	8.0149	15874
May-06	6.1241	0.78361	1.3087	8.014	15995
Jun-06	5.9228	0.78997	1.3518	8.006	15985
Jul-06	6.0141	0.78867	1.3285	7.9893	15984
Aug-06	6.0838	0.78085	1.3107	7.9739	16038
Sep-06	5.9883	0.7861	1.325 7.9339		16014
Oct-06	5.9617	0.79262	1.3258	7.9028	16058
Nov-06	6.0801	0.77566	1.2933	7.8632	16100
Dec-06	6.1472	0.75707	1.2725	7.822	16073
Jan-07	6.0956	0.76988	1.278 7.7893		16059
Feb-07	6.07	0.7644	1.2771	7.7514	15982
Mar-07	6.1372	0.75501	1.2612	7.7384	16043
Apr-07	6.3931	0.73973	1.2082	7.7235	16066
May-07	6.3354	0.73981	1.2116	7.676	16070
Jun-07	6.427	0.74515	1.1873	7.6305	16127
Jul-07	6.5691	0.72857	1.1529	7.5727	16100
Aug-07	6.2683	0.73437	1.2091	7.5732	16235
Sep-07	6.3745	0.71831	1.1805	7.5208	16194
Oct-07	6.7478	0.70249	1.112	7.5022	16072
Nov-07	6.6498	0.68111	1.1166	7.4212	16056
Dec-07	6.4247	0.68686	1.1474	7.3705	16030
Jan-08	6.3818	0.67964	1.1347	7.2408	15992
Feb-08	6.5435	0.67794	1.0954	7.1661	15931
Mar-08	6.5302	0.64431	1.0835	7.0743	15918
Apr-08	6.5141	0.63484	1.0745	6.9985	16117

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	CNY/AUD	EUR/USD	AUD/USD	CNY/USD	VND/USD
May-08	6.6198	0.64248	6.972		16181
Jun-08	6.561	0.64267	1.0515	6.8988	16529
Jul-08	6.5791	0.63473	1.0392	6.8362	16789
Aug-08	6.0232	0.67029	1.1383	6.8525	16606
Sep-08	5.5835	0.69768	1.2251	6.8373	16623
Oct-08	4.6964	0.75473	1.462	6.8354	16705
Nov-08	4.4998	0.78438	1.519	6.8283	16919
Dec-08	4.601	0.74307	1.4909	6.8547	17069
Jan-09	4.6145	0.75566	1.4836	6.8364	17483
Feb-09	4.4445	0.78167	1.5386	6.8362	17476
Mar-09	4.5564	0.76699	1.5025	6.8365	17555
Apr-09	4.8883	0.75762	1.3977	6.8311	17777
May-09	5.2254	0.73178	1.3066	6.8236	17775
Jun-09	5.4836	0.71364	1.2465	6.8344	17791
Jul-09	5.4952	0.71007	1.2437	6.8315	17811
Aug-09	5.7063	0.70128	1.1975	6.8329	17796
Sep-09	5.8867	0.68623	1.1602	6.8283	17832
Oct-09	6.1894	0.6748	1.1035	6.8271	17864
Nov-09	6.2752	0.67067	1.0881	6.8272	18017
Dec-09	6.1634	0.6858	1.1081	6.8277	18502
Jan-10	6.2353	0.7008	1.0951	6.8273	18460
Feb-10	6.0493	0.7313	1.1291	6.829	18709
Mar-10	6.2265	0.737	1.0963	6.8258	18961
Apr-10	6.3236	0.74565	1.0795	6.8259	18964
May-10	5.9512	0.79678	1.1489	6.8276	19012
Jun-10	5.8206	0.81829	1.172	6.8188	18997

Export Shipping Cost and Economic Growth in Australia and Major End Market Destinations

	Vietnam - GDF - real growth rate (%)	China GDP (%)	Australia GDP (%)	USA - GDP - real growth rate (%)	EU - GDP - real growth rate (%)	Export Shipping Costs, AU\$	Export Shipping Costs, US\$
September 2005		10.0	2.2				
December 2005	7.7	10.3	1.8	4.4	2.4	\$694.00	\$ 515.60
March 2006		10.9	1.6				
June 2006		11.3	1.8			\$719.00	\$ 531.88
September 2006		10.7	2.4				
December 2006	8.5	10.8	2.6	3.2	1.7	\$724.00	\$ 568.96
March 2007		12.7	2.3				
June 2007		13.6	2.0			\$733.00	\$ 617.37
September 2007		13.1	1.9				
December 2007	8.2	12.3	2.0	3.2	3.1	\$740.00	\$ 644.94
March 2008		10.5	2.6				
June 2008		9.8	2.8			\$797.00	\$ 757.96
September 2008		9.1	2.1				
December 2008	8.5	7.0	0.5	2.0	3.0	\$800.00	\$ 536.59
March 2009		6.1	-1.0				
June 2009		7.7	-1.1			\$773.00	\$ 620.14
September 2009		8.5	0.2				
December 2009	6.2	10.1	1.8	1.1	0.8	\$771.00	\$ 695.79
March 2010		10.0	2.7				
June 2010		8.0	2.6			\$781.00	\$ 666.38

APPENDIX C

Export of end-of-life tyres to Vietnam and commodity prices – Statistical Analyses

Linear (Pearson) correlation tests were undertaken for all economic factors with the quantity of whole-baled tyres exported to Vietnam. A second set of correlation tests was undertaken with the values for the export of whole baled tyres brought forward three months to account for the delay between order and shipping. The results of these correlation tests are summarised in the table below.

The Pearson correlation coefficient is a measure of the degree of linear relationship between two variables. However, scatter plots generated indicated that the relationship between most pairs of variables could not be described as linear. It was therefore considered more appropriate to look at the Spearman's rank correlation coefficient, which, by ranking the data before calculating correlation, can be used to assess a relationship which is non-linear. Spearman correlation coefficients are also included in the table below.

Table 33: Correlation test results comparing the export of end-of-life tyres to Vietnam and economic factors

	Pearson correlations	Pearson correlations (adjusted for time lag)	Spearman correlations	Spearman correlations (adjusted for time lag)
Malaysia Tapis Blend oil price ⁱ	0.14	0.28	0.18	0.21
Natural rubber price ⁱⁱ	0.30	0.28	0.25	0.22
Steel, cold-rolled coil/sheet price ⁱⁱⁱ	0.48	0.46	0.62	0.55
Steel, wire rod price ^{iv}	0.16	0.33	0.18	0.23
Coal price ^v	0.47	0.61	0.65	0.72
Import price of new tyres ^{vi}	0.32	0.57	0.35	0.55
AUD/USD ^{vii}	-0.08	-0.33	-0.24	-0.45
CNY/USD ^{viii}	-0.88	-0.90	-0.90	-0.90
VND/USD ^{ix}	0.79	0.76	0.82	0.82
Australia, GDP, real growth rate ^x	-0.30	-0.31	-0.11	-0.09
China, GDP, real growth rate ^{xi}	-0.65	-0.56	-0.66	-0.65
Import shipping costs ^{xii}	0.64	0.86	0.70	0.83
Export shipping costs ^{xii}	0.74	0.90	0.70	0.83

i. Oil Malaysia Tapis Blend Price, US Dollars per Barrel, U.S. Energy Information Administration (2011).

Natural Rubber Price, No.1 Rubber Smoked Sheet, FOB Maylaysian/Singapore, US cents per pound, International Monetary Fund (2011).

iii. Steel, cold-rolled coil/sheet (Japan) producers' export contracts (3 to 12 months terms) fob mainly to Asia, US Dollars per Metric Ton, International Monetary Fund (2011).

iv. Steel, Wire Rod, US\$ per Tonne, Middle East Steel Prices, ME Steel (2010).

v. Coal, Australian thermal coal, US Dollars per metric tonne, International Monetary Fund (2011).

vi. New Tyre Price, Hyder derived.

vii. Australian Dollar (applying a base currency of U.S Dollars), University of British Columbia (2011).

viii. Chinese Renminbi (applying a base currency of U.S Dollars), University of British Columbia (2011).

ix. Vietnamese Dong (applying a base currency of U.S Dollars), University of British Columbia (2011).

x. Gross Domestic Product, Current prices, Percentage Changes, Australian Bureau of Statistics (2010).

xi. Real Gross Domestic Product, percent change from a year earlier, International Monetary Fund (2009).

xii. The national port interface export cost index for ships in the 15 000–20 000 GT range, (Australian average for each six month period of exporting a container in an average ship), Bureau of Infrastructure, Transport and Regional Economics (2010)

Generally, the closer a correlation coefficient is to 1 or -1 the stronger the relationship between the two variables. For the purposes of this assessment a correlation between 0.3 and 0.5 was

considered moderate, and greater than 0.5 was considered a strong relationship. Assuming a non-linear relationship, the results of the Spearman calculations indicated that there was a strong relationship between the export of end-of-life tyres to Vietnam with the following economic factors:

- import and export shipping costs;
- price of coal;
- price of steel;
- price of new tyres (when adjusted for time lag);
- strength of the Chinese and Vietnamese currency; and
- growth rate of China's GDP.

Multiple regression analysis was carried out to assess the simultaneous effect of these variables on the export of tyres to Vietnam. As the data available for import and export shipping costs was only bi-annual, monthly data was extrapolated between the bi-annual shipping cost data in order to preserve the degrees of freedom and the integrity of the data.

The results of the multiple regression analyses, conducted using Microsoft Excel and presented overleaf, indicate that 82% of the variation in export of tyres to Vietnam can be explained by the variation in the price of oil, the price of rubber, the price of coal, the price of steel, Australian import and export shipping costs, the strength of the Chinese and Vietnamese currency. After the data was adjusted to the previously discussed time lag, this percentage increased to 85%.

MULTIPLE REGRESSION ANALYSES

Regression Statistics	
Multiple R	0.920200218
R Square	0.846768442
Adjusted R Square	0.81612213
Standard Error	105983.7435
Observations	49

ANOVA	df	SS	MS	F	Significance F
Regression	8	2.48288E+12	3.10359E+11	27.63035405	5.62008E-14
Residual	40	4.49302E+11	11232553879		
Total	48	2.93218E+12			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	5233165.65	5359525.86	0.98	0.33	-5598840.05	16065171.35	-5598840.05	16065171.35
Malaysia Tapis Blend Oil Price, US\$ per barrel	3946.90	2058.86	1.92	0.06	-214.21	8108.01	-214.21	8108.01
Natural Rubber Price, US cents per pound	1548.87	1425.34	1.09	0.28	-1331.85	4429.60	-1331.85	4429.60
Steel Cold-rolled coil/sheet (Japan), US\$ per Tonne	534.60	333.13	1.60	0.12	-138.69	1207.89	-138.69	1207.89
Coal, Australian thermal coal, US\$ per metric tonne	-4351.30	2380.30	-1.83	0.08	-9162.06	459.46	-9162.06	459.46
CNY/USD	-593624.82	268360.96	-2.21	0.03	-1136002.55	-51247.10	-1136002.55	-51247.10
VND/USD	76.33	53.80	1.42	0.16	-32.39	185.06	-32.39	185.06
Import Shipping Costs (AUD)	4234.17	7566.90	0.56	0.58	-11059.11	19527.45	-11059.11	19527.45
Export Shipping Costs (AUD)	-7693.43	10208.46	-0.75	0.46	-28325.50	12938.65	-28325.50	12938.65

MULTIPLE REGRESSION ANALYSES

Regression Statistics	Time adjusted
Multiple R	0.935617899
R Square	0.875380853
Adjusted R Square	0.848436173
Standard Error	93538.87253
Observations	46

ANOVA	df	SS	MS	F	Significance F
Regression	8	2.27404E+12	2.84255E+11	32.48807701	1.8219E-14
Residual	37	3.23732E+11	8749520674		
Total	45	2.59777E+12			

	Coefficients	Standard Error	t Stat	P-value	Lower 95%	Upper 95%	Lower 95.0%	Upper 95.0%
Intercept	1979773.906	4745481.097	0.417191401	0.678949239	-7635484.05	11595031.86	-7635484.05	11595031.86
Malaysia Tapis Blend Oil Price, US\$ per barrel	481.2808839	1848.701905	0.260334499	0.796049139	-3264.54495	4227.106721	-3264.54495	4227.106721
Natural Rubber Price, US cents per pound	-97.5432393	1422.240515	-0.06858421	0.945689903	-2979.27623	2784.18975	-2979.27623	2784.18975
Steel Cold-rolled coil/sheet (Japan), US\$ per Tonne	250.7207985	306.5812592	0.817795579	0.418709369	-370.471833	871.9134304	-370.471833	871.9134304
Coal, Australian thermal coal, US\$ per metric tonne	2431.252757	2141.094883	1.135518457	0.263460366	-1907.01752	6769.523037	-1907.01752	6769.523037
CNY/USD	-283585.056	238272.98	-1.19016876	0.241560736	-766371.968	199201.8564	-766371.968	199201.8564
VND/USD	78.29002578	47.64093819	1.643335097	0.10878607	-18.2396834	174.8197349	-18.2396834	174.8197349
Import Shipping Costs (AUD)	-12718.3015	7056.570509	-1.80233464	0.079643944	-27016.2714	1579.668383	-27016.2714	1579.668383
Export Shipping Costs (AUD)	11740.92529	9366.70757	1.253474094	0.217896212	-7237.82685	30719.67742	-7237.82685	30719.67742

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APPENDIX D

Import and Export Codes

Import codes

4003000024 Reclaimed rubber in primary forms or in plates, sheets or strip

4004000025 Waste, parings and scrap of rubber (excl. hard rubber) and powders and granules obtained therefrom

4006100001 Camel-back strips for retreading rubber tyres, of unvulcanised rubber

4006900002 Forms nes (eg rods, tubes and profile shapes) and articles (eg discs and rings), of unvulcanised rubber

4011100005 New pneumatic rubber radial ply tyres of a kind used on motor cars, including station wagons and racing cars (excl. high performance tyres)

4011100006 New pneumatic rubber tyres of a kind used on motor cars, including station wagons and racing cars (excl. high performance and radial ply tyres)

4011100098 New pneumatic rubber high performance (ie. with aspect ratio not greater than 55) tyres of a kind used on motor cars including station wagons and racing cars

4011200020 New pneumatic rubber tyres for light trucks with a nominal rim diameter code equal to or less than 17.5 (excl. radial ply tyres)

4011200021 New pneumatic rubber tyres of a kind used on buses or lorries (excl. light trucks with a nominal rim diameter code equal to or less than 17.5) (excl. radial ply tyres) 4011200081 New pneumatic rubber radial ply tyres for light trucks with a nominal rim diameter code equal to or less than 17.5

4011200086 New pneumatic rubber radial ply tyres of a kind used on buses or lorries (excl. light trucks with a nominal rim diameter code equal to or less than 17.5)

4011300011 New pneumatic tyres, of rubber, of a kind used on aircraft

4011400012 New pneumatic tyres, of rubber, of a kind used on motorcycles

4011610031 New pneumatic rubber tyres, with a herring-bone or similar tread, of a kind used on agricultural or forestry graders

4011610032 New pneumatic rubber tyres, with a herring-bone or similar tread, of a kind used on agricultural or forestry tractors

4011610035 New pneumatic rubber tyres, with a herring-bone or similar tread, of a kind used on agricultural or forestry vehicles and machines (excl. graders and tractors)

4011620037 New pneumatic rubber tyres, with a herring-bone or similar tread, of a kind used on construction or industrial earthmoving vehicles and machines, having a rim size not exceeding 61 cm

4011620038 New pneumatic rubber tyres, with a herring-bone or similar tread, of a kind used on construction or industrial graders, having a rim size not exceeding 61 cm

4011620043 New pneumatic rubber tyres, with a herring-bone or similar tread, for construction or industrial handling vehicles & machines (excl. earthmoving and grader tyres), having a rim size not exceeding 61 cm

4011630050 New pneumatic rubber tyres, with a herring-bone or similar tread, of a kind used on construction or industrial earthmoving vehicles and machines, having a rim size exceeding 61 cm

4011630051 New pneumatic rubber tyres, with a herring-bone or similar tread, of a kind used on construction or industrial graders, having a rim size exceeding 61 cm

4011630056 New pneumatic rubber tyres, with a herring-bone or similar tread, for construction or industrial handling vehicles and machines (excl. earthmoving and grader tyres), having a rim size exceeding 61 cm

4011690058 New pneumatic rubber tyres, with a herring-bone or similar tread (excl. of a kind used on agricultural, forestry, construction or industrial handling vehicles and machines) 4011920060 New pneumatic rubber tyres (excl. those with a herring-bone or similar tread) of a kind used on agricultural or forestry graders

4011920061 New pneumatic rubber tyres (excl. those with a herring-bone or similar tread) of a kind used on agricultural or forestry tractors

4011920064 New pneumatic rubber tyres (excl. those with a herring-bone or similar tread) of a kind used on agricultural or forestry vehicles and machines (excl. graders and tractors) 4011930065 New pneumatic rubber tyres (excl. those with a herring-bone or similar tread) of a kind used on construction or industrial earthmoving vehicles and machines, having a rim size not exceeding 61 cm

4011930066 New pneumatic rubber tyres (excl. those with a herring-bone or similar tread) of a kind used on construction or industrial graders, having a rim size not exceeding 61 cm 4011930071 New pneumatic rubber tyres for construction or industrial handling vehicles & machines (excl. those with a herring-bone or similar tread, earthmoving and grader tyres), having a rim size not exceeding 61 cm

4011940073 New pneumatic rubber tyres (excl. those with a herring-bone or similar tread) of a kind used on construction or industrial earthmoving vehicles and machines, having a rim size exceeding 61 cm

4011940074 New pneumatic rubber tyres (excl. those with a herring-bone or similar tread) of a kind used on construction or industrial graders, having a rim size exceeding 61 cm 4011940079 New pneumatic rubber tyres for construction or industrial handling vehicles and machines (excl. those with a herring-bone or similar tread, earthmoving and grader

tyres), having a rim size exceeding 61 cm

4011990081 New pneumatic rubber tyres, (excl. those with a herring-bone or similar tread and of a kind used on agricultural, forestry, construction or industrial handling vehicles and machines)

4012110083 Retreaded tyres of rubber, of a kind used on motor cars (incl. station wagons and racing cars)

4012120085 Retreaded tyres of rubber, of a kind used on buses or lorries

4012130086 Retreaded tyres of rubber, of a kind used on aircraft

4012190089 Retreaded tyres, of rubber (excl. those used on motor cars, buses, lorries and aircraft)

4012200031 Used pneumatic tyres, of rubber, of a kind used on motor cars (incl. station wagons and racing cars)

4012200032 Used pneumatic tyres, of rubber, for trucks

4012200033 Used pneumatic tyres, of rubber (excl. those used on motor cars, station wagons, racing cars and trucks)

4012900027 Solid tyres of rubber

4012900028 Tyre flaps of rubber

4012900029 Cushion tyres and interchangeable tyre treads of rubber

8426120010 Mobile lifting frames on tyres and straddle carriers

8426410014 Other lifting machinery, self-propelled, on tyres, having a working weight not exc 50 tonnes

8426410015 Other lifting machinery, self-propelled, on tyres, having a working weight exc 50 tonnes

8427100020 Fork-lift trucks, non-rider type, powered by an electric motor, having at a 600 mm load centre a lifting capacity of less than 1500 kg

8427100021 Fork-lift trucks, non-rider type, powered by an electric motor, having at a 600 mm load centre a lifting capacity of 1500 kg and over

8427100022 Fork-lift trucks, rider type powered by an electric motor, having at a 600 mm load centre a lifting capacity of less than 1500 kg

8427100023 Fork-lift trucks, rider type powered by an electric motor, having at a 600 mm load centre a lifting capacity of 1500 kg and over but less than 2000 kg

8427100024 Fork-lift trucks, rider type powered by an electric motor, having at a 600 mm load centre a lifting capacity of 2000 kg and over but less than 3000 kg

8427100025 Fork-lift trucks, rider type powered by an electric motor, having at a 600 mm load centre a lifting capacity of 3000 kg and over

8427100026 Self-propelled works trucks, powered by an electric motor

8427200001 Fork-lift trucks (excl. those powered by an electric motor) having at a 600 mm load centre a lifting capacity of less than 1500 kg

8427200002 Fork-lift trucks (excl. those powered by an electric motor) having at a 600 mm load centre a lifting capacity of 1500 kg and over but less than 2000 kg 8427200003 Fork-lift trucks (excl. those powered by an electric motor) having at a 600 mm load centre a lifting capacity of 2000 kg and over but less than 3000 kg 8427200004 Fork-lift trucks (excl. those powered by an electric motor) having at a 600 mm load centre a lifting capacity of 3000 kg and over but less than 4000 kg 8427200005 Fork-lift trucks (excl. those powered by an electric motor) having at a 600 mm load centre a lifting capacity of 4000 kg and over but less than 5000 kg 8427200005 Fork-lift trucks (excl. those powered by an electric motor) having at a 600 mm load centre a lifting capacity of 4000 kg and over but less than 5000 kg 8427200006 Fork-lift trucks (excl. those powered by an electric motor) having at a 600 mm load centre a lifting capacity of 5000 kg and over but less than 5000 kg

8427200007 Fork-lift trucks (excl. those powered by an electric motor) having at a 600 mm load centre a lifting capacity of 6000 kg and over

8427200008 Self-propelled trucks (excl. those powered by an electric motor and fork-lift trucks)

8427900009 Pallet trucks

8427900010 Works trucks fitted with lifting or handling equipment (excl. pallet trucks and self-propelled trucks)

8429110038 Self-propelled track laying bulldozers and angledozers

8429190039 Self-propelled bulldozers and angledozers other than those used for track laying

8429200040 Self-propelled graders & levellers

8429300028 Self-propelled scrapers

8429400029 Self-propelled tamping machines and road rollers

8429511041 Self-propelled front-end shovel loaders for track laying or underground loaders having a payload capacity exc 16 tonnes 8429519036 Self-propelled front-end shovel loaders (excl. tracklaying and underground loaders having a payload capacity exc 16 t) 8429521038 Electric walking draglines, excavators of the tracklaying or wheel type operating wt exc 12 t, & mechanical shovels shovel capacity exc 5 cubic metres, with a 360 degree revolving superstructure 8429529039 Mechanical shovels, excavators & shovel loaders with 360 degree revolving superstructure, excl elec walking draglines, track/wheel type excavators op wt exc 12 t & mech shovels with shovel capacity exc 5 cubic metres 8429591036 Self-propelled mechanical shovels exc 5 m3 (excl. those with a 360 degree revolving superstructure) 8429599004 Self-propelled four-wheel drive wheel loaders (excl. those with a 360 degree revolving superstructure) 8429599040 Mechanical shovels, excavators & shovel loaders (excl four-wheel drive wheel loaders, front-end shovel loaders, mach with a 360 deg revolv superstructure, mech shovels with cap exc 5cubic metres) 8430100006 Pile-drivers and pile-extractors 8430200007 Snow-ploughs and snow-blowers 8430310008 Self-propelled coal or rock cutters and tunnelling machinery 8430390009 Coal or rock cutters and tunnelling machinery (excl. self-propelled) 8430410014 Other boring or sinking machinery, self-propelled (excl. rock boring machines) 8430410041 Self-propelled rotary and percussive rock drills 8430410042 Self-propelled rock boring machines, excl rotary & percussive rock drills 8430490019 Rock boring machines (excl. rotary and percussive rock drills and self-propelled) 8430490043 Rotary and percussive rock drills, excl self-propelled types 8430490044 Boring or sinking machinery excl self-propelled types & rock boring machines 8430500045 Other self propelled machinery for handling earth, minerals or ores 8432100008 Agricultural, horticultural or forestry ploughs 8432210009 Disc harrows 8432290047 Harrows (excl disc harrows), scarifiers, cultivators, weeders & hoes 8432300012 Seeders, planters and transplanters 8432400013 Manure spreaders and fertilizer distributors 8432800014 Agricultural, horticultural or forestry machinery for soil preparation or cultivation nes; lawn or sports-ground rollers 8433110055 Ride on or tractor lawn mowers with the cutting device rotating in a horizontal plane 8433110056 Powered hand or push lawn mowers with the cutting device rotating in a horizontal plane 8433110057 Attachments for powered lawn mowers with the cutting device rotating in a horizontal plane 8433110060 Powered lawn mowers with the cutting device rotating in a horizontal plane (excl. ride on, tractor, hand, or push mowers, or attachments thereof) 8433190062 Ride on or tractor lawn mowers (excl. powered mowers with the cutting device rotating in a horizontal plane) 8433190063 Hand or push lawn mowers (excl. powered mowers with the cutting device rotating in a horizontal plane) 8433190066 Powered lawn mowers (excl. powered mowers with the cutting device rotating in a horizontal plane; ride on, tractor, hand or push mowers) 8433200026 Mowers (excl. for lawns, parks or sports-grounds but incl. cutter bars for tractor mounting) 8433300049 Other haymaking machinery, (excl. mowers for lawns, parks or sports-grounds, and cutter bars for tractor mounting) 8433401036 Round bale hay balers 8433409037 Straw or fodder balers (incl. pick-up balers but excl. round bale hay balers) 8433510029 Combine harvester-threshers

Study into domestic and international fate of end-of-life tyres – Final Report Hyder Consulting Pty Ltd – ABN 76 104 485 289 AA003649 8433520030 Threshing machinery (excl. combine harvester-threshers)

8433530001 Root or tuber harvesting machines

8433591039 Cotton picking machines, green maize harvesters and tree shakers

8433599043 Other harvesting machines (excl. cotton picking machines; green maize harvesters; tree shakers, combine harvester-threshers, root or tuber harvesters)

8701100001 Pedestrian controlled tractors (excl. tractors of the type used on railway station platforms)

8701200002 Assembled road tractors for semi-trailers, presented with their trailers or semi-trailers and, when combined, have a g.v.w. of 10.16 t or more

8701200003 Assembled road tractors for semi-trailers (excl. those presented with their trailers or semi-trailers and, when combined, have a g.v.w. of 10.16 t or more)

8701200004 Unassembled road tractors for semi-trailers

8701300071 Track-laying tractors not exc 10t (excl tractors of the type used on railway station platforms)

8701300078 Track laying tractors exceeding 10 T

8701901115 Agricultural tractors having an engine power of less than 15 Kw with a single P.T.O., rear axle mounted and rear facing and having rear hydraulic lift 3 point linkage 8701901140 Agricultural tractors with engine power of 15 Kw or more but not exc 30 P.T.O. Kw (rated engine speed)

8701901141 Agricultural tractors with engine power of 15 Kw or more, exc 30 but not exc 45 P.T.O. Kw (rated engine speed)

8701901142 Agricultural tractors with engine power of 15 Kw or more, exc 45 but not exc 60 P.T.O. Kw (rated engine speed)

8701901143 Agricultural tractors with engine power of 15 Kw or more, exc 60 but not exc 75 P.T.O. Kw (rated engine speed)

8701901144 Agricultural tractors with engine power of 15 Kw or more, exc 75 but not exc 90 P.T.O. Kw (rated engine speed)

8701901145 Agricultural tractors with engine power of 15 Kw or more, exc 90 but not exc 105 P.T.O. Kw (rated engine speed)

8701901146 Agricultural tractors with engine power of 15 Kw or more, exc 105 P.T.O. Kw (rated engine speed)

8701901939 Agricultural tractors having an engine power of less than 15 Kw (excl. those with single P.T.O., rear axle mounted and rear facing and having rear hydraulic lift 3 point linkage)

8701902079 Tractors for dumpers

8701909035 Tractors (excl. pedestrian controlled tractors, road tractors for semi-trailers, track laying tractors, agricultural tractors or tractors for dumpers)

8702101074 Motor vehicles for the transport of ten or more persons incl driver, with compression-ignition internal combustion piston engine (diesel or semi-diesel), g.v.w. exc 3.5t or assembled g.v.w. not exc 3.5t

8702109075 Motor vehicles for the transport of ten or more persons incl driver, with compression-ignition internal combustion piston engine (diesel or semi-diesel) (excl. g.v.w. exc 3.5t or assembled g.v.w. not exc 3.5t)

8702901076 Motor vehicles for the transport of ten or more persons incl the driver, not with compression-ignition internal combustion piston engine (diesel or semi-diesel), g.v.w. exc 3.5t or assembled g.v.w. not exc 3.5t,

8702909077 Motor vehicles for the transport of ten or more persons incl the driver, not with compression-ignition internal combustion piston engine (diesel or semi-diesel) (excl. g.v.w. exc 3.5t or assembled g.v.w. not exc 3.5t)

8703100001 Motor vehicles for the transport of persons (excl for ten or more persons) specially designed for travelling on snow; golf cars and similar vehicles

8703211102 Used and second-hand PMVs (excl motor vehs for the transport of ten or more persons) with spark ign intl combust reciproc piston engine, cyl cap not exc 1000cc

8703211903 Ass new PMVs (excl vehs for the transport of ten or more persons) with spark ign intl combust reciproc reciproc piston eng, cyl cap not exc 1000cc

8703211923 New, unassembled passenger mtr vehicles (excl. 8702, for snow, golf or similar veh, ambulances, hearses, police vans, amphib & off road veh) with spark-ignition internal combustion reciprocating piston eng of a cyl capacity not exc 1000cc

8703212004 Mot vehs with spark-ign intl combust reciproc piston eng (excl PMVs, mot vehs for the transport of ten or more persons) cyl cap not exc 1000cc, with gvm exc. 3.5t or assembled gvm not exc. 3.5t

8703219070 Vehicles designed for the transport of less than 10 persons, with spark ign. internal combus. recip. piston engine, cyl. cap. not exc 1000 cc, (excl passenger motor vehicles, and vehicles with g.v.w. exc 3.5t or assembled g.v.w. not exc 3.5t)

8703221105 Used and sec-hand PMVs (excl mot vehs for the transport of ten or more persons) with spark ign intl combust reciproc piston eng, cyl cap exc 1000cc but not exc 1500cc

8703221906 New PMVs (excl vehs for the transport of ten or more persons) with spark ign intl combust reciproc piston eng, cyl cap exc 1000cc but not exc 1500cc

8703222007 Mot vehs with spark-ign intl combust reciproc piston eng (excl PMVs, mot vehs for the transport of ten or more persons) cyl cap exc 1000cc but not exc1500 cc, gvm exc. 3.5t or assembled gvm not exc. 3.5t

8703229080 Vehicles designed for the transport of less than 10 persons, with spark ign. internal combus. recip. piston engine, cyl. cap. exc 1000cc but not exc 1500cc (excl PMVs and vehicles with gcw exc 3.5t or assembled gvw not exc 3.5t)

8703231108 Used or sec-hand PMVs less than 5 years of age (excl vehs for the transport of ten or more persons), with spark-ign intl comb recip piston eng, cyl cap exc 1500cc but not exc 3000cc

8703231126 Sec-hand passenger mtr veh (excl. 8702, snow, golf or similar veh, ambulances, hearses, police vans, amphib & off-road) 5yrs old or > with spark-ignition internal combustion reciprocating piston eng, cyl capacity exc 1500cc but not exc3000cc

8703231909 New PMVs (excl assd 4WD vehs, vehs for tsport of ten or more persons) with spark-ign intl comb recip pist eng, cyl cap exc 1500cc but not exc 3000cc 8703231921 New, assembled 4wd passenger mtr veh (excl. 8702, snow, golf or similar veh, ambulances, hearses, police vans, amphib & off-road veh) with spark-ignition internal comb reciprocating piston eng, cylinder capacity exc1500cc but not exc3000cc

8703232011 Mot vehs with spark-ign int comb recip piston eng cyl cap exc 1500cc but not exc 3000cc (excl PMVs, mot vehs for the transport of ten or more persons gvw exc 3.5t and assembled gvw not exc 3.5t)

8703239085 Vehicles designed for the transport of less than 10 persons, with spark ign. internal combus. recip. piston engine, cyl. cap. exc 1500cc but not exc 3000cc with gvm exc 3.5t or assembled gvm not exc 3.5t

8703241111 Used or sec-hand PVMs less than 5 years of age (excl vehs for tsport of ten or more persons) with spark-ign intlcomb recip piston eng, cyl cap exc 3000cc 8703241126 Sec-hand passenger mtr vehicles (excl. 8702, snow, golf or similar veh, ambulances, hearses, police vans, amphib & off-road veh) with spark-ignition internal combustion reciprocating piston eng, cyl capacity exc 3000cc, 5 yrs old ormore

8703241912 New passenger motor vehicles (excl vehicles for transport of ten or more persons), with spark-ignition internal combustion reciprocating piston engine, of a cyl capacity exc 3000cc

8703242013 Mot vehs with spark-ign int comb recip piston eng, cyl cap exc 3000cc, gvw exc 3.5t (excl assembled gvw not exc 3.5t and vehicles designed mainly for the transport of less than 10 persons)

8703242083 Assembled off-road mtr vehicles for the transport of persons (excl. 8702, snow, golf or similar veh & passenger veh) with spark-ignition internal combustion reciprocating piston engine of a cylinder capacity exc 3000cc & G.V.W. not exc 3.5t

8703242084 Assembled mtr vehicles for the transport of persons (excl. 8702, snow, golf or similar veh, passenger & off-road veh) with spark-ignition internal combustion reciprocating piston engine of a cylinder capacity exc 3000cc & G.V.W. not exc 3.5t

8703249090 Vehicles designed for the transport of less than 10 persons, with spark ign. internal combus. recip. piston engine, cyl. cap. exc 3000cc (excl PMVs, vehicles with gvw exc 3.5t and assembled gvw not exc 3.5t)

8703311114 Used and sec-hand PMVs, with compression-ign intl comb piston eng (diesel or semi-diesel) cyl cap not exc 1500cc (excl mot vehs for thetransport of ten or more persons)

8703311915 New PMVs, with compression-ignition internal combustion piston engine, diesel or semi-diesel, of a cylinder capacity not exc 1500cc (excl motor vehicles for the transport of ten or more persons)

8703312016 Motor vehicles with compression-ignition internal combustion piston engines (diesel or semi-diesel) cyl cap not exc 1500cc (excl PMVs, vehs for the transport of ten or more persons, gvw exc 3.5t and assembled gvw exc 3.5t)

8703319095 Vehicles designed for the transport of less than 10 persons, with comp. ign. intern combus. recip. pist eng diesel & semi diesel cyl cap exc 1500cc (excl passenger motor vehicles and vehicles with gvw exc 3.5t or assembled not exc 3.5t)

8703321117 Used and sec-hand PMVs, with compression-ign int comb piston eng, cyl cap exc 1500cc but not exc 2500cc (excl mot vehs for the transport of ten or more persons)

8703321919 New PMVs, with compression-ign intl comb piston eng, cyl cap exc 1500cc but not exc 2500cc (excl mot vehs for the transport of ten or more persons)

8703322020 Vehicles with compres-ign internal combustion piston eng (diesel or semi-diesel), cyl capacity exc 1500 cc but not exc 2500 cc, assembled gvw not exc 3.5t (excl passenger motor vehicles and vehicles for the transport of ten or more persons)

8703322021 Vehicle assemb & unassemb, g.v.w. exc 3.5t, with compres-ign internal combustion piston eng (diesel or semi-diesel), cyl capacity exc 1500 cc but not exc 2500 cc (excl passenger motor vehicles and assembled gvw not exc 3.5t)

8703329099 Vehicles designed for the transp. of less than 10 persons with comp ign intl combus recip piston eng diesel & semi diesel, cyl. cap. exc 1500cc but not exc 2500cc, (excl PMVs, vehs with gvw exc 3.5t or asseembled gvw not exc 3.5t)

8703331122 Used and sec-hand PMVs, with comp-ign intl comb piston eng, cyl cap exc 2500cc (excl mot veh for the transport of ten or more persons)

8703331924 New passenger motor vehicles, with compression-ignition internal combustion piston engine, of a cylinder capacity exc 2500cc (excl motor vehicles for the transport of ten or more persons)

8703332002 Assembled mtr veh for the transport of persons (excl. 8702, snow, golf ors imilar veh & passenger motor veh) with compression-ignition internal combustion piston eng (diesel/semi-diesel), cylinder capacity exc 2500cc & gvw not exc3.5t

8703332023 Motor vehicles with comp-ign intl comb piston eng (diesel or semi-diesel), cyl cap exc 2500cc, with gvw exc 3.5t (excl PMVs or vehicles for the transport of ten or more persons)

8703339020 Vehicles designed for the transport of less than 10 pers, with comp. ign. internal combus. recip. piston eng diesel & semi diesel, cyl. cap. exc 2500cc, (excl passenger vehic, vehic with g.v.w. exc 3.5t or assemb g.v.w. not exc 3.5t)

8703901101 Used or second-hand passenger motor vehicles (excl those with compression/spark-ignition internal combustion reciprocating piston eng, vehicles for transport of ten or more persons)

8703901902 New passenger motor vehicles (excl those with compression/spark-ignition internal combustion reciprocating piston eng, vehicles for transport of ten or more persons) 8703902003 Mot vehs des for trans of less than 10 pers (excl PMVs, vehs spark ign inter com reciproc eng, compr ign int comb pist eng (diesel or semi-diesel)) gvw exc 3.5t and assembled gvw not exc 3.5t

8703909010 mot vehs des for trans of less than 10 pers (excl PMVs, vehs spark ign inter com reciproc eng, compr ign int comb pist eng (diesel or semi-diesel)) gvw exc 3.5t or assembled gvw not exc 3.5t

8704100004 Assembled dumpers designed for off-highway use having a capacity exc 80t

8704100017 Assembled dumpers designed for off-highway use having a capacity not exc 30 t

8704100018 Assembled dumpers designed for off-highway use having a capacity exceeding 30 t but not exceeding 80 t

8704100024 Unassembled dumpers designed for off-highway use

8704211007 New motor vehicles for the transport of goods with compression-ignition internal combustion piston engine (diesel or semi-diesel) (excl dumpers designed for off-highway use and assembled gvw not exc 3.5t) g.v.w. exc 3.5t but not exc 5t)

8704211008 Used or secondhand motor vehicles for the transport of goods with compression-ignition internal combustion piston engine (dies or semi-dies) (excl dumpers design for off-highway use and assemb gvw not exc 3.5t) gvw exc 3.5t but not exc 5t

8704211077 Assembled off-road motor vehicles for the transport of goods (excl. dumpers designed for off-highway use) with compression-ignition internal combustion piston engine (diesel or semi-diesel) and gross vehicle weight not exc 3.5t

8704211078 Assembled motor vehicles for the transport of goods (excl. dumpers designed for off-highway use and off-road vehicles) with compression-ignition internal combustion piston engine (diesel or semi-diesel) and a gross vehicle weight not exc 3.5t

8704219079 Unassembled motor vehicles for the transport of goods (excl. dumpers designed for off-highway use) with compression-ignition internal combustion piston engine (diesel or semi-diesel) and a gross vehicle weight not exc 3.5t

8704220007 Assembled vehicles for the transport of goods with g.v.w. of 10.16t or more but not exc 20t, with compression-ignition internal combustion piston engine (diesel or semidiesel), (excl. dumpers designed for off-highway use)

8704220029 Assembled vehicles having a g.v.w. exc 5 t but less than 10.16 t, with compress-ignit intern combustion piston engines (diesel or semi-diesel), used for the transport of goods

8704220030 Unassembled vehicles having a g.v.w. exc 5 t but not exc 20 t, with compress-ignit intern combust piston engines (diesel or semi-diesel), used for the transport of goods 8704230008 Assembled vehicles for the transport of goods, with g.v.w. exc 20t, with compression-ignition internal combustion piston engine (diesel or semi-diesel), (excl. dumpers designed for off-highway use)

8704230033 Unassembled vehicles for the transport of goods, with g.v.w. exc 20t, with compression-ignition internal combustion piston engine (diesel or semi-diesel), (excl. dumpers designed for off-highway use)

8704311009 New motor vehicles for the transport of goods, with g.v.w. exc 3.5t but not exc 5t, with spark ignition internal combustion piston engine (excl. dumpers designed for off-highway use)

Study into domestic and international fate of end-of-life tyres – Final Report Hyder Consulting Pty Ltd – ABN 76 104 485 289 AA003649 8704311010 Used or secondhand motor vehicles for the transport of goods, gvw exc 3.5t but not exc 5t with spark ignition internal combustion piston engine (excl dumpers designed for off-highway use)

8704311080 Assembled off-road motor vehicles for the transport of goods (excl. dumpers designed for off-highway use) with spark-ignition internal combustion reciprocating piston engine and a gross vehicle weight not exc 3.5t

8704311081 Assembled motor vehicles for the transport of goods (excl. dumpers designed for off-highway use and off-road vehicles) with spark-ignition internal combustion reciprocating piston engine and a gross vehicle weight not exc 3.5t

8704319082 Unassembled motor vehicles for the transport of goods (excl. dumpers designed for off-highway use) with spark-ignition internal combustion reciprocating piston engine and a gross vehicle weight not exc 3.5t

8704320011 Motor vehicles for the transport of goods, having a g.v.w. exc 5t, with spark-ignition internal combustion piston engine (excl. dumpers designed for off-highway use) 8704901039 Assembled motor vehicles (excl. dumpers designed for off-highway use, those with compression-ignition internal combustion piston engines and spark-ignition internal combustion piston engines), used for the transport of goods

8704909040 Unassembled motor vehicles (excl. dumpers designed for off-highway use, those with compression-ignition internal combustion piston engines and spark-ignition internal combustion piston engines), used for the transport of goods

8705100010 Assembled crane lorries

8705100050 Unassembled crane lorries

8705200024 Mobile drilling derricks

8705300025 Fire fighting vehicles

8705400026 Concrete-mixer lorries

8705900027 Special purpose motor vehicles other than those designed for the transport of persons or goods (excl. crane lorries, mobile drilling derricks, fire fighting vehicles and concrete-mixer lorries)

8708703001 Road wheels and parts and accessories thereof for tractors (excl. pedestrian-controlled, road tractors for semi-trailers, track-laying, agricultural and tractors for dumpers) 8708703002 Road wheels and parts and accessories thereof for pedestrian-controlled tractors and agricultural tractors

8708709178 Road wheels of a kind used as components in passenger motor vehicles

8708709980 Road wheels (excl. for tractors of 8701.10.00, 8701.90.1, 8701.90.90 and of a kind used as components in passenger motor vehicles)

8709110012 Elect work trucks, self-propelled, not fitted with lifting or handling equip, used in factories, warehouses, dock areas or airports for short distance transport of goods; elect tractors used on railway station platforms

8709190013 Non-elect work trucks, self-propelled, not fitted with lifting or handling equip, used in factories, warehouses, dock areas or airports for short distance transport of goods; non-elect tractors used on railway station platforms

8709900054 Parts for works trucks, self-propelled, not fitted with lifting or handling equipment, used in factories, warehouses, dock areas or airports for short distance transport of goods; tractors used on railway station platforms

8710000016 Tanks and other armoured fighting vehicles, motorised, whether or not fitted with weapons, and parts of such vehicles

8711100055 Motorcycles (incl mopeds) & cycles fitted with an auxiliary motor, with or without side-cars, with reciprocating internal combustion piston engine, cyclinder capacity not exc 50 cc

8711200023 Motorcycles (incl. mopeds) and cycles fitted with an auxiliary motor, with or without side-cars, with recip intern combust piston eng of a cylinder capacity exc 245 cc but not exc 250 cc

8711200056 Motorcycles (incl mopeds) & cycles fitted with an auxiliary motor, with or without side-car, with reciprocating internal combustion piston engine, cyl capacity exc 50cc but not exc 245 cc

8711300024 Motorcycles (incl. mopeds) and cycles fitted with an auxiliary motor, with or without side-cars, with recip internal combustion piston eng of a cylinder capac exc 250 cc but not exc 500 cc

8711400025 Motorcycles (incl. mopeds) and cycles fitted with an auxiliary motor, with or without side-cars, with recip internal combustion piston eng of a cylinder capac exc 500 cc but not exc 800 cc

8711500026 Motorcycles (incl. mopeds) and cycles fitted with an auxiliary motor, with or without side-cars, with recip internal combustion piston eng of a cylinder capac exc 800 cc

8711900027 Motorcycles (incl. mopeds) and cycles fitted with an auxiliary motor, with or without side-cars nes; sidecars 8716100015 Trailers and semi-trailers of the caravan type, for housing or camping 8716200016 Self-loading or self-unloading trailers and semi-trailers for agricultural purposes 8716310040 Tanker trailers and tanker semi-trailers used for the transport of goods 8716390041 Trailers and semi-trailers used for the transport of goods (excl. caravan, agricultural and tanker types 8716400042 Trailers and semi-trailers (excl. those for the transport of goods, of the caravan type and of the agricultural type) 8716800030 Golf buggies not mechanically propelled 8716800036 Vehicles not mechanically propelled (excl. golf buggies) 8801000001 Gliders and hang gliders 8801000002 Balloons and dirigibles and non-powered aircraft (excl. gliders and hang gliders) 8802110003 Helicopters of an unladen weight not exc 2,000 kg 8802120004 Helicopters of an unladen weight exc 2,000 kg 8802200005 Aeroplanes and other aircraft (excl. helicopters) of an unladen weight not exc 2,000 kg 8802300006 Aeroplanes and other aircraft (excl. helicopters) of an unladen weight exc 2,000 kg but not exc 15,000 kg 8802400007 Aeroplanes and other aircraft (excl. helicopters) of an unladen weight exc 15,000 kg 8803200011 Under-carriages and parts thereof of gliders, helicopters and aeroplanes
Export codes

40030000 Reclaimed rubber in primary forms or in plates, sheets or strip

40040000 Waste, parings and scrap of rubber (excl. hard rubber) and powders and granules obtained therefrom

40061000 'Camel-back' strips for retreading rubber tyres, unvulcanised

40069000 Forms nes (eg rods, tubes and profile shapes) and articles (eg discs and rings), of unvulcanised rubber

40111000 New pneumatic rubber tyres for motor cars (incl. station wagons and racing cars)

40112000 New pneumatic rubber tyres for buses or lorries

40113000 New pneumatic rubber tyres for aircraft

40114000 New pneumatic rubber tyres for motorcycles

40115000 New pneumatic rubber tyres for bicycles

40116100 New pneumatic tyres, of rubber, of a kind used on agricultural or forestry vehicles and machines, with a 'herring-bone' or similar tread

40116200 New pneumatic tyres, of rubber, of a kind used on construction or industrial handling vehicles and machines and having a rim size not exceeding 61 cm, with a 'herringbone' or similar tread

40116300 New pneumatic tyres, of rubber, of a kind used on construction or industrial handling vehicles and machines and having a rim size exceeding 61 cm, with a 'herring-bone' or similar tread

40116900 New pneumatic tyres, of rubber, having a 'herring-bone' or similar tread (excl. those used on agricultural, forestry construction or industrial handling vehicles and machines) 40119200 New pneumatic tyres, of rubber, of a kind used on agricultural or forestry vehicles and machines (excl. those with a 'herring-bone' or similar tread)

40119300 New pneumatic tyres, of rubber, of a kind used on construction or industrial handling vehicles and machines and having a rim size not exceeding 61 cm (excl. those with a 'herring-bone' or similar tread)

40119400 New pneumatic tyres, of rubber, of a kind used on construction or industrial handling vehicles and machines and having a rim size exceeding 61 cm (excl. those with a 'herring-bone' or similar tread)

40119901 New pneumatic tyres, of rubber (excl. those used on agricultural, forestry, construction or industrial handling vehicles and machines and those with a 'herring-bone' or similar tread)

40121100 Retreaded tyres of rubber, of a kind used on motor cars (incl. station wagons and racing cars)

40121200 Retreaded tyres, of rubber, of a kind used on buses or lorries

40121300 Retreaded tyres, of rubber, of a kind used on aircraft

40121900 Retreaded tyres, of rubber (excl. those used on motor cars, buses or lorries and aircraft)

40122000 Used pneumatic rubber tyres

40129000 Solid or cushion tyres, interchangeable tyre treads and tyre flaps of rubber

40131000 Rubber inner tubes for motor cars (incl. station wagons and racing cars), buses or lorries

40132000 Rubber inner tubes for bicycles

40139000 Rubber inner tubes (excl. those for motor cars, station wagons, racing cars, buses, lorries and bicycles)

87011000 Pedestrian controlled tractors (excl. tractors of the type used on railway station platforms)

87012000 Road tractors (excl. tractors of the type used on railway station platforms) for semi-trailers

87013000 Track-laying tractors (excl. tractors of the type used on railway station platforms)

87019010 Tractors (excl. tractors of the type used on railway station platforms, pedestrian controlled, road and track-laying tractors) for agricultural use

87019020 Tractors (excl. tractors of the type used on railway station platforms, pedestrian controlled, road and track-laying tractors) for constructional use

87021010 Unassembled motor vehicles for the transport of ten or more persons, includiding the driver, with compression-ignition internal combustion piston engine (diesel or semidiesel)

Study into domestic and international fate of end-of-life tyres – Final Report Hyder Consulting Pty Ltd – ABN 76 104 485 289 AA003649 87021020 Assembled motor vehicles for the transport of ten or more persons, including the driver, with compression-ignition internal combustion piston engine (diesel or semi-diesel) 87029020 Assembled motor vehicles for the transport of ten or more persons, including the driver (excl. compression-ignition internal combustion piston engine (diesel or semidiesel))

87031010 Unassembled vehicles specially designed for travelling on snow and unassembled golf cars and similar vehicles (excl. vehicles of 8702)

87031021 New and assembled vehicles specially designed for travelling on snow, golf cars and similar vehicles (excl. vehicles of 8702)

87031022 Secondhand and assembled vehicles specially designed for travelling on snow, golf cars and similar vehicles (excl. vehicles of 8702)

87032110 Unassembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of a cylinder capacity not exc 1,000 cc

87032121 New assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of a cylinder capacity not exc 1,000 cc

87032122 Secondhand assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of a cylinder capacity not exc 1,000 cc

87032210 Unassembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine of a cylinder capacity exc 1,000 cc but not exc 1,500 cc

87032221 New assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of a cylinder capacity exc 1,000 cc but not exc 1,500 cc

87032222 Secondhand assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of a cylinder capacity exc 1,000 cc but not exc 1,500 cc

87032310 Unassembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of a cylinder capacity exc 1,500 cc but not exc 3,000 cc

87032321 New assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of cylinder capacity exc 1,500 cc but not exc 3,000 cc

87032322 Secondhand assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of a cylinder capacity exc 1,500 cc but not exc 3,000 cc

87032410 Unassembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of a cylinder capacity exc 3,000 cc

87032421 New assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of a cylinder capacity exc 3,000 cc

87032422 Secondhand assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with spark-ignition reciprocating piston engine, of cylinder capacity exc 3,000 cc

87033110 Unassembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with diesel engine, of a cylinder capacity not exc 1,500 cc

87033121 New assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with diesel engine, of a cylinder capacity not exc 1,500 cc 87033122 Secondhand assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with diesel engine, of a cylinder capacity not exc 1,500 cc 1,500 cc

87033210 Unassembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with diesel engine, of a cylinder capacity exc 1,500 cc but not exc 2,500 cc

87033221 New assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with diesel engine, of a cylinder capacity exc 1,500 cc but not exc 2,500 cc

87033222 Secondhand assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with diesel engine, of a cylinder capacity exc 1,500 cc but not exc 2,500 cc

87033310 Unassembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with diesel engine, of a cylinder capacity exc 2,500 cc 87033321 New assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with diesel engine, of a cylinder capacity exc 2,500 cc 87033322 Secondhand assembled motor cars and vehicles mainly designed for the transport of persons (excl. public-transport type) with diesel engine, of a cylinder capacity exc 2,500 cc 2,500 cc

87041010 Unassembled dumpers designed for off-highway use

87041020 Assembled dumpers designed for off-highway use

87042110 Unassembled motor vehicles for the transport of goods (excl. dumpers designed for off-highway use), diesel or semi-diesel engine, gvw not exc 5 tonnes

87042121 Assembled commercial road transport vehicles with diesel or semi-diesel engine, gvw not exc 5 tonnes

87042129 Assembled motor vehicles for the transport of goods (excl. commercial road transport vehicles and dumpers designed for off-highway use), diesel or semi-diesel engine, gvw not exc 5 tonnes

87042210 Unassembled motor vehicles for the transport of goods (excl. dumpers designed for off-highway use), diesel or semi-diesel engine, gvw exc 5 tonnes but not exc 20 tonnes 87042221 Assembled commercial road transport vehicles with diesel or semi-diesel engine, gvw exc 5 tonnes but not exc 20 tonnes

87042229 Assembled motor vehicles for the transport of goods (excl. commercial road transport vehicles and dumpers designed for off-highway use), diesel or semi-diesel engine, gvw exc 5 tonnes but not exc 20 tonnes

87042321 Assembled commercial road transport vehicles with diesel or semi-diesel engine, gvw exc 20 tonnes

87042329 Assembled motor vehicles for the transport of goods (excl. commercial road transport vehicles and dumpers designed for off-highway use), diesel or semi-diesel engine, gvw exc 20 tonnes

87043110 Unassembled motor vehicles for the transport of goods (excl. dumpers designed for off-highway use), with spark-ignition internal combustion piston engine, gvw not exc 5 tonnes

87043121 Assembled commercial road transport vehicles with spark-ignition internal combustion piston engine, gvw not exc 5 tonnes

87043129 Assembled motor vehicles for the transport of goods (excl. commercial road transport vehicles and dumpers designed for off-highway use), with spark-ignition internal combustion piston engine, gvw not exc 5 tonnes

87043200 Motor vehicles for the transport of goods (excl. dumpers designed for off-highway use) with spark-ignition internal combustion piston engine, g.v.w. exc 5 tonnes 87049010 Unassembled motor vehicles for the transport of goods (excl. dumpers designed for off-highway use) other than with diesel or semi-diesel engine or spark-ignition internal combustion piston engine

87049021 Assembled commercial road transport vehicles other than with diesel or semi-diesel engine or spark-ignition internal combustion piston engine

87049029 Assembled motor vehicles for the transport of goods (excl. commercial road transport vehicles and dumpers for off-highway use) other than with diesel or semi-diesel engine or spark-ignition internal combustion piston engine

87051030 Crane lorries whether assembled or unassembled

87052010 Unassembled mobile drilling derricks

87052020 Assembled mobile drilling derricks

87053000 Fire fighting vehicles

87054000 Concrete-mixer lorries

87059010 Unassembled special purpose motor vehicles (excl. those principally designed for the transport of persons or goods and crane lorries, mobile drilling derricks, fire fighting vehicles and concrete-mixer lorries)

87059020 Assembled special purpose motor vehicles (excl. those principally designed for the transport of persons or goods and crane lorries, mobile drilling derricks, fire fighting vehicles and concrete-mixer lorries)

87091100 Electrical self-propelled work trucks, not fitted with lifting or handling equipment, of the type used in factories, airports or the like for short distance transport of goods and tractors used on railway station platforms

87091900 Non-electrical self-propelled work trucks, not fitted with lifting or handling equipment, of the type used in factories, airports or the like for short distance transport of goods and tractors used on railway station platforms

87099000 Parts for self-propelled work trucks, not fitted with lifting or handling equipment, of the type used in factories, airports or the like for short distance transport of goods and for tractors used on railway station platforms

87100000 Motorised tanks and other armoured fighting vehicles and parts thereof

87111000 Motorcycles (incl. mopeds) and cycles fitted with an auxiliary motor, with reciprocating internal combustion piston engine of a cylinder capacity not exc 50 cc

Study into domestic and international fate of end-of-life tyres – Final Report Hyder Consulting Pty Ltd – ABN 76 104 485 289 AA003649 87112000 Motorcycles (incl. mopeds), with reciprocating internal combustion piston engine of a cylinder capacity exc 50 cc but not exc 250 cc 87113000 Motorcycles, with reciprocating internal combustion piston engine of a cylinder capacity exc 250 cc but not exc 500 cc 87114000 Motorcycles, with reciprocating internal combustion piston engine of a cylinder capacity exc 500 cc but not exc 800 cc 87115000 Motorcycles, with reciprocating internal combustion piston engine of a cylinder capacity exc 800 cc 87119000 Side cars for motorcycles 87131000 Invalid carriages, not mechanically propelled 87139000 Invalid carriages, mechanically propelled 87161000 Trailers and semi-trailers of the caravan type, for housing or camping 87162000 Self-loading or self-unloading trailers and semi-trailers for agricultural purposes 87163100 Tanker trailers and tanker semi-trailers nes 87163900 Trailers and semi-trailers for the transport of goods (excl. tanker trailers and tanker semi-trailers) nes 87164000 Trailers and semi-trailers nes 87168000 Vehicles, not mechanically propelled nes 87169000 Parts for trailers, semi-trailers and other vehicles, not mechanically propelled 88010010 Gliders and hang gliders 88010019 Balloons and dirigibles and non-powered aircraft (excl. gliders and hang-gliders) 88021100 Helicopters of an unladen weight not exc 2,000 kg 88021200 Helicopters of an unladen weight exc 2.000 kg 88022011 Aeroplanes of an unladen weight not exc 2,000 kg, exported as cargo (loaded on vessel) 88022012 Aeroplanes of an unladen weight not exc 2,000 kg, non-cargo (under own power) 88022090 Aircraft (excl. helicopters and aeroplanes) of an unladen weight not exc 2,000 kg 88023011 Aeroplanes of an unladen weight exc 2,000 kg but not exc 15,000 kg, exported as cargo (loaded on vessel) 88023012 Aeroplanes of an unladen weight exc 2,000 kg but not exc 15,000 kg, non-cargo (under own power) 88023090 Aircraft (excl. helicopters and aeroplanes) of an unladen weight exc 2,000 kg but not exc 15,000 kg 88024011 Aeroplanes of an unladen weight exc 15,000 kg, exported as cargo (loaded on vessel) 88024012 Aeroplanes of an unladen weight exc 15,000 kg, non-cargo (under own power) 88024090 Aircraft (excl. helicopters and aeroplanes) of an unladen weight exc 15,000 kg 88026000 Spacecraft (incl. satellites) and suborbital and spacecraft launch vehicles