



The *Aluminium for Future Generations* initiative is a programme of continuous improvement on the part of the global aluminium industry, overseen by the *International Aluminium Institute (IAI)*, with members representing about 80% of global primary aluminium production.

The initiative comprises voluntary objectives for improvements in the social, economic and environmental performance across all the key phases of aluminium's life cycle. There are currently fourteen voluntary objectives, agreed by the IAI's Board of Directors – chief executives of the Institute's twenty three member companies – and the number is increasing year by year. The industry's performance is measured annually against quantitative metrics or sustainable development indicators.

This update reports on the industry's 2008 performance.

For further information on IAI members and activities visit [www.world-aluminium.org](http://www.world-aluminium.org).

Year 2008 performance data was collected from IAI members and non-member companies representing:

- Aluminium smelters producing 26 million tonnes of primary aluminium, equivalent to almost 65% of total global production;
- Alumina refineries producing 51 million tonnes of smelter grade alumina, equivalent to more than 65% of total global production;
- Bauxite mines producing over 120 million tonnes of bauxite, equivalent to almost 70% of total global production.

### Overarching Objective

The industry aims to increase global participation in the IAI annual surveys.

## 2008 Sustainability Performance

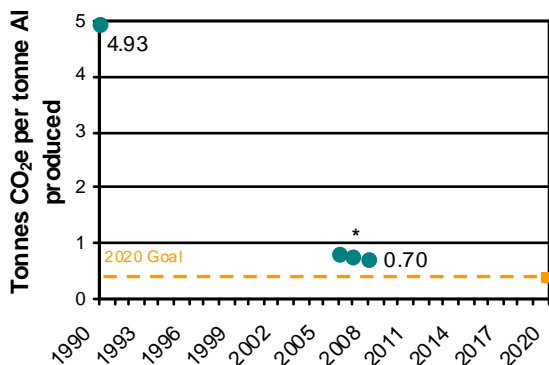
### Voluntary Objective 1

Following the successful achievement of the global goal for an 80% reduction in PFC emissions per tonne of primary aluminium produced by 2006 (from the 1990 baseline), the aluminium industry will further reduce global emissions of PFCs per tonne of aluminium by at least 50% by 2020 as compared to 2006.

- The primary aluminium industry seeks to achieve the long term elimination of perfluorocarbon (PFC) emissions.
- Coverage of the annual Survey of PFC emissions from IAI member and non-member aluminium producers has doubled from a global aluminium production of 12 Mt in 1990 to 24 Mt (61% of the industry's production) in 2008. Through the efforts of its member companies, the IAI is striving to increase the global aluminium production coverage of its annual Surveys to over 80%.
- Based on IAI annual Survey results, by 2020 IAI member companies commit to operate with PFC emissions per tonne of production no higher than the 2006 global median level for their technology type.
- Progress will be monitored and reported annually and reviewed periodically by a recognised and independent third party. There will be interim reviews to ensure progress towards achievement of the 2020 objective

A further improvement in the aluminium industry's perfluorocarbon (PFC) emissions performance was reported in 2008. These results continue the global aluminium industry's trend of significant reductions in PFC emissions (CF<sub>4</sub> and C<sub>2</sub>F<sub>6</sub>), on a total as well as per tonne of production basis.

The 2008 results indicate that the global aluminium industry has reduced its PFC emission per tonne of production by 86% from 4.93 in 1990 to 0.70 t CO<sub>2</sub>e/t Al in 2008 – and is on course for a further 50% reduction from the 2006 level by 2020.



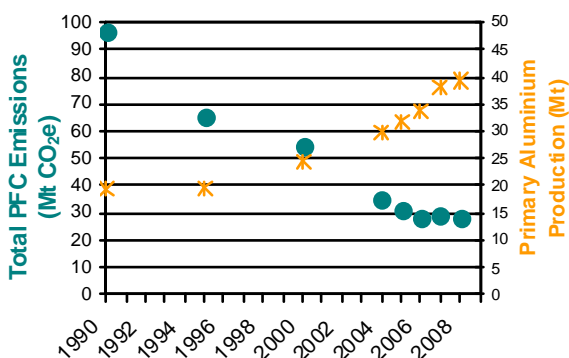
\* Revised 2006 and 2007 data

### Perfluorocarbons and Anode Effects

Perfluorocarbons (PFCs) are a group of potent greenhouse gases with long atmospheric lifetimes, of which the greatest volume is emitted from industrial processes, including during intermittent events in the primary aluminium smelting process, known as “anode effects”.

An anode effect is a process upset condition where an insufficient amount of alumina (Al<sub>2</sub>O<sub>3</sub>) is available to be chemically dissolved in the electrolyte bath, contained in the reduction cells (or “pots”). Under these conditions the electrolytic bath itself begins to undergo electrolysis resulting in the emission of gases containing the PFCs tetrafluoroethane (CF<sub>4</sub>) and hexafluoroethane (C<sub>2</sub>F<sub>6</sub>).

Total PFC emissions to the atmosphere in 2008 from primary aluminium production have been estimated at less than 30 Mt of CO<sub>2</sub>e, a reduction of over 70% from 1990 levels, despite a doubling in aluminium production over the same period.

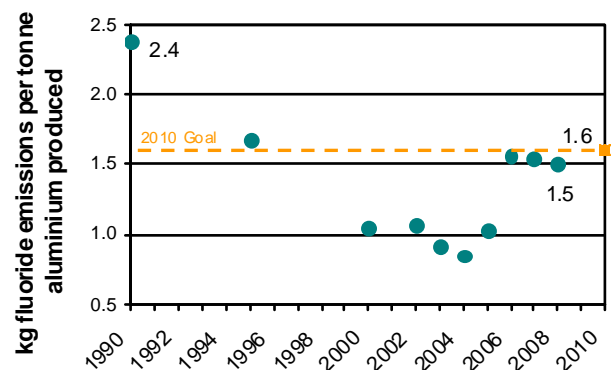


A considerable range in performance continues to be reported in the benchmark data for facilities operating with similar reduction technologies. This indicates that the opportunity remains to make further progress in reducing anode effect frequency and duration and the resulting PFC emissions from a greater achievement of industry best practice.

Further details of the industry's PFC emission reduction performance can be found in the 2008 Anode Effect Survey Report, available at [www.world-aluminium.org/cache/fl0000300.pdf](http://www.world-aluminium.org/cache/fl0000300.pdf)

### Voluntary Objective 2

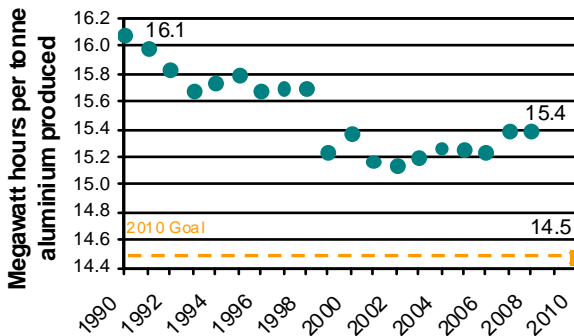
A minimum 33% reduction in fluoride emissions by IAI member companies per tonne of aluminium produced by 2010 versus 1990.



Total fluoride emissions (gaseous and particulate) were reduced by approximately 36% per tonne of aluminium produced between 1990 and 2008, exceeding the 2010 voluntary objective. Since 2006 all Russian facilities are included in the dataset.

### Voluntary Objective 3

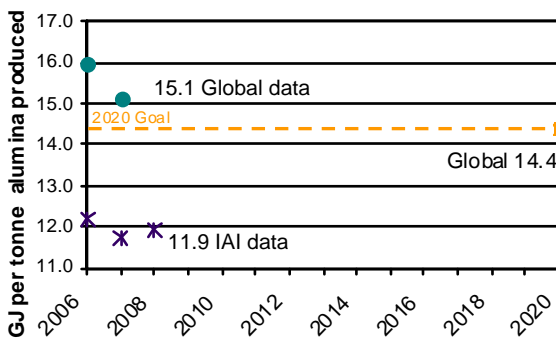
A 10% reduction in smelter electrical energy usage by IAI member and reporting companies per tonne of aluminium produced by 2010 versus 1990.



The average electrical energy required by the smelting process to produce one tonne of aluminium from alumina was cut by 4% between 1990 and 2008, mainly through investment in new production capacity. This year's data include for the first time two Chinese smelters. The 2008 survey results show a stabilisation in average electrical energy consumption compared with 2007.

### Voluntary Objective 4

A 10% reduction in energy use per tonne of alumina produced for the industry as a whole by 2020 versus 2006 levels.



IAI surveyed plants reported 11.9 GJ energy consumption per tonne of alumina produced in 2008, compared to 11.7GJ in 2007 and 12.2 GJ in 2006.

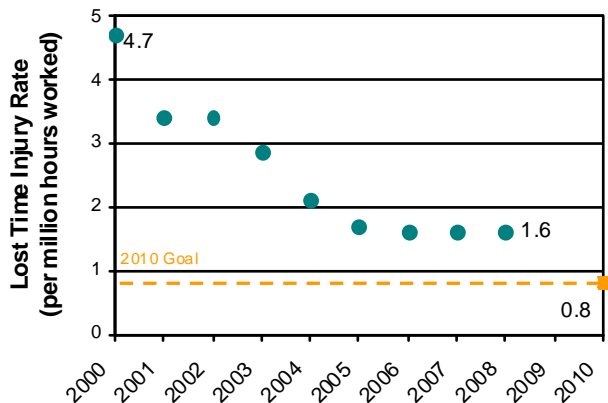
On the global average (90% of global production), 15.1 GJ energy were used in Low Temperature,

High Temperature and Bayer Sinter processes to produce one tonne of alumina in 2007. This equals a reduction of 5% compared to 2006. Data are based on 39 IAI reporting companies supplemented with CRU data for 16 companies, and it is planned to report 2008 global data by the end of 2009.

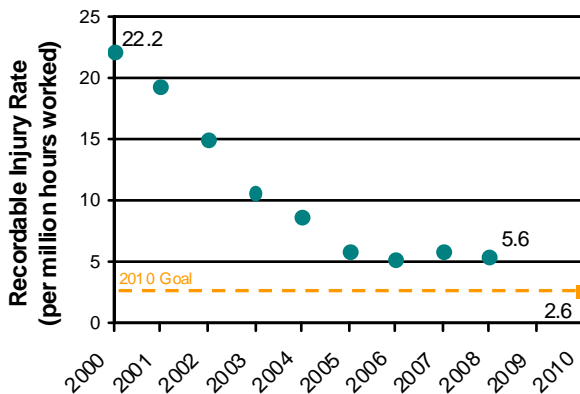
### Voluntary Objective 5

Following a 66% reduction in the lost time injury frequency rate and a 77% reduction in total recordable injury frequency rate between 2000 and 2006, IAI member and reporting companies will further reduce both of these rates by 50% by 2010 as compared to 2006.

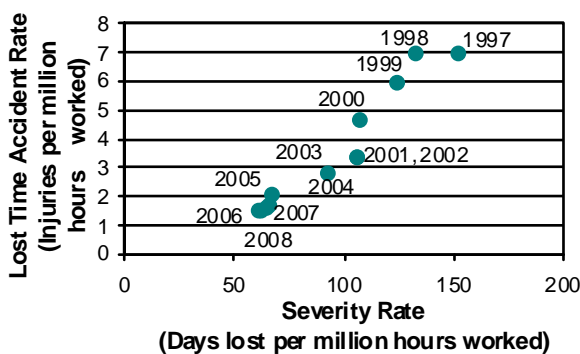
Safety performance data is collected in a survey with a wider reporting base than IAI membership. The survey was initiated in 1997, with a coverage of 107 million working hours. In 2008 the number of working hours surveyed had risen to 398 million. The survey now covers 95 aluminium smelters, 32 alumina refineries and 21 bauxite mines.



The total recordable injury frequency rate has decreased by 7% between 2007 and 2008. The lost time injury frequency rate has remained constant for the past three years. A focus on improving injury rates has also seen the number of days lost per injury (the severity rate) decrease by 58% between 1997 and 2006.



Improvement in the industry's injury rates is being driven by factors including increased top management attention and commitment to safety, a more systematic approach to the analysis and follow up of accidents and higher levels of involvement of the workforce, as well as mechanization and automation as a means of reducing hazards and safety risks.



### Voluntary Objective 6

Implementation of Management Systems for Environment (including ISO 14000 or equivalent certification) and/or Health and Safety in 95% of IAI member companies' plants by 2010.

In 2008 the industry achieved this objective, with 99% of surveyed plants having EHS management systems in place. Of the surveyed facilities 97% had achieved ISO 14000 certification, while 51% were OHSAS 18000 certified.

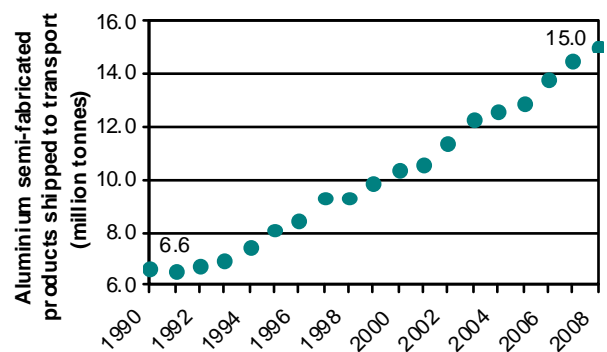
### Voluntary Objective 7

Implementation of an Employee Exposure Assessment and Medical Surveillance Programme in 95% of IAI member companies' plants by 2010.

In 2008, 100% of the surveyed plants had employee exposure assessment and medical surveillance programmes in place, as defined in IAI published guidelines.

### Voluntary Objective 8

The industry will monitor annually aluminium semis shipments for use in transport in order to track aluminium's contribution through light-weighting to reducing greenhouse gas (GHG) emissions from road, rail, air and sea transport.



Preliminary results show that aluminium semi-fabricated products shipped to the transport sector increased by approximately 22% in the five years from 2003. Global greenhouse gas savings from the use of aluminium for light-weighting vehicles have the potential to double between 2005 and 2020 to 500 million tonnes of CO<sub>2</sub> per year.

### Voluntary Objective 9

The IAI has developed a mass flow model to identify future recycling flows. The industry will report regularly on its global recycling performance.

The aluminium industry is a pioneer in tracking the global flows of its products through the full value chain from mining, through use, to recycling and reuse. To do so it has developed a comprehensive mass flow model based on "Material Flow Analysis" methodology. The industry illustrates the

model's output in a flow chart, which is made available to the public on an annual basis. The IAI has published annual mass flow charts since 2003.

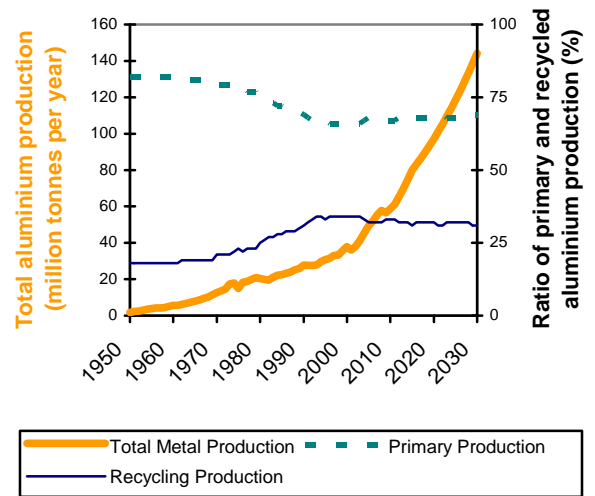
The industry is continuously improving the model, with more accurate statistics and with the help of research centres and universities. Due to uncertainties in the data on product life times and recycling rates for some products in certain regions, the IAI is conducting additional research on the 3.5 million tonnes of scrap which has been identified as possibly available for recycling or stored in use.

Preliminary results illustrate that around 46 million tonnes of aluminium, from primary and recycled sources, ended up in finished products in 2008.

In the same year, approximately one-third of the metal in products available on the market is sourced from recycled (18 million tonnes) and two-thirds from primary metal (39 million tonnes). Projected growth rates in the demand for aluminium products, combined with the long lifetimes of most products, suggest that this ratio of recycled to primary sourced metal is unlikely to change in the short to medium term.

Around 8.7 million tonnes of scrap from used products (old scrap) were recovered globally in 2008.

Three quarters of all the aluminium ever produced (since the 1880s) is still in productive use. In 2008 this stock had grown to more than 640 million tonnes. Of the aluminium currently stored in productive use, equally one third is in buildings (windows, roofing, cladding etc), transport (automotive, public transport etc.) and engineering & cable (overland cable, machinery) applications.



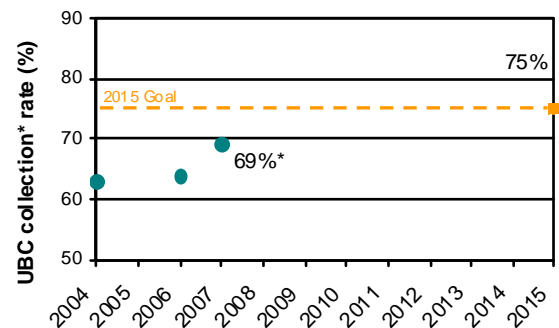
The global stock of aluminium in productive use is growing every year, in 2008 by 28 million tonnes.

The preliminary results of the mass flow model in 2008 are shown in the diagram on page seven.

### Voluntary Objective 10

The global aluminium industry will work to encourage a global aluminium UBC (used beverage cans) recycling target of 75% by 2015.

The collection rate of UBC depends greatly upon individual national incentives including deposit systems, voluntary prepaid recycling charges or advertising, and the efficiency of the collection schemes. Globally the collection rate of UBC is approximately 69% in 2007.



\* Includes 2008 data for the USA and unregistered collection for some regions

## Voluntary Objectives 11 & 12

The IAI member companies will seek to reduce their fresh water consumption per tonne of (10) aluminium and (11) alumina produced.

IAI member companies will concentrate efforts to minimise fresh water consumption where there are limited available fresh water resources.

Fresh water is a significant issue to the industry and the Institute continues to collect data on fresh water consumption. There are some smelters that operate with very low water usage and "0" water discharge. Progress is being made in reducing water use in many refineries. Due to differences between regions and facilities in the definitions of fresh water consumption and in the level of fresh water stress, further analysis and development of indicators is required before full quantification of the industry's environmental impact can be assessed.

## Voluntary Objective 13

The IAI member companies will seek to increase the proportion of bauxite mining land rehabilitated annually.

Globally, bauxite mining disturbed around 30 km<sup>2</sup> in 2006, an area equivalent in size to one half of Manhattan Island, NY. In the same year, an equivalent area of mined land was rehabilitated. Bauxite mining has therefore reached a steady state in which newly mined areas are offset by rehabilitation of existing mining areas.

## Voluntary Objective 14

The Aluminium Industry recognises that spent pot-lining has properties that makes it a valuable material for use in other processes and will therefore strive to convert all spent pot-lining into feedstocks for other industries, which include cement, steel, mineral wool and construction aggregate companies or to re-use and or process all SPL in its own facilities.

Pending final deposition, the industry will endeavour to store all spent pot-lining in secure, waterproof, ventilated buildings/containers that will maintain the spent pot-lining in a dry state with no potential for the build up of noxious gases.

Spent pot lining (SPL) is an unavoidable by-product of the aluminium smelting process. On average, 15-35 kg of SPL is produced per tonne of aluminium, with a global weighted mean of 22 kg in 2008. Compared to 2007, reporting plants have slightly decreased from 73 to 71 plants. Reported production increased from 16 to 17 million tonnes. In 2008, 34% of SPL output was recycled externally out of a total reported output of 377 thousand tonnes of SPL. Close to 50% of the SPL output was deposited in form of treated deposition or stored pending final deposition or recycling.

The industry has systematically worked to minimize the amount of SPL produced, by extending the lifetime of the lining in the smelter pots. Since the 1970s, SPL has been recognised as a valuable resource for other industries, including as a feedstock in the cement, mineral wool and steel production processes. However, the main barrier to supply of SPL as a feedstock has been economics. Individual smelters do not produce enough SPL to provide a continuous supply of feedstock for a cement plant to justify their conversion to receiving this material. Through collaboration with potential customers, and between companies to increase regional supply, the recycling of this material has become more viable and widespread.

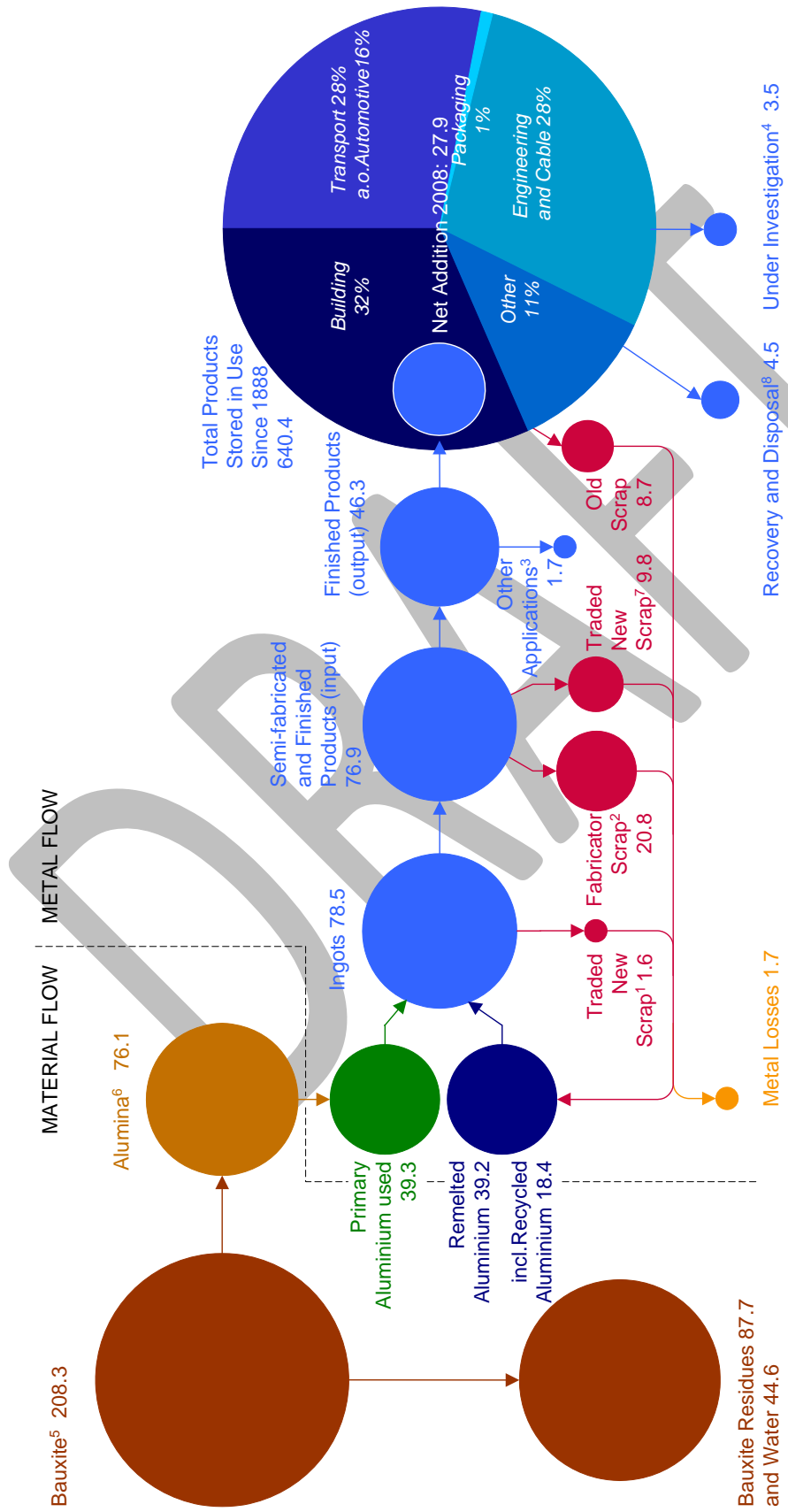
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Values in millions of metric tonnes. Values might not add up due to rounding. Production stocks not shown

1 Aluminium in skimmings; 2 Scrap generated by foundries, rolling mills and extruders. Most is internal scrap and not taken into account in statistics; 3 Such as deoxidation aluminium (metal property is lost) 4 Area of current research to identify final aluminium destination (reuse, recycling, recovery or disposal); 5 Calculated based on IAI LCI report - update 2005. Includes, depending on the ore, between 30% and 50% alumina; 6 Calculated. Includes on a global average 52% aluminium; 7 Scrap generated during the production of finished products from semis; 8 Either incinerated with/without energy recovery, material recovery or disposal.