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EPD®
THE INTERNATIONAL EPD® SYSTEM

INDIA EPD®
THE INTERNATIONAL EPD SYSTEM

Environmental Product Declaration

In accordance with ISO 14025 for :

PRIMARY ALUMINIUM

from:

VEDANTA ALUMINIUM

Programme:	The International EPD® System, www-environdec.com
Programme operator:	EPD International AB
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Contents

Programme Information

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PRODUCT CATEGORY RULES (PCR)
PCR: Basic aluminium products and special alloys (2022:08), version 1.0

INDEPENDENT THIRD-PARTY VERIFICATION OF THE DECLARATION AND DATA, ACCORDING TO ISO 14025:2006
☐ EPD process certification ☒ EPD verification

THIRD PARTY VERIFIER
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Approved by: The International EPD System Technical Committee, supported by the Secretariat
In case of recognised individual verifiers
Approved by: The International EPD® System Procedure for follow-up of data during EPD validity involves third party verifier

Procedure for follow-up of data during EPD validity involves third party verifier
☐ Yes ☒ No

The EPD owner has the sole ownership, liability, and responsibility for the EPD. EPDs within the same product category but from different programmes may not be comparable.

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LCA DEVELOPED BY

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Company Information

Vedanta Aluminium is amongst the world's top aluminium producers, and India's largest producer of aluminium, catering to discerning customers in nearly 50 countries. In FY22, Vedanta produced more than half of India's aluminium at 2.27 million tonnes. With deep expertise in metal production and value-addition, leverage innovative and leading-edge technologies to serve their customers a bundle of advantages, including the best quality products and an ecosystem designed to support them in their evolving business journey.

Today, Vedanta Aluminium are one of the world's most preferred suppliers of top-quality aluminium products and alloys, which find applications in critical sectors like aerospace, aviation, defence, transportation, electricity distribution, packaging etc and in sunrise sectors such as electric vehicles, renewable energy and more. With world-class assets, Vedanta passionately fulfils their mission of spurring emerging applications of aluminium, for a greener and more sustainable tomorrow.

Vedanta Aluminium operate a 2 MTPA (million tonnes per annum) capacity alumina refinery in Lanjigarh (Kalahandi district, Odisha), India since 2007 and an associated 75 MW captive power plant. The refinery feeds its large aluminium smelters at Jharsuguda, in Odisha, and BALCO, in Chhattisgarh. Alumina refinery is widely hailed as having transformed one of the most underprivileged regions of the country to bring it into the socio-economic mainstream of the state of Odisha.

Vedanta aluminium operate the world's largest single-location aluminium plant (ex: China) at Jharsuguda, Odisha. The plant has a 1.8 MTPA aluminium smelting capacity and an associated 3615 MW thermal power generation facility. It is the only Indian smelter in the global '1 Million Tonne' production and export club, and a leader in value-added aluminium products that find critical applications across a diverse array of industries.

BALCO (Bharat Aluminium Company Limited) is India's iconic aluminium producer and was conceived as a temple of modern India. It is owned 49% by the Government of 8 India and 51% by Vedanta Limited. BALCO operates a 0.57 MTPA aluminium smelter in Korba, Chhattisgarh. It is widely acclaimed as one of India's greatest disinvestment and privatisation success stories. The company has seen a growth of roughly 6 times since the government divested a 51% stake when it increased its aluminium production from 100 KTPA (kilo tons per annum) in FY 01 to 345 KTPA in FY05 to 575 KTPA in FY20. The company has deployed world-class technologies and operational efficiencies to clock this unprecedented quantum growth.

Product Information

1.PRODUCT DESCRIPTION

All forms of primary aluminium :Primary foundry alloys ,billets, wire rods, flip coil, and ingots of various lengths, widths, heights, and diameters from Vedanta Aluminium.

UN CPC CODE

4153 - Semi-finished products of aluminium or aluminium alloys

GEOGRAPHICAL SCOPE

Global

2. PRODUCT APPLICATION

INGOT/SOW

Application area: Re-melting industries further can be used for making secondary products like billet (manufacturing of doors and windows, automobile parts, structure parts), wire rod (overhead power cables, wires, transformer winding wires, mechanical use (rivets, strips, etc)), primary foundry alloy (used in die casting companies), aluminum powder (cosmetics, water treatment, and cracker industry), slab (production of can, foils, sheet, etc).

PRIMARY FOUNDRY ALLOY

Application area: Manufacture of casting parts (automobile wheels, engine blocks, cylinder head, etc).

T-INGOT- STEEL INDUSTRY

Application area: Galvanisation and galvalume process

BILLETS

Application area: Automobile industry (heat exchangers, ABS, interior parts, structures, radiators, air conditioners, condenser tubes, etc), building and construction (manufacturing of doors and windows, and structure parts) solar panel framing, air conditioning industry.

WIRE ROD

Application area: Electrical and power distribution industry (wiring harnesses, power cables, transformers, motor rewinds, and in high-voltage transmission lines), construction and building (rivets, strips, pipes etc), food packing (clips).

Product Information

The product contains different shapes and different types of primary aluminium. Primary aluminum billets are produced as 1xxx, 3xxx, 6xxx (Customizable). Primary foundary alloy are produced as AlSi7(A356.2), AlSi9, AlSi11, LM series (customisable). Wire rod are produced as AA1370, AA8030, AA8176. Ingots are produced as P1020 Dimension 740mm * 170mm * 114mm. Sow- Ingot are produced as P1020. Flip coil are produced as 1xxx.

Content Declaration

PRODUCT RAW MATERIAL COMPOSITION				
Material	Amount, Mass	Usability		
		Renewable	Non-renewable	Recycled
Aluminium	96-98%		X	
Others	2-4%		X	

PRODUCT RAW MATERIAL MAIN COMPOSITION		
Raw Material Category	Amount, Mass	Material Origin
Metals	100%	India 30%, Other Countries 70%
Minerals	-	-
Fossil Materials	-	-
Bio-Based Materials	-	-

LCA Information

TIME REPRESENTATIVENESS
data refer to the year 2022

DATABASE USED
Ecoinvent Database 3.8

LCA SOFTWARE USED
SimaPro 9.3.0.3

The project's general scope and the approach taken to accomplish the stated goals are described in the next section. Selecting the appropriate manufacturing technologies, supporting product systems, the study's declared unit and system boundary, data collection, software & database, cut-off criteria, data quality requirements, geographical and time coverage, allocation principles, and LCIA category selection are all included.

STANDARDS

- All of the products in compliance with ISO 9001, 14001 and 45001.
- The test method for chemical composition analysis confirms with ASTM E1251.
- The test method for mechanical testing confirms with ASTM B557M and ASTM B193.
- The specification of EC grade wire rod conforms to ASTM B233 and ASTM B917(fot temper designation).
- The chemical composition/grade of all of the products conform to International Alloy Designations as per Aluminium Association.

DECLARED UNIT
The Declared Unit (DU) is 1 tonne of aluminium product

DESCRIPTION OF SYSTEM BOUNDARIES
Cradle to gate with modules C4 and D. (A1-A3,C4+D)

INVENTORY
The inventory for the LCA study is based on the 2022 production figures for aluminium products by Vedanta Aluminium production plant in India. This EPD's system boundary is cradle to gate with modules C4 and D. (A1-A3, C4+D).

ALLOCATIONS
There is no product allocation in this study.

CUT-OFF CRITERIA
All energy flows are considered in the analysis of the LCA without any cut-off criteria.

ASSUMPTIONS
Raw materials, transport, production and, packaging materials data are collected from the production plant.

LCA MODELLING, CALCULATION AND DATA QUALITY
The results of the LCA with the indicators as per EPD requirement are given in the LCA result tables. According to the PCR, all energy calculations were obtained using Cumulative Energy Demand (CED) methodology. There are no co-product allocations within the LCA study underlying this EPD.

REACH
All of the products comply to EC1907/2006 for REACH certification. All products have valid REACH and ROHS certificates. None of the products contain REACH, ROHS substance or SVHCs.

LCA Information

More Information

A1-RAW MATERIAL SUPPLY
Production of aluminum billets, wire rods, ingots are locally sourced. The term “raw material supply” refers to pretreatment of raw materials prior to production.

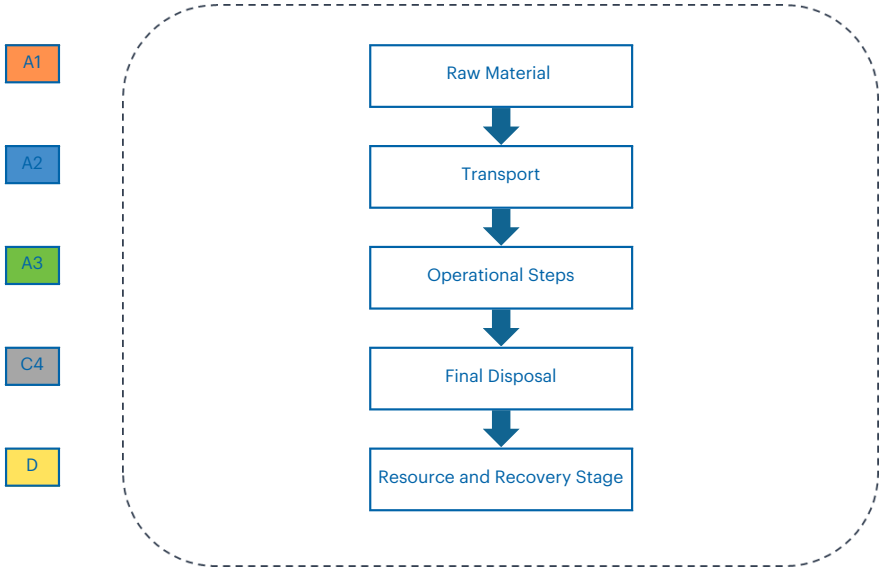
A2-TRANSPORT
For the delivery of raw materials and other materials to the plant as well as the internal transportation of materials, transportation is considered. Based on the information provided by the manufacturer for 2022, the transportation distances and routes are calculated.

A3-MANUFACTURING
The environmental impacts considered for the Vedanta Aluminum manufacturing steps for the products of aluminum billets, wire rods and ingot are included smelting. Energy, water and packaging consumptions are taken into consideration in this module.

C4- FINAL DISPOSAL
According to the European Aluminum Association (“EAA”), 10% of aluminum waste goes to landfill. In this study, 10% of the waste was sent to landfill by taking EAA as reference.

D-RESOURCE & RECOVERY STAGE
According to European Aluminium Association (“EAA”), 90% of the aluminium wastes is recycled.

System boundaries of primary aluminium production



System Boundaries

LCA Information

Product stage			Construction process stage			Use stage							End of life stage				Resource & recovery stage
	Raw material supply	Transport	Manufacturing	Transport	Construction installation	Use	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	De-construction& demolition	Transport	Waste processing	Disposal	Recycling potential
Module	A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
Module declared	x	x	x	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	x	x
Geography	GLO	ROW	IN	-	-	-	-	-	-	-	-	-	-	-	-	ROW	ROW
Specific data use	>99%			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - products	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-
Variation - sites	Not relevant			-	-	-	-	-	-	-	-	-	-	-	-	-	-

LCA Results

Potential Environmental Impact

Impact Category	Unit	A1	A2	A3	Total A1-A3	C4	D
GWP-Fossil	kg CO2 eq	3.96E+03	1.63E+03	1.90E+04	2.46E+04	3.90E+00	-1.10E+02
GWP-Biogenic	kg CO2 eq	1.40E+00	4.12E-01	1.37E+00	3.19E+00	1.30E-02	-4.04E+01
GWP-Luluc	kg CO2 eq	1.17E+00	1.08E+00	2.13E+00	4.38E+00	4.36E-03	-4.99E-01
GWP-Total	kg CO2 eq	3.96E+03	1.63E+03	1.90E+04	2.46E+04	3.92E+00	-1.51E+02
ODP	kg CFC -11 eq	4.47E-04	3.08E-04	1.67E-04	9.23E-04	4.26E-07	-1.61E-05
AP	mol H+ eq	3.71E+01	4.16E+01	9.29E+01	1.72E+02	2.59E-02	-8.38E-01
*EP-Freshwater	kg P eq	1.63E+00	1.18E-01	9.90E+00	1.16E+01	1.15E-03	-2.40E-02
EP-Freshwater	kg (PO4) eq	2.40E-01	1.08E-02	6.79E-02	3.19E-01	3.41E-01	-3.23E-01
EP-Marine	kg N eq	5.72E+00	1.02E+01	1.85E+01	3.44E+01	6.41E-03	-2.86E-01
EP-Terrestrial	mol N eq	6.21E+01	1.13E+02	1.93E+02	3.69E+02	6.90E-02	-2.81E+00
POCP	kg NMVOC	1.75E+01	2.95E+01	5.01E+01	9.71E+01	2.05E-02	-7.93E-01
ADPE	kg Sb eq	4.71E-03	2.93E-03	1.32E-02	2.08E-02	8.64E-06	-1.74E-03

Impact Category	Unit	A1	A2	A3	Total A1-A3	C4	D
ADPF	MJ	4.77E+04	2.13E+04	2.30E+05	2.99E+05	5.55E+01	-1.41E+03
WDP	m3 depriv	4.62E+02	5.47E+01	1.70E+03	2.22E+03	1.45E+00	-1.08E+01
PM	disease Inc.	4.75E-04	6.59E-05	2.59E-04	8.00E-04	3.88E-07	-2.42E-05
IR	kBq U-235 eq	1.35E+02	9.41E+01	4.34E+02	6.64E+02	3.24E-01	-7.47E+00
ETP-FW	CTUe	1.82E+05	1.64E+04	5.28E+05	7.27E+05	3.63E-09	-3.07E-07
HTTP-C	CTUh	1.72E-05	1.24E-05	9.16E-07	3.05E-05	3.63E-09	-3.07E-07
HTTP-NC	CTUh	2.08E-04	1.12E-05	2.38E-04	4.57E-04	9.57E-08	-3.11E-06
SQP	Pt	1.05E+04	5.59E+03	3.24E+04	4.84E+04	7.10E+01	-2.70E+03
Acronyms	GWP-total: Climate change, GWP-fossil: Climate change- fossil, GWP-biogenic: Climate change - biogenic, GWP-luluc: Climate change - land use and transformation, ODP: Ozone layer depletion, AP: Acidification terrestrial and freshwater, EP-freshwater: Eutrophication freshwater, EPmarine: Eutrophication marine, EP-terrestrial: Eutrophication terrestrial, POCP: Photochemical oxidation, ADPE: Abiotic depletion - elements, ADPF: Abiotic depletion - fossil resources, WDP: Water scarcity, PM: Respiratory inorganics - particulate matter, IR: Ionising radiation, ETP-FW: Ecotoxicity freshwater, HTP-c: Cancer human health effects, HTP-nc: Non-cancer human health effects,SQP: Land use related impacts, soil quality						
Legend	A1: Raw Material Supply, A2: Transport, A3: Manufacturing, C4: Final Disposal, D: Resource& Recovery Stag						

LCA Results

Climate Impact

Impact Category	Unit	A1	A2	A3	Total A1-A3	C4	D
GWP-GHG	kg CO2 eq	3.96E+03	1.63E+03	1.90E+04	2.46E+04	3.92E+00	-1.51E+02
Disclosure 1	This indicator includes all greenhouse gases included in the GWP total, but excludes biogenic carbon dioxide uptake, emissions and biogenic carbon stored in the product.						
Acronyms	GWP-GHG = Global Warming Potential total excl. biogenic carbon following IPCC AR5 methodology which excludes biogenic carbon dioxide uptake and emissions and biogenic carbon stored in the product. This indicator is thusequal to the GWP indicator.						

Use of Resources

Impact Category	Unit	Total	A1-Total Raw Material	A2 - Total Transport	A3- Total	C4- Disposal	D- Recycle
PERE	MJ	2.38E+03	0.00	0.00	2.38E+03	0.00	0.00
PERM	MJ	1.07E+04	0.00	0.00	10728.352	0.00	0.00
PERT	MJ	1.31E+04	0.00	0.00	1.31E+04	0.00	0.00
PENRE	MJ	2.97E+05	4.77E+04	2.13E+04	2.30E+05	5.55E+01	-1.41E+03
PENRM	MJ	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
PENRT	MJ	2.97E+05	4.77E+04	2.13E+04	2.30E+05	5.55E+01	-1.41E+03
SM	kg	0.00E+00	0.00	0.00	0.00	0.00	0.00
RSF	MJ	0.00E+00	0.00	0.00	0.00	0.00	0.00
NRSF	MJ	0.00E+00	0.00	0.00	0.00	0.00	0.00
FW	m3	2.21E+03	4.62E+02	5.47E+01	1.70E+03	1.45E+00	-1.08E+01
Acronyms	PERE = Use of renewable primaryenergy excluding renewable primary energy resources used as raw materials; PERM = Use of renewable primary energy resources used as raw materials; PERT = Total use of renewable primary energy resources; PENRE = Use of non-renewable primary energy excluding non renewable primary energy resources used as raw materials; PENRM = Use of nonrenewable primary energy resources used as raw materials; PENRT = Total use of non-renewable primary energy re-sources; SM = Use of secondary material; RSF = Use of renewable secondary fuels; NRSF = Use of non-renewable secondary fuels; FW = Use of net fresh water						

LCA Results

Waste Output & Flows

Impact Category	Unit	Total	A1-Total Raw Material	A2 - Total Transport	A3- Total	C4- Disposal	D- Recycle
HWD	kg	7.24E+01	0.00E+00	0.00E+00	7.24E+01	0.00	0.00
NHWD	kg	4.24E+01	0.00E+00	0.00E+00	4.24E+01	0.00	0.00
RWD	kg	0.00E+00	0.00E+00	0.00E+00	0.00	0.00	0.00
CRU	kg	0.00E+00	0.00E+00	0.00E+00	0.00	0.00	0.00
MFR	kg	2.97E+00	0.00E+00	0.00E+00	2.97	0.00	0.00
MER	kg	0.00E+00	0.00E+00	0.00E+00	0.00	0.00	0.00
EE (Electrical)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00	0.00	0.00
EE (Thermal)	MJ	0.00E+00	0.00E+00	0.00E+00	0.00	0.00	0.00
Acronyms	HWD: Hazardous waste disposed, NHWD: Non-hazardous waste disposed, RWD: Radioactive waste disposed, CRU: Components for reuse, MFR: Material forrecycling, MER: Materials for energy recovery, EE (Electrical): Exportedenergy electrical, EE (Thermal): Exported energy, Thermal						

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References

EN ISO 9001
Quality Management Systems-Requirements

EN ISO 14001
Environmental Management Systems- Requirements

ISO 14020:2000
Environmental Labels and Declaration- General Principles

ISO 14025 DIN ISO 14025:2009-11:
Environmental Labels and declarations- Type III environmental declarations
Principles and procedures

ISO 14040/44 DIN EN ISO 14040:2006-10.
Environmental management Life Cycle Assessment Principles and framework
(ISO14040**:**2006**)** and Requirements and guidelines **(**ISO 14044**:**2006**)**

GPI
General Programme Instructions of the International EPD system Version 4.0

PCR for Basic aluminium products and special alloys (2022:08), version 1.0

The International EPD System

The International EPD System is a programme for type III environmental declarations, maintaining a system to verify and register EPDs as well as keeping a library of EPDs and PCRs in accordance with ISO 14025.
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