

# ALUMINIUM

- ▶ Aluminium is 100% recyclable.
- ▶ Aluminium recycling processes use only 5% of the energy required for its initial extraction and processing,<sup>1</sup> 10% of the initial capital equipment costs<sup>2</sup> and saves 97% of the greenhouse gas (GHG) emissions.<sup>3</sup>
- ▶ Despite aluminium being the third most abundant element found in the Earth's crust, Europe is highly dependent on its import.



## CONSUMPTION AND DEMAND CONTINUES TO CLIMB

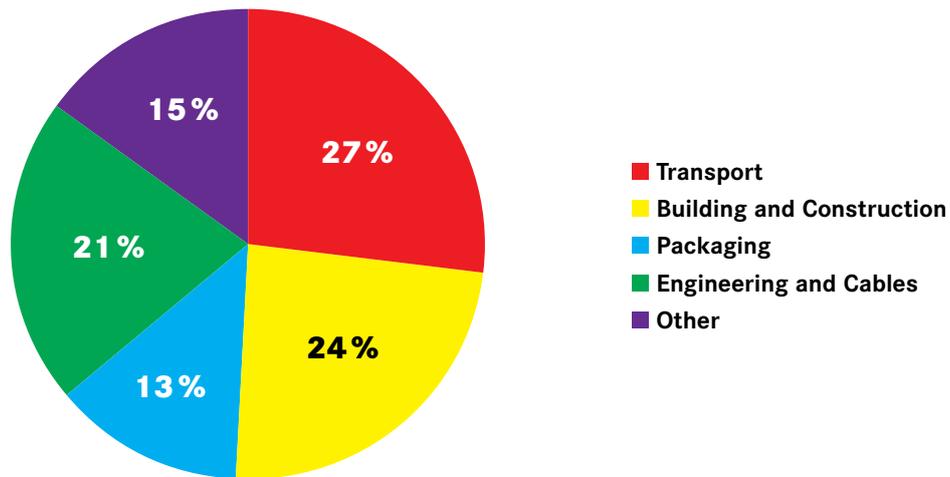
Aluminium is the dominant non-ferrous metal in use today because it is strong and lightweight. Alumina is extracted from bauxite ore and then transported to primary aluminium processing plants where it is manufactured into a range of products from beverage cans through to vehicle parts and construction materials.

Aluminium is an ideal material for architectural applications due to the ease with which it can be shaped and its inherent resistance to corrosion. It is also a key material in the transport sector, because of its strength, combined with its light weight. It is used to manufacture cars, aircraft, ships and trains.<sup>4</sup>

At present consumption levels, there are enough commercially available deposits of bauxite, the raw, oxidised form of aluminium, to last for 300 years.<sup>5</sup> However, despite it being the third most abundant element found in the Earth's crust, after oxygen and silicon,<sup>6</sup> the EU is highly reliant on importing bauxite. In 2008, the biggest producers of bauxite were Australia (30%), Brazil (13%) and China (10%).<sup>7</sup> In the EU, the final production of aluminium from its raw materials<sup>8</sup> is dominated by Germany, followed by France, Spain, the Netherlands and the UK. However, overall European production has declined, largely as a result of the economic crisis.<sup>9</sup>

Nevertheless, the consumption of aluminium continues to climb. From 1980 until 2008, consumption rates in Europe rose from 14kg to 22kg per capita.<sup>10</sup>

Figure 1: Global end-use for finished aluminium products 2007 <sup>11</sup>



## IMPACTS OF ALUMINIUM PRODUCTION

Aluminium manufacturing harms the environment. It is an extremely energy-intensive process and emits significant quantities of carbon dioxide (CO<sub>2</sub>), along with some perfluorocarbon (PFC) gases.<sup>12</sup> As a result, the aluminium industry alone is responsible for around 1% of global greenhouse gas emissions.<sup>13</sup> Critically, because of the much lower energy requirements involved in recycling, each tonne of aluminium recycled avoids nine tonnes of CO<sub>2</sub> equivalent<sup>14</sup> emissions.<sup>15</sup>

Bauxite mining has significant negative environmental and social impacts in Jamaica,<sup>16</sup> Australia,<sup>17</sup> India, Brazil and elsewhere<sup>18</sup> including the contamination of water and fishing supplies, the destruction of land and displacement of local communities.<sup>19</sup>

As highlighted by Friends of the Earth Brazil, bauxite exploitation poses severe and ongoing threats to local communities and their fragile Amazonian environment. For example, Alcoa, a world leader in the extraction of bauxite and the production of aluminium, is currently set to take over 50,000 ha of land owned by Ribeirinho communities that inhabit the shores of Lake Juruti.<sup>20</sup> Brazil has an estimated 8.2 billion tons of bauxite reserves, with most of the bauxite mining taking places in the state of Pará, in the northern Amazonian region.<sup>21</sup> The extraction of bauxite and the aluminium supply chain are controlled by multinational corporations including Vale, Norsk Hydro, BHP Billiton and Rio Tinto.

In Eastern India, there are further significant deposits of bauxite in the states of Orissa and Andhra Pradesh, where hundreds of indigenous communities live. Since the 1980s, bauxite and alumina projects have been fiercely opposed by local communities, who have been blighted by pollution, land and water grabbing, displacement, repression and serious human rights abuses.<sup>22</sup>



## ALUMINIUM RECYCLING RATES ARE GOOD - BUT COULD BE MUCH BETTER

Importantly, aluminium can be recycled continually without losing its characteristic properties. Used aluminium is 100% recyclable, and 75% of all the aluminium ever used, equivalent to 540m tonnes, is still in use today. If recycling rates can be improved this percentage can be increased further.<sup>23</sup>

Critically, the aluminium recycling process uses only 5% of the energy required for its initial extraction and processing<sup>24</sup> and 10% of the initial capital equipment costs.<sup>25</sup> Recycling also saves 97% of the greenhouse gas (GHG) emissions<sup>26</sup> generated in the primary production process.<sup>27</sup>

Aluminium recycling rates are good in many parts of Europe – although there is still both scope and a pressing need to improve that rate because of increasing demand. Extensive recycling infrastructure is now in place, with 273 aluminium recycling plants across Europe in 2008.<sup>28</sup> Recycled aluminium production reached around 4.3 million tonnes in 2010, of which 2.2 million was produced by refiners.<sup>29</sup> Refiners and remelters play integral roles in aluminium recycling, establishing links with collectors, dismantlers, metal merchants and scrap processors who deal with the collection and treatment of scrap.<sup>30</sup>

The recycling of aluminium from buildings is now as high as 92-98% across Europe.<sup>31</sup> This can even take place on a very large scale, as shown in the UK: 96% of the aluminium used in the old Wembley Stadium (over 400 tonnes) was recovered and recycled during the demolition process.<sup>32</sup> Similarly, across Europe 90-95% of the aluminium used in cars is collected and reused, or introduced into the recycling loop.<sup>33</sup>

Recycling rates for aluminium packaging in the EU are still relatively low, despite the fact that aluminium commands the highest price per tonne for any recycled product collected at the roadside.<sup>34</sup> In Europe, the collection rate for all aluminium packaging is around 50%, in line with the EU regulations on packaging waste (which require all Member States to achieve this target for the return and/or collection of metals).<sup>35</sup>

Up to 99% of all aluminium packaging produced is consumer packaging, with the majority of it used in the home.<sup>36</sup> In particular, the aluminium beverage can is the world's most recycled container<sup>37</sup> because it is easy to collect, crush and recycle. In Europe, two-thirds of aluminium beverage cans were recycled in 2010, representing a record number of at least 24 billion cans, and tripling the recycling rate over 20 years.<sup>38</sup>

Belgium, Finland, Germany, Switzerland and Norway collect more than 90% of their aluminium beverage cans. These countries have achieved such high aluminium can recycling rates due to efficient and well-established collection and sorting infrastructures.<sup>39</sup> Relatively low levels of beverage can recycling are prevalent in Eastern European countries including Romania (20%), Slovenia (27%) and Latvia (30%). Considering that the UK is a wealthy industrialised European country, its recycling levels of 50% are also relatively low.<sup>40</sup>

**Figure 2: Aluminium can recycling in the EU27, EFTA and Turkey, 2010<sup>41</sup>**

COUNTRIES	RECYCLING RATE %	COMMENTS ON THE RECYCLING RESULTS
Austria	65	Green dot scheme (metal packaging)
Belgium (+Luxembourg)	91	Green dot scheme (average for all beverage containers)
Bulgaria	50	Eurostat (metal packaging)
Cyprus	70	Eurostat (estimate, metal packaging)
Czech Rep. & Slovakia	52	Eurostat (combined average results all metal packaging)
Denmark	89	Deposit system (all beverage containers)
Estonia	61	Deposit system (cans only)
Finland	95	Deposit system (cans only)
France	57	Green dot scheme and others (rigid aluminium packaging)
Germany	96	Deposit scheme (cans only)
Greece	38	Eurostat (aluminium packaging only)
Hungary	50	Eurostat (metal packaging)
Ireland	45	Green dot scheme (extrapolations for cans)
Italy	72	Green dot scheme (aluminium packaging)
Latvia	30	Green dot scheme + industry report for cans only
Lithuania	40	Green dot scheme + industry report for cans only
Malta	59	Eurostat (metal packaging)
Netherlands	88	Industry reports (metal packaging)
Poland	72	Incentive based collection, combined industry reports
Portugal	45	Green dot scheme (metal packaging)
Romania	20	Incentive based collection, industry reports
Slovenia	27	Eurostat (metal packaging)
Spain	61	Green dot scheme + data industry study
Sweden	87	Deposit system (cans only)
United Kingdom	54	Packaging Recovery Notes (PRN) trading only
Switzerland	91	Levy based system
Norway	93	Deposit system (cans only)
Iceland	85	Deposit system (cans only)
Turkey	75	Incentive based collection, incl. unregistered collection & recycling
<b>Total recycling rate</b>	<b>75</b>	
<b>Russia + other C&amp;E Europe</b>	<b>75</b>	Incentive based collection, incl. unregistered collection & recycling

## INCREASE RESOURCE EFFICIENCY, REDUCE BAUXITE IMPORTS

Despite high levels of aluminium recycling and declining production levels, around 15 million tonnes of bauxite is still imported into the EU every year.<sup>42</sup> Major savings could be made across Europe if resource efficiency measures were deployed to their full potential. As recognised by the European Commission, for example, UK businesses could save around €5.1 billion (£4 billion) per year in the metal manufacturing sector, if resource efficiency measures were properly applied.<sup>43</sup>

Considering that aluminium is almost 100% recycleable, the profile of and support for aluminium recycling should be raised with respect to its reusability in packaging, vehicles, architecture and other applications. Progressive national and EU public procurement policies should also stop the sourcing of bauxite from mines that cause social displacement and environmental harm. There is a clear opportunity to reduce consumption levels through legal targets that guarantee full recovery rates and continued reuse. Indeed, the revision of the Waste Framework Directive recycling targets for all materials in 2014 will offer an important opportunity to achieve full recovery rates.<sup>44</sup>

# REFERENCES

- <sup>1</sup> Alupro, Why collect aluminium? accessed 20 June 2012. <http://www.alupro.org.uk/sectors/local-authorities/why-collect-aluminium/>
- <sup>2</sup> UK Parliament Select Committee on Science and Technology, Aluminium: A Truly Sustainable Material, January 2008. <http://www.publications.parliament.uk/pa/ld200708/ldselect/ldsctech/163/8012207.htm>
- <sup>3</sup> OECD Environment Directorate, Materials case Study 2: Aluminium, 2010. <http://www.oecd.org/dataoecd/52/42/46194971.pdf>
- <sup>4</sup> OECD Environment Directorate, Materials case Study 2: Aluminium, 2010. <http://www.oecd.org/dataoecd/52/42/46194971.pdf>
- <sup>5</sup> International Aluminium Institute, Fourth Sustainable Bauxite Mining Report I 2008, 2009. <http://www.world-aluminium.org/media/filer/2012/06/12/f10000292.pdf>
- <sup>6</sup> International Aluminium Institute, Bauxite Mining, accessed 10 July 2012. <http://www.world-aluminium.org/About+Aluminium/Production/Bauxite+mining>
- <sup>7</sup> ECORYS, Competitiveness of the EU Non-ferrous Metals Industries: FWC Sector Competitiveness Studies, April 2011. [http://ec.europa.eu/enterprise/sectors/metals-minerals/files/fn97624\\_nfm\\_final\\_report\\_5\\_april\\_en.pdf](http://ec.europa.eu/enterprise/sectors/metals-minerals/files/fn97624_nfm_final_report_5_april_en.pdf) (p.60) Two-thirds of global bauxite reserves are held in Brazil, Australia and Guinea.
- <sup>8</sup> Bauxite is converted into alumina, which is then converted into aluminium.
- <sup>9</sup> ECORYS, Competitiveness of the EU Non-ferrous Metals Industries: FWC Sector Competitiveness Studies, April 2011. [http://ec.europa.eu/enterprise/sectors/metals-minerals/files/fn97624\\_nfm\\_final\\_report\\_5\\_april\\_en.pdf](http://ec.europa.eu/enterprise/sectors/metals-minerals/files/fn97624_nfm_final_report_5_april_en.pdf)
- <sup>10</sup> European Commission, Annex V to the Report of the Ad-hoc Working Group on defining critical raw materials, 2010. [http://ec.europa.eu/enterprise/policies/raw-materials/files/docs/annex-v\\_en.pdf](http://ec.europa.eu/enterprise/policies/raw-materials/files/docs/annex-v_en.pdf)
- <sup>11</sup> Organisation of European Aluminium Refiners and Remelters, International Aluminium Institute, Global Aluminium Recycling: A Cornerstone of Sustainable Development, 2009. <http://www.world-aluminium.org/cache/f10000181.pdf>
- <sup>12</sup> OECD Environment Directorate, Materials case Study 2: Aluminium, 2010. <http://www.oecd.org/dataoecd/52/42/46194971.pdf>
- <sup>13</sup> Organisation of European Aluminium Refiners and Remelters, International Aluminium Institute, Global Aluminium Recycling: A Cornerstone of Sustainable Development, 2009. <http://www.world-aluminium.org/cache/f10000181.pdf>
- <sup>14</sup> Carbon dioxide equivalency is a quantity that describes, for a given mixture and amount of greenhouse gas, the amount of CO<sub>2</sub> that would have the same global warming potential (GWP), when measured over a specified timescale, generally, 100 years.
- <sup>15</sup> DEFRA, Making the most of packaging – a strategy for a low-carbon economy, June 2009. <http://www.defra.gov.uk/publications/files/pb13189-full-packaging-strategy-090624.pdf>
- <sup>16</sup> Al Jazeera, Environmental Damage from Bauxite Mining in Jamaica, 6 July 2009. <http://www.greatmining.com/videos/2009/07/environmental-damage-from-bauxite.html>
- <sup>17</sup> The Wilderness Society, Bauxite mining threatens Wild Rivers, 7 February 2011. <http://www.wilderness.org.au/regions/queensland/bauxite-mining-threatens-wild-rivers>
- <sup>18</sup> Samarendra Das & Felix Padel, Battles over Bauxite in East India: The Khondalite Mountains of Khondistan, 23 August 2010. <http://www.savingiceland.org/2010/08/battles-over-bauxite-in-east-india-the-khondalite-mountains-of-khondistan/>
- <sup>19</sup> NAT/Friends of the Earth Brazil, Aluminium Value Chain, 2011.
- <sup>20</sup> NAT/Friends of the Earth Brazil, Aluminium Industry – the forest turns to dust. <http://www.youtube.com/watch?v=zzHK5ZdcRcs>
- <sup>21</sup> Hydro, New Global Bauxite and Alumina Business, 29 April 2011. [http://www.hydro.com/upload/Documents/Presentations/Quarterly/2011/Bauxite\\_Alumina\\_presentation\\_Q1-2011.pdf](http://www.hydro.com/upload/Documents/Presentations/Quarterly/2011/Bauxite_Alumina_presentation_Q1-2011.pdf)
- <sup>22</sup> Samarendra Das & Felix Padel, Battles over Bauxite in East India: The Khondalite Mountains of Khondistan, 23 August 2010. <http://www.savingiceland.org/2010/08/battles-over-bauxite-in-east-india-the-khondalite-mountains-of-khondistan/>
- <sup>23</sup> UK Parliament Select Committee on Science and Technology, Aluminium: A Truly Sustainable Material, January 2008. <http://www.publications.parliament.uk/pa/ld200708/ldselect/ldsctech/163/8012207.htm>  
WRAP Good Practice Guide – Are you collecting foil and aerosols with your mixed cans? 2009. <http://www.wrap.org.uk/sites/files/wrap/Are%20you%20collecting%20foil%20and%20aerosols%20with%20your%20mixed%20cans.pdf>
- <sup>24</sup> Alupro, Why collect aluminium? accessed 20 June 2012 <http://www.alupro.org.uk/sectors/local-authorities/why-collect-aluminium/>
- <sup>25</sup> UK Parliament Select Committee on Science and Technology, Aluminium: A Truly Sustainable Material, January 2008. <http://www.publications.parliament.uk/pa/ld200708/ldselect/ldsctech/163/8012207.htm>
- <sup>26</sup> OECD Environment Directorate, Materials case Study 2: Aluminium, 2010. <http://www.oecd.org/dataoecd/52/42/46194971.pdf>

# REFERENCES

- <sup>27</sup> WRAP Good Practice Guide – Are you collecting foil and aerosols with your mixed cans? 2009. <http://www.wrap.org.uk/sites/files/wrap/Are%20you%20collecting%20foil%20and%20aerosols%20with%20your%20mixed%20cans.pdf>
- <sup>28</sup> Organisation of European Aluminium Refiners and Remelters, International Aluminium Institute, Global Aluminium Recycling: A Cornerstone of Sustainable Development, 2009. <http://www.world-aluminium.org/cache/fl0000181.pdf> International Energy Agency & International Aluminium Institute, Global Aluminium Recycling, the Global Energy Cycle and the Role of Society regarding Collection, 24 May 2007. <http://www.iea.org/work/2007/aluminium/gerber.pdf>
- <sup>29</sup> European Aluminium Association, Facts and Figures. <http://www.alueurope.eu/production-recycled-aluminium-production-source-oea/>
- <sup>30</sup> Organisation of European Aluminium Refiners and Remelters, International Aluminium Institute, Global Aluminium Recycling: A Cornerstone of Sustainable Development, 2009. <http://www.world-aluminium.org/cache/fl0000181.pdf>
- <sup>31</sup> International Energy Agency & International Aluminium Institute, Global Aluminium Recycling, the Global Energy Cycle and the Role of Society regarding Collection, 24 May 2007. <http://www.iea.org/work/2007/aluminium/gerber.pdf> Kawneer, Why Aluminium? accessed 28 June 2012. [http://www.kawneer.com/kawneer/united\\_kingdom/en/info\\_page/why\\_aluminium.asp](http://www.kawneer.com/kawneer/united_kingdom/en/info_page/why_aluminium.asp)
- <sup>32</sup> UK Parliament Select Committee on Science and Technology, Aluminium: A Truly Sustainable Material, January 2008. <http://www.publications.parliament.uk/pa/ld200708/ldselect/ldsctech/163/8012207.htm> WRAP Good Practice Guide – Are you collecting foil and aerosols with your mixed cans? 2009. <http://www.wrap.org.uk/sites/files/wrap/Are%20you%20collecting%20foil%20and%20aerosols%20with%20your%20mixed%20cans.pdf>
- <sup>33</sup> Organisation of European Aluminium Refiners and Remelters, European Aluminium Association, Aluminium Recycling in Europe – The Road to High Quality Products, undated. <http://www.world-aluminium.org/cache/fl0000217.pdf>
- <sup>34</sup> Alupro, Why collect aluminium? accessed 20 June 2012. <http://www.alupro.org.uk/sectors/local-authorities/why-collect-aluminium/>
- <sup>35</sup> Organisation of European Aluminium Refiners and Remelters, International Aluminium Institute, Global Aluminium Recycling: A Cornerstone of Sustainable Development, 2009. <http://www.world-aluminium.org/cache/fl0000181.pdf> Europa, Packaging and packaging waste, accessed 17 July 2012. [http://europa.eu/legislation\\_summaries/environment/waste\\_management/l21207\\_en.htm](http://europa.eu/legislation_summaries/environment/waste_management/l21207_en.htm)
- <sup>36</sup> Alupro, Low Weight, but High Value – Aluminium packaging is worth recycling, accessed 20 June 2012. <http://www.alupro.org.uk/sectors/local-authorities/>
- <sup>37</sup> Organisation of European Aluminium Refiners and Remelters, International Aluminium Institute, Global Aluminium Recycling: A Cornerstone of Sustainable Development, 2009. <http://www.world-aluminium.org/cache/fl0000181.pdf>
- <sup>38</sup> Recycling International, Europe recycles two out of three aluminium beverage cans, 19 July 2012. <http://www.recyclinginternational.com/recycling-news/6416/non-ferrous-metals/europe/europe-recycles-two-out-three-aluminium-beverage-cans>
- <sup>39</sup> Recycling International, Europe recycles two out of three aluminium beverage cans, 19 July 2012. <http://www.recyclinginternational.com/recycling-news/6416/non-ferrous-metals/europe/europe-recycles-two-out-three-aluminium-beverage-cans>
- <sup>40</sup> *ibid*
- <sup>41</sup> European Aluminium Association, Two out of Three Aluminium Beverage Cans Recycled in Europe! 16 July 2012. [http://www.alueurope.eu/wp-content/uploads/2011/08/Press-Release-Alu-bevcans-recycling-2010final\\_16July2012.pdf](http://www.alueurope.eu/wp-content/uploads/2011/08/Press-Release-Alu-bevcans-recycling-2010final_16July2012.pdf)
- <sup>42</sup> European Commission, Annex V to the Report of the Ad-hoc Working Group on defining critical raw materials, 2010. [http://ec.europa.eu/enterprise/policies/raw-materials/files/docs/annex-v\\_en.pdf](http://ec.europa.eu/enterprise/policies/raw-materials/files/docs/annex-v_en.pdf)
- <sup>43</sup> European Commission, Analysis associated with the Roadmap to a Resource Efficient Europe: Part I, 20 September 2011. [http://ec.europa.eu/environment/resource\\_efficiency/pdf/working\\_paper\\_part1.pdf](http://ec.europa.eu/environment/resource_efficiency/pdf/working_paper_part1.pdf)
- <sup>44</sup> The existing EU Waste Framework Directive recycling targets are set out in paragraph 2: <http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2008:312:0003:0030:EN:PDF>

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