

# Ciências ULisboa

Faculdade  
de Ciências  
da Universidade  
de Lisboa

**Eng Energy & Environment**



# **Environmental Impact & LCA**

## CHALENDGE #2

---

27 de Setembro (terça-feira) 14h40 e as 15h40



Pedro Pinto  
Departamento Técnico



## CHALENDGE #2

---

11 de Outubro (terça-feira) 14h40 as 15h40



Paulo Silva  
Departamento Logística



8 de Novembro (terça-feira) 14h40 as 15h40



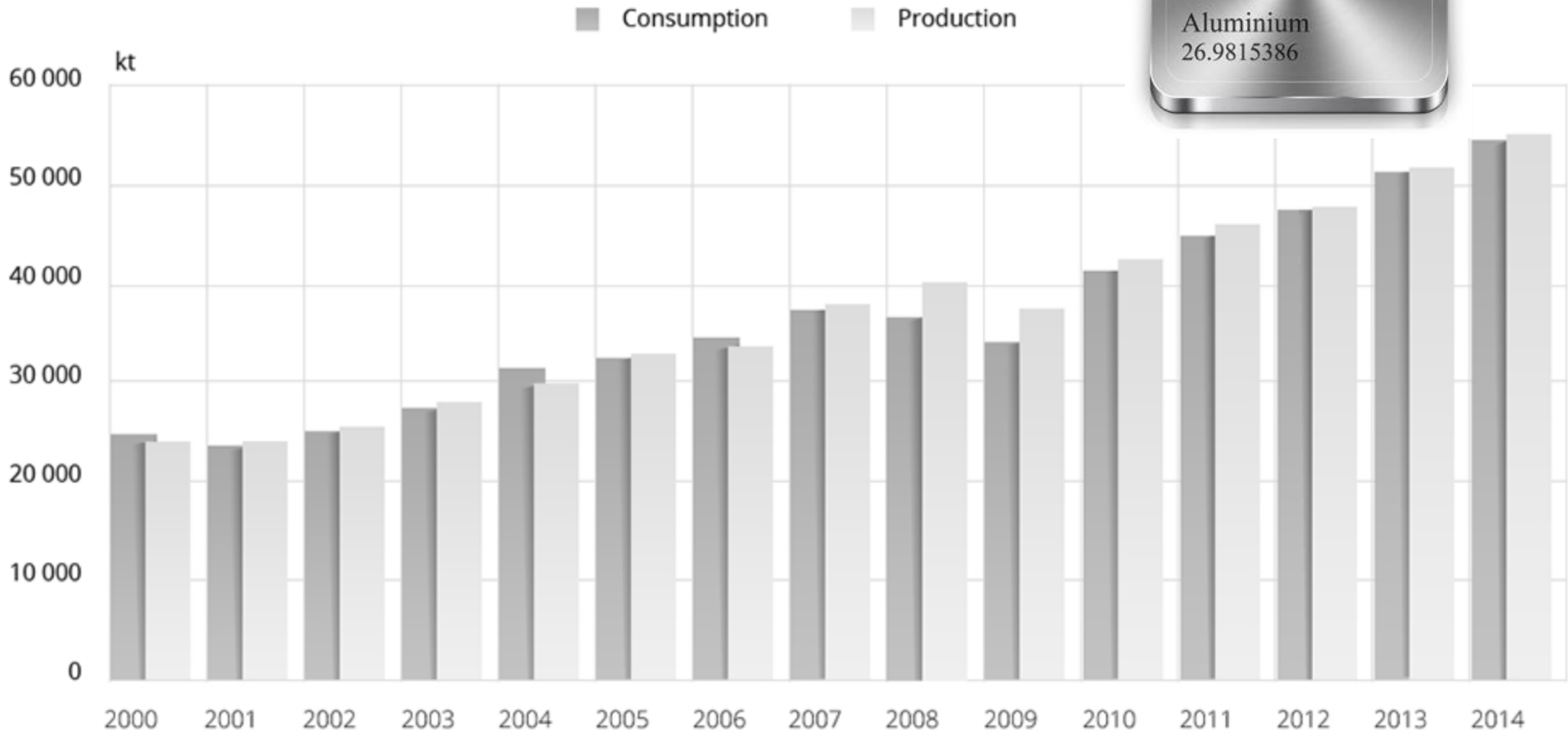
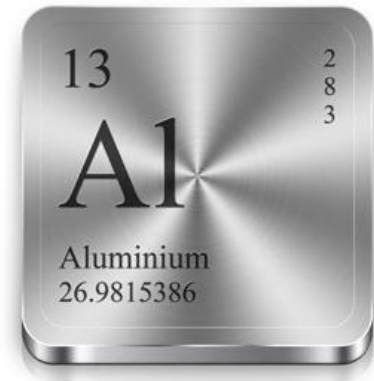
# Sogilub

Sociedade de Gestão Integrada  
de Óleos Lubrificantes Usados, Lda.

**12** RESPONSIBLE  
CONSUMPTION  
AND PRODUCTION



# Vehicle production

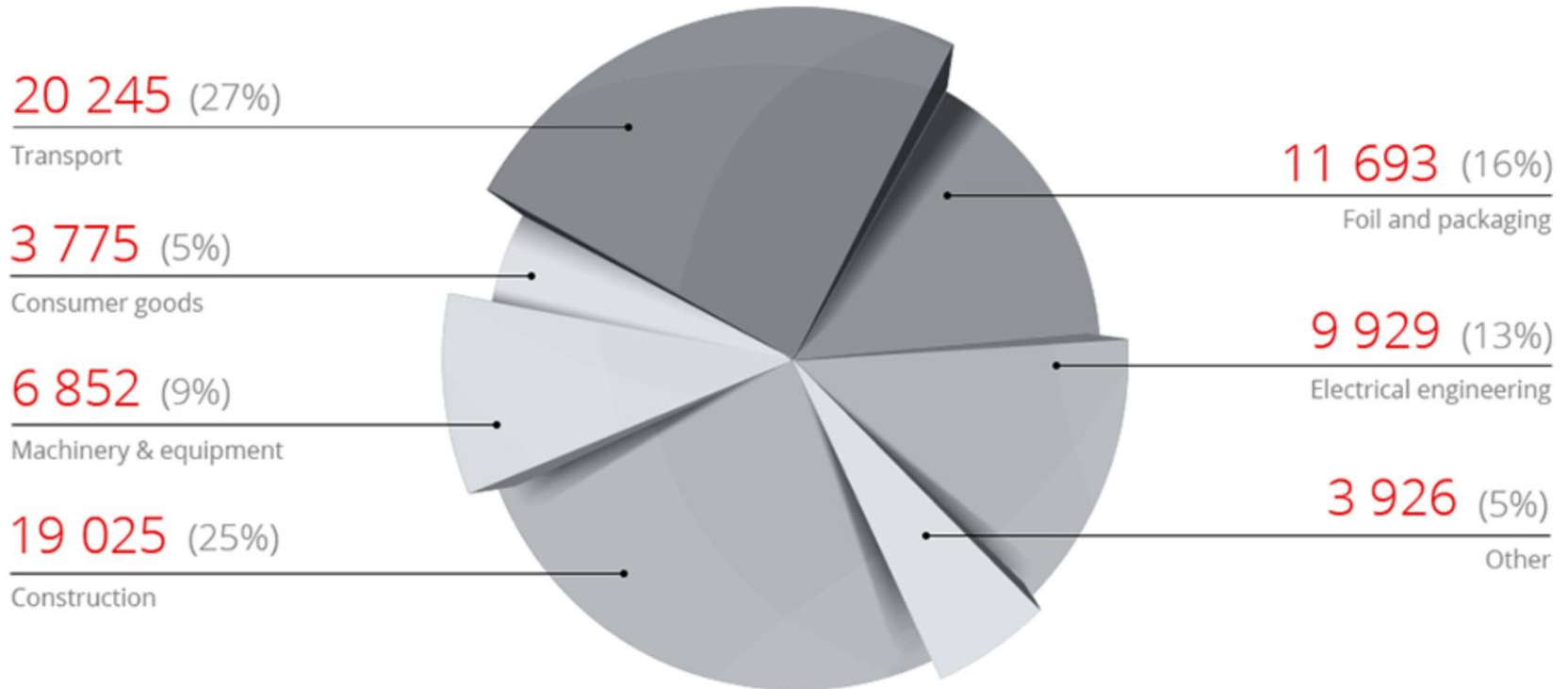


Source: CRU

[https://www.aluminiumleader.com/economics/how\\_aluminium\\_market\\_works/](https://www.aluminiumleader.com/economics/how_aluminium_market_works/)

# Vehicle production

Aluminium consumption by industry, thousand tonnes



Source: CRU

[https://www.aluminiumleader.com/economics/how\\_aluminium\\_market\\_works/](https://www.aluminiumleader.com/economics/how_aluminium_market_works/)





## Life Cycle Assessment of Aluminium Components in Cars



A full Life Cycle Assessment is important to understand the full story when it comes to assessing the environmental impact of ...

YouTube - European Aluminium - Dec 8, 2020

<https://www.youtube.com/watch?v=IRBr62LNOCI>

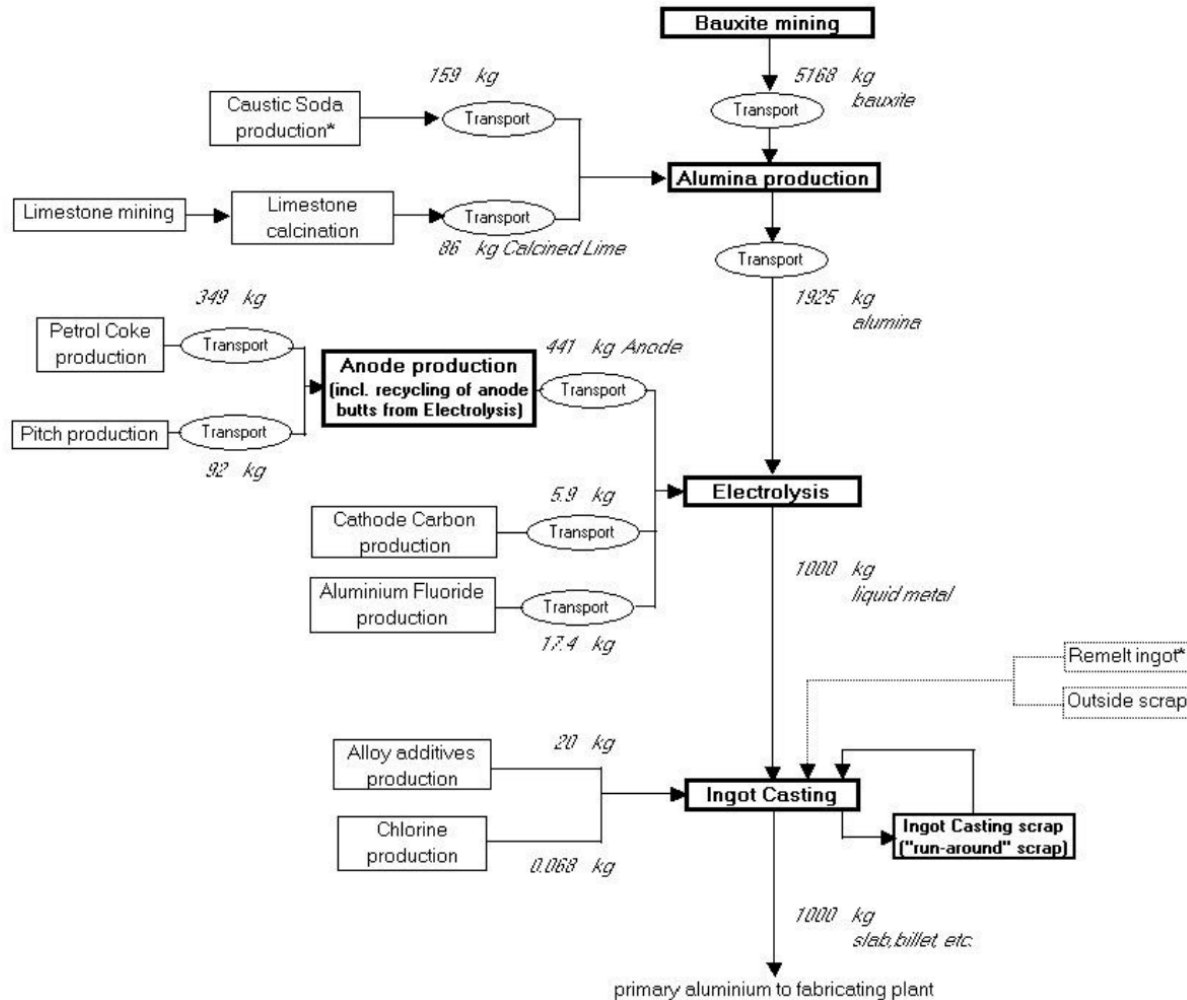
LCI for year 2000 [https://bauxite.world-aluminium.org/uploads/media/1274452849Global\\_LCI\\_Report\\_03.pdf](https://bauxite.world-aluminium.org/uploads/media/1274452849Global_LCI_Report_03.pdf)

## Processes

- bauxite mining;
- alumina production;
- anode production: production of pre-baked anodes, production of Söderberg paste;
- electrolysis;
- ingot casting.



# Aluminium production

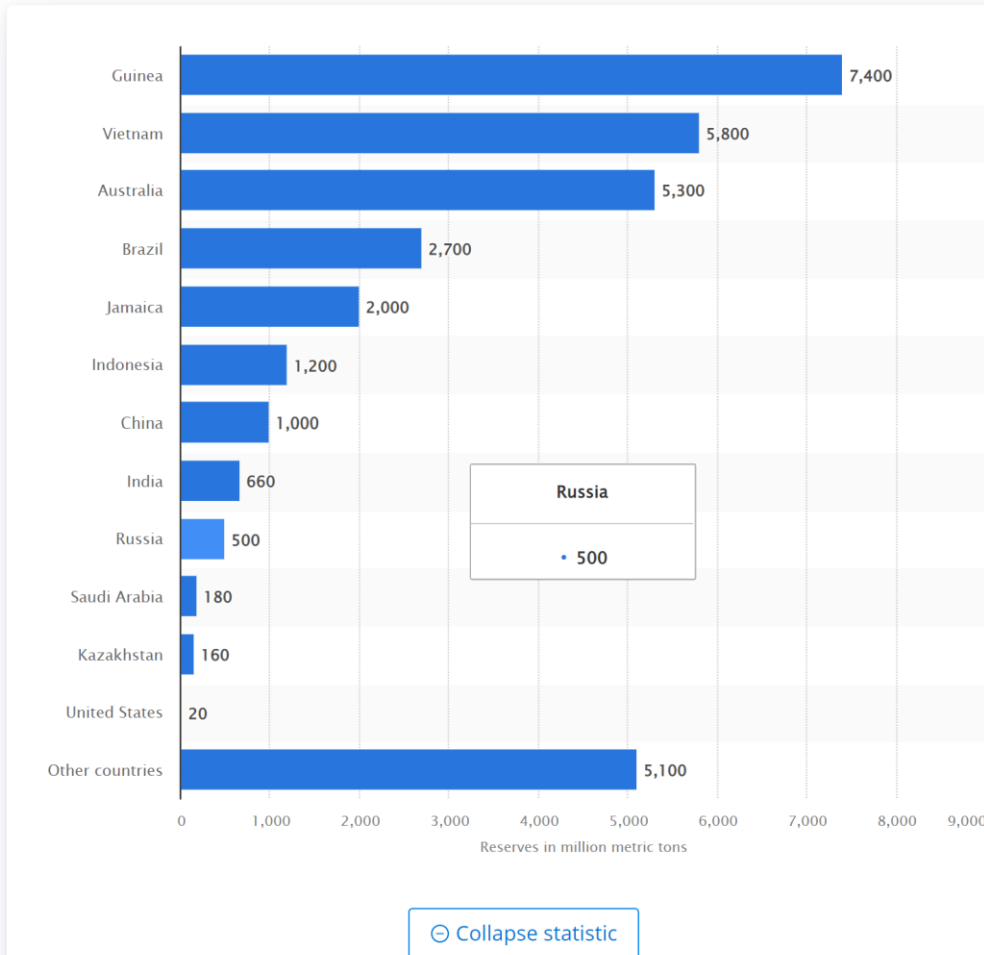


\* input from remelt or recycled aluminium ("cold metal") is excluded as not representative for primary aluminium (see para. 2.3 reference flow)





## Countries with the largest bauxite reserves worldwide as of 2021 (in million metric tons)



- ★
- 🔔
- ⚙️
- 🔗
- “ ”
- 🇪🇸
- 🖨️

### DOWNLOAD



### Source

- Show sources informatio
- Show publisher informat
- Use Ask Statista Research

### Release date

January 2022

### Region

Worldwide

### Survey time period

2021

### Supplementary notes

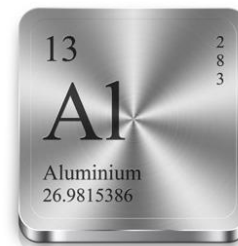
Bauxite and alumina (as a g tons of dried bauxite is requ metric tons of alumina, whic metric ton of primary alumi expressed in million metric

### Open this statistic in...

- 🇪🇸 Spanish
- 🇩🇪 German



# Aluminium production



IAI LCS 2000  
Inventory data for 1000 kg Primary Aluminium

## INPUTS

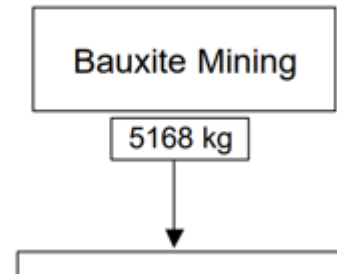
Process	Bauxite mining	Alumina production	Anode production	Electrolysis	Ingot Casting	Total	
<b>Raw materials</b>							
Bauxite	5168					<b>5168</b>	kg
Caustic Soda		159				<b>159</b>	kg
Calcined Lime		86				<b>86</b>	kg
<i>Alumina</i>						<i>1925</i>	<i>kg</i>
Petrol Coke			349			<b>349</b>	kg
Pitch			92			<b>92</b>	kg
<i>Anode</i>						<i>441</i>	<i>kg</i>
Aluminium Fluoride				17,4		<b>17,4</b>	kg
Cathode Carbon				6,1		<b>6,1</b>	kg
<i>Aluminium (liquid metal)</i>						<i>1000</i>	<i>kg</i>
Alloy additives					20	<b>20</b>	kg
Chlorine					0,068	<b>0,068</b>	kg
<i>Cast Ingot</i>						<i>1000</i>	<i>kg</i>
<b>Other raw material inputs</b>							
Fresh Water		6,4	0,5	2,95	3,15	<b>13,0</b>	m3
Sea Water		6,5	0,001	20,8	0,2	<b>27,5</b>	m3
Refractory materials			5,5	6		<b>11,5</b>	kg
Steel (for anodes)			1,4			<b>1,4</b>	kg
Steel (for cathodes)				5,5		<b>5,5</b>	kg
<b>Fuels and electricity</b>							
Coal		185	0,9			<b>186</b>	kg
Diesel Oil	10,3	1,2	1,4		0,1	<b>13,0</b>	kg
Heavy Oil		221,4	6,2		10	<b>238</b>	kg
Natural Gas		233	23		52	<b>308</b>	m3
Electricity		203	62	15365	81	<b>15711</b>	kWh



Bauxite Mining data

	Selected	2 Australian mines	9 mines (Aachen)	N.American LCI 1998
<b>Inputs</b>				
Diesel	2 kg/t*	0.90 kg/t	0.67 – 1.8 kg/t	4.37 kg/t
Other oil	-	(1.16 kg/t medium fuel oil, 0.27 kg/t gasoline)>		1.43 kg/t
Electricity	-	0.002 kWh/t		0.4 kWh/t
Fresh water	-	0.031 m3/t		
<b>Outputs</b>				
Particulates	2.35 kg/t*		0.002–0.005 kg/t	2.35 kg/t
Solid waste	136 kg/t*			136 kg/t

\*per t of bauxite output



2 kg diesel U/1000 kg Bauxite \* 5158 kg Bauxite/1000 kg AL =

2\*5.158 = 10.3 kg diesel for 1000 kg AL

Check for consistency!!!!!!







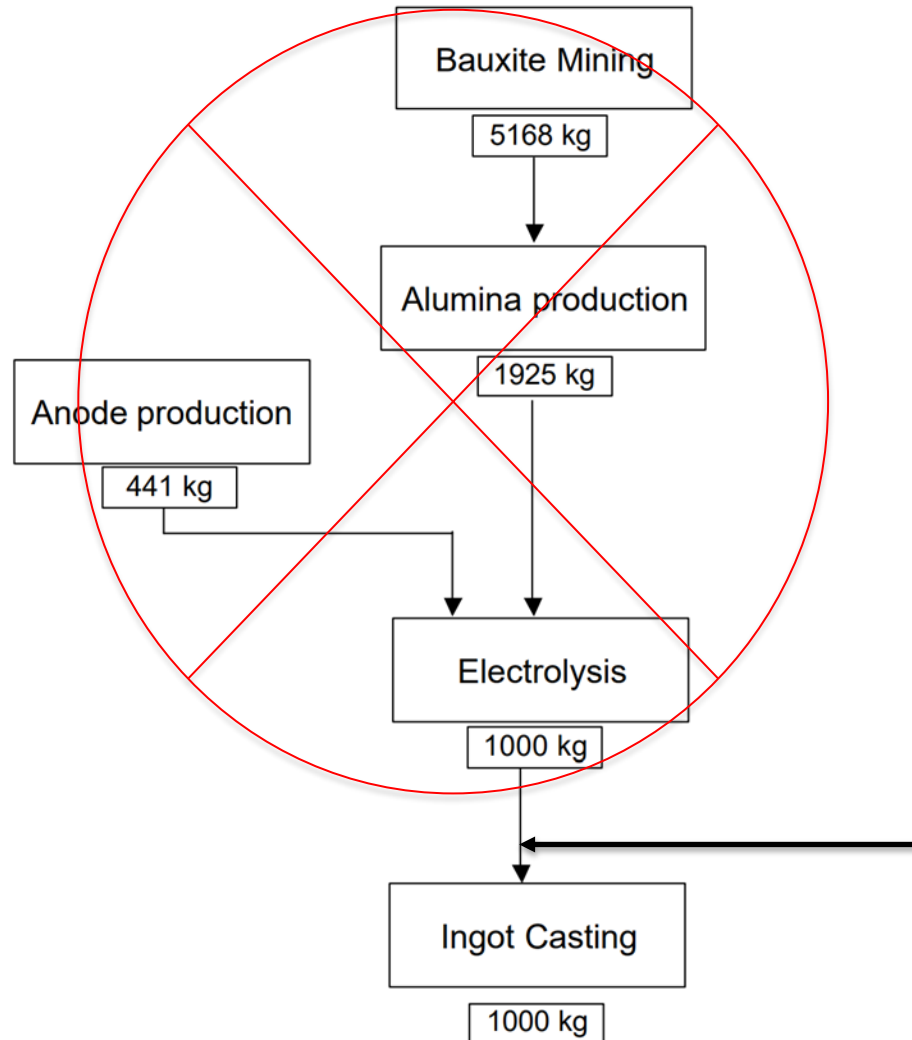
This is for primary AL production,  
 recycling .....???????

Steel (for cathodes)			5,5		<b>5,5</b>	kg
<b>Fuels and electricity</b>						
Coal		185	0,9		<b>186</b>	kg
Diesel Oil	10,3	1,2	1,4	0,1	<b>13,0</b>	kg
Heavy Oil		221,4	6,2	10	<b>238</b>	kg
Natural Gas		233	23	52	<b>308</b>	m3
Electricity		203	62	15365	<b>15711</b>	kWh



<https://www.hrw.org/report/2021/07/22/aluminum-car-industrys-blind-spot/why-car-companies-should-address-human-rights>

# Aluminium recycling

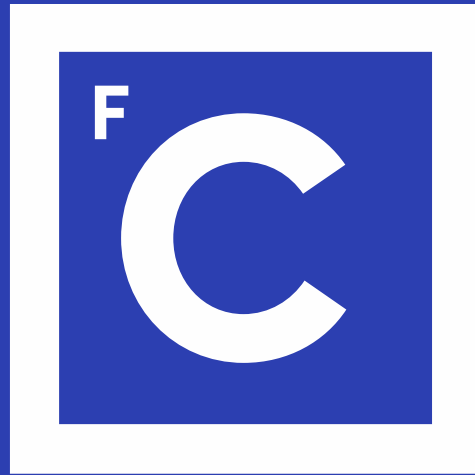




Tip for the final challenge (Challenge #5):

Incorporate the scenario of recycling 100% of the scrap AL into the analysis and observe if ASR sorting compensates the carbon footprint

**Thanks**



# Ciências ULisboa

Faculdade  
de Ciências  
da Universidade  
de Lisboa