Environmental Product Declaration

of Average Ground Granulated Blast- Furnace Slag

JSW Cement Limited

ISO 14020:2006, ISO 14025:2006, ISO 14040:2006, ISO 14044:2006, EN 15804:2012, EN 16908:2017

EPD registration number:	**S-P-01415**
Publication date:	**23-12-2019**
Validity date:	**22-12-2024**
Geographical scope:	**India**

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1. Introduction

This current declaration aims to provide the measurable and verifiable environmental impacts for the environmental assessment of 1000 kg of average Ground Granulated Blast-furnace Slag (GGBS) manufactured at all the 3 Cement Plants of JSW Cement Limited.

JSW Cement is a part of USD 14 billion JSW Group, JSW entered the Cement market in 2009 with a vision to ensure a sustainable future for the country by producing eco-friendly cement, using industrial by-products such as slag. Its plants at Vijayanagar in Karnataka, Nandyal in Andhra Pradesh, Dolvi in Maharashtra and Salboni in West Bengal produce environment friendly cement which helps to reduce the carbon footprint and ensures optimal utilization of natural resources. Though, JSW Cement is a relatively late entrant into the industry but with a capacity to produce over 14.0 million tons per year, it is fast becoming a force to reckon with.

Not only does JSW Cement manufacture one of the eco-friendly cements in India, but it also engineers its products for superior strength and durability. All the plants of JSW Cement use state of art German technology of finish mode grinding in Roller Presses. It has won many prestigious awards for its energy-saving processes.

JSW Cement produces Portland Slag Cement (PSC) and Ground Granulated Blast -furnace Slag (GGBS). With key markets in Telangana, Andhra Pradesh, Karnataka, Tamil Nadu, Kerala, Maharashtra, Odisha, Goa, Jharkhand, Bihar and West Bengal. JSW Cement has been delivering high-quality product to several large infrastructural projects in the southern, western and eastern regions of the country. Recently JSW Cement strategically invested in Shiva Cement based out of Odisha.

Ground granulated blast-furnace slag (GGBS) conforms to IS: 16714:2018. It is obtained by quenching molten iron slag (a by-product of iron and steelmaking) from a blast furnace in water or steam, to produce a glassy, granular product that is then dried and ground into a fine powder. The process of granulating the slag involves cooling of molten slag through high-pressure water jets. This rapidly quenches the slag and forms granular particles generally not bigger than 5 mm. The rapid cooling prevents the formation of larger crystals, and the resulting granular material comprises around 95% non-crystalline calcium-alumino silicates. GGBS (sustainable material for Green building construction) replace the Portland cement helps in reducing CO_2 emissions and in conserving non –renewable resources of limestone. The use of GGBS in concrete is recognized by LEED (Leadership in Energy and Environmental Design) and add points towards its certification.

This background LCA report is for the EPD of 1000 kg of average GGBS manufactured at the 3 Cement Plants at Nandyal, Dolvi and Vijayanagar of JSW Cement Limited. The LCA is conducted in accordance with EN15804 (Core rules for the product category of construction products) and EN 16908:2017 (sub-PCR Cement and Building Lime) for preparation of Environmental Product Declaration (EPD).

2. General Information

2.1 EPD, PCR, LCA Information

Table 1. EPD Information

Programme	The International EPD® System, www.environdec.com
Program operator	EPD International AB Box 210 60, SE- 100 31 Stockholm, Sweden.
Declaration holder	Mr. Manoj Kumar Rustagi JSW Cement Limited 3rd Floor, JSW Centre, Bandra Kurla Complex Bandra (East) - 400051, India Email: manoj.rustagi@jsw.in
Product	Ground Granulated Blast -furnace Slag (GGBS) – IS 16714: 2018
EPD registration number	S-P-01415
Publication date	23-12-2019
Validity date	22-12-2024
Geographical scope	India
Reference standards	IS0 14020:2001, ISO 14025:2006, ISO 21930:2007, EN 15804:2012, EN 16908:2017
UN CPC Code	3744

Table 2. PCR Information

Reference PCR	PCR 2012-01 v2.2	EN 16908:2017
Date of Issue	October 2013	February 2017

Table 3: Verification Information

Demonstration of verification	External, independent verification
Third party verifier	Sunil Kumar C S, Founder & Principal Consultant Chakra4 Sustainability Consulting Services Email: cssunil67@gmail.com

Table 4. LCA Information

Title	Background LCA Report of Average GGBS
Preparer	Dr. Rajesh Kumar Singh Thinkstep Sustainability Solutions Pvt. Ltd. 421, MIDAS, Sahar Plaza, Andheri Kurla Road, Andheri East, Mumbai, India - 400059 Email: rajesh.singh@thinkstep.com
Reference standards	ISO 14040/44 standard

2.2 Reference Period of EPD Data
The reference period for the data used within this EPD is the year 2018-19.

2.3 Geographical Scope of EPD Application
The geographical scope of this EPD is India.

2.4 Additional Information about EPD
JSW Cement Limited manufactures Portland Slag Cement (PSC - IS 455:2015), Portland Composite Cement (PCC) and Ground Granulated Blast-furnace Slag (GGBS - IS 16714:2018) at 4 Cement Plants. The EPD is declared for an average GGBS product. The target group of EPD are Green Building Certification Program holders and consultants, customers, project developers, statutory agencies and government. GGBS is mainly used for structural concrete construction (Partial replacement of OPC in Ready Mix Concrete).

This EPD is in accordance with ISO 14025 and EN 15804. EPD of construction products may not be comparable if they do not comply with EN 15804. Product Category Rules (PCR) for the assessment of the environmental performance of cement is PCR 2012-01 v2.2 Construction products and construction services, compliant with the European standard EN 15804:2012+A1:2013 (Sustainability of construction works - Environmental product declarations - Core rules for the product category of construction products) and EN 16908:2017 (sub-PCR Cement and Building Lime). These PCRs are applicable to the product 'cement' complying with the standard EN 197-1 (composition, specifications and conformity criteria for common cements).

The environmental impacts are calculated on the basis of the functional unit wherein each flow related to material consumption, energy consumption, emissions, effluent and waste is scaled to the reference flow.

The processes listed below for the production of the final product including primary packaging is included. The processes which are mandatory to be included in plant operation in particular are:

- Secondary material production (GBS)
- Grinding of slag
- Packaging.

The manufacturing of buildings, other capital goods and plant dismantling are not included. Inbound transportation of secondary materials and fuel are included, and outbound transportation of GGBS product is not included as per PCR.

3. Product Description and System Boundaries

3.1 Product Identification and Usage
Cement is the most essential raw material in any kind of construction activity. It is used in preparation of concrete. Accordingly, cement industry plays a crucial role in the infrastructural development of the country. The present declaration is conducted for 1000 kg of average GGBS manufactured at 3 plants of JSW Cement Limited.

Table 5. GGBS identification and usage

Product standard	GGBS
Significant characteristic	higher strength, eco-friendly.
Application domain	Resistant to chemical attack.
Market segment	Structural concrete construction (Partial replacement of OPC in Ready Mix Concrete).

Table 6: Technical Specification of GGBS Product

Technical Specification	Average GGBS	IS: 16714:2018
Fineness (m^2/kg)	364	320 (Min)
Slag Activity Index Test		
7 Days	75.30%	60% (Min)
28 Days	RA	75% (Min)
Magnesium Oxide (MgO)	6.07%	17.0% (Max)
Manganese Oxide (MnO)	0.32%	5.5% (Max)
Sulphide Sulphur	0.57%	2.0% (Max)
Sulphate (as SO_3)	0.29%	3.0% (Max)
Insoluble Residue (IR)	0.21%	3.0% (Max)
Chloride Content (CI)	0.008%	0.1% (Max)
Glass content (%)	94%	85% (Min.)
Moisture	0.09%	1.0% (Max)
Chemical Moduli $\frac{CaO+MgO+1/3\ Al_2O_3}{SiO_2+2/3Al_2O_3}$	1.01	1.0 (Min.)
$\frac{CaO+MgO+Al_2O_3}{SiO_2}$	1.79	1.0 (Min.)

3.2 Product Manufacturing
The main steps in GGBS manufacturing process are:

3.2.1 Raw material production (Secondary material)
During the steel production process, blast furnace slag is produced which is a secondary material. This is utilized as main raw material for the GGBS production.

3.2.2 Water Granulation (Cooling of Blast furnace slag)
The blast furnace slag produced are cooled and granules are formed with the water granulation process which will be utilized for the GGBS production.

3.2.3 Grinding of slag
The cement mill grinds the GBS to a fine powder which is then called GGBS and stored in a silo.

3.2.4 Packaging
The GGBS is then stored in silos and packed in bags using packing machines.

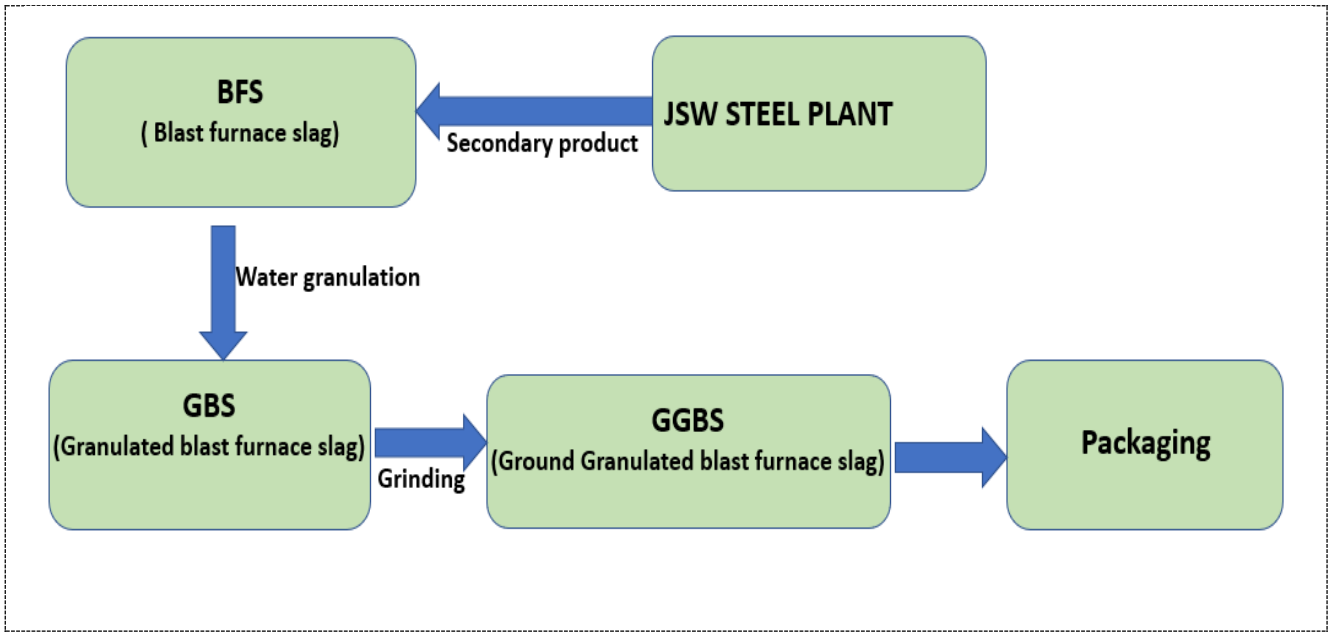

Figure 1: System boundary for the LCA study (A1, A2, A3)

3.3 System Boundaries

The selected system boundaries comprise the production of GGBS including raw material extraction up to the finished product at the factory gate.

Table 7. System boundary and product stages

Module	Product stages
A1	Production of raw materials (Secondary material)
A2	Upstream Transport (Inbound transportation)
A3	Manufacturing (GBS grinding)

The system boundary does not include:

- Capital equipment and maintenance of production facility
- Maintenance and operation of support equipment
- Human labor and employee transport

4. LCA

4.1 Information Sources and Data Quality

It is important that data quality is in accordance with the requirements of the LCA's goal and scope. This is essential to the reliability of LCA and achievement of the intended application. The quality of the LCI data for modelling the life cycle stages have been assessed according to ISO 14044 (ISO, 2006b). Data quality is judged by its precision (measured, calculated or estimated), completeness (e.g. are there unreported emissions?), consistency (degree of uniformity of the methodology applied on a LCA serving as a data source) and representativeness (geographical, time period, technology). To cover these requirements and to ensure reliable results, first-hand industry data in combination with consistent, upstream LCA information

is used. The datasets have been used in LCA-models worldwide for several years in industrial and scientific applications for internal as well as critically reviewed studies. In the process of providing these datasets, they have been cross-checked with other databases and values from industry and science. JSW Cement Limited provided the most accurate and representative data for GGBS production. For all data requirements, primary data were used where possible. Where there were gaps in the data, the average value, based on data collected from other production sites, was incorporated into the dataset.

4.2 Estimations and Methodology

4.2.1 Allocation procedures

No allocation has been done.

4.2.2 Average GGBS

The inventory data of the GGBS produced at all the 3 plants are used to calculate the declared average GGBS. The weighted average is determined based on the produced amounts by weight in 2018-19.

4.2.3 Declared unit

The declared unit for the EPD is 1000 kg of average Ground Granulated Blast-furnace Slag (GGBS) manufactured at all the 3 cement plants of JSW Cement Limited.

4.2.4 Impact assessment

A list of relevant impact categories and category indicators is defined and associated with the inventory data. Various environmental impacts and emissions are associated with the raw material production, transport of materials to manufacturing site and GGBS production.

CML 2001 (January 2013) method developed by Institute of Environmental Sciences, Leiden University, Netherlands have been selected for evaluation of environmental impacts. These indicators are scientifically and technically valid.

A list of relevant impact categories and category indicators is defined and associated with the inventory data. PCR 2012-01 v2.2 and EN 16908:2017 has been used to conduct the LCA. The PCR identifies the following LCI and LCIA.

1. Potential Environmental Impact (according with EN15804)
    - Global warming potential, GWP (100 years) (kg CO_2 equivalent)
    - Depletion potential of the stratospheric ozone layer, ODP (20 years) (kg CFC-11 equivalent)
    - Acidification potential of soil and water, AP (kg SO_2 equivalent)
    - Eutrophication potential, EP (kg PO_4^{3-} equivalent)
    - Formation potential of tropospheric ozone, POCP (kg Ethene (C_2H_2) equivalent)
    - Abiotic depletion potential (ADP-elements) for non-fossil resources (kg Sb equivalent)
    - Abiotic depletion potential (ADP-fossil fuels) for fossil resources (MJ, net calorific value)

2. Use of Natural Resources (according with EN15804)
    - Total use of renewable primary energy resources (primary energy and primary energy resources used as raw materials) (MJ, net calorific value)
    - Total use of non-renewable primary energy resources (primary energy and primary energy resources used as raw materials) (MJ, net calorific value)
    - Use of secondary material (kg)
    - Use of renewable secondary fuels (MJ, net calorific value)

- Use of non- renewable secondary fuels (MJ, net calorific value)
- Use of net fresh water (m^3)

3. Other Environmental Indicators
   - Components for re-use (kg)
   - Materials for recycling (kg)
   - Materials for energy recovery (kg)
   - Exported energy (MJ)
   - Dust (total dust and PM_{10}) (kg)
   - Hazardous waste (as defined by regional directives) disposed (kg)
   - Non-hazardous waste disposed (kg)
   - Radioactive waste disposed/stored (kg)

4.3 Cut Off Rules

Input and output data have been collected through detailed questionnaires which have been developed and refined. In practice, this means that, at least, all material flows going into the GGBS production processes (inputs) higher than 1% of the total mass flow (t) or higher than 1% of the total primary energy input (MJ) are part of the system and modelled in order to calculate elementary flows. All material flows leaving the product system (outputs) accounting for more than 1% of the total mass flow is part of the system. All available inputs and outputs, even below the 1% threshold, have been considered for the LCI calculation. For hazardous and toxic materials and substances the cut-off rules do not apply.

Secondary raw materials used in the production system is accounted adopting the following approach:

- The environmental impacts related to the 'previous life' is not considered.
- The processes needed to prepare the secondary raw material to the new use is considered.
- If the secondary raw material contains energy, the amount is estimated considering the gross calorific value and presented as secondary energy resource.
- If the secondary raw material does not contain energy, the quantity that enter the system is considered as secondary raw material.

4.4 Background Data

All relevant background datasets were taken from the GaBi-8 software database developed by thinkstep AG. To ensure comparability of results in the LCA, the basic data from the GaBi-8 database were used for fuel, energy, transportation and auxiliary materials.

4.5 System Boundaries

4.5.1 Technical system boundaries

The LCA model of 1000 kg of average GGBS represents a Cradle-to-Gate system, starting from raw material production (Secondary material) and ending with the product packaging.

The system boundary and geographical scope includes:

- Production of raw materials (Secondary material).
- Transport of raw materials.
- Grinding of slag.
- Electricity, Energy, water and raw materials used in the above process.
- Emissions to air, effluent discharges and solid waste disposal.

Table 8. Modules of the production life cycle included (X = declared module; MND = module not declared)

Production			Installation		Use stage							End-of-Life				Next product system
Raw material supply	Transport to manufacturer	Manufacturing	Transport to building site	Installation into building	Use / application	Maintenance	Repair	Replacement	Refurbishment	Operational energy use	Operational water use	Deconstruction / demolition	Transport to EoL	Waste processing for reuse, recovery, recycle	Disposal	Reuse, recovery or recycling potential
A1	A2	A3	A4	A5	B1	B2	B3	B4	B5	B6	B7	C1	C2	C3	C4	D
X	X	X	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND	MND

4.5.2 Geographical system boundaries

The geographical system boundaries of the LCA cover the production of GGBS in India.

4.5.3 Temporal system boundaries

The data collection is related to one year of operation and the year of the data is indicated in the questionnaire for each data point. The majority of data was derived from the period April 2018 to March 2019.

4.6 Comparability

The EPD is established on the basis of the PCR 2012-01 v2.2 compliant to EN 15804 and EN 16908:2017 (sub-PCR Cement and Building Lime). According to these standards, EPDs do not compare the environmental performance of products in the construction sector. Any comparison of the declared environmental performance of products lies outside the scope of these standards and is suggested to be feasible only if all compared declarations follow equal standard provisions.

4.7 Results

The LCIA result of overall 3 cement plants of JSW Limited together for GGBS. The following results excludes the impact of OPC & PSC production. The estimated impact results are only relative statements which do not indicate the end points of impact categories, exceeding threshold values, safety margins or risks.

Table 9.LCIA result for 1000 kg average GGBS

LCIA Impact Category	Unit	Module A1- A3
Abiotic Depletion (ADP elements)	kg Sb-Eq.	2.85E-06
Abiotic Depletion (ADP Fossil)	MJ	696.82
Acidification Potential (AP)	kg SO_2-Eq.	0.65
Eutrophication Potential (EP)	kg Phosphate-Eq.	0.03
Global Warming Potential (GWP)	kg CO_2-Eq.	60.21
Ozone Layer Depletion Potential (ODP)	kg CFC11-Eq.	9.32E-14
Photochemical Ozone Creation Potential (POCP)	kg Ethene-Eq.	0.03

Table 10.Use of natural resources for 1000 kg average GGBS

Parameters	Unit	Module A1- A3
Renewable primary energy as energy carrier	MJ	72.62
Renewable primary energy resources as raw materials	MJ	0.00
Total renewable primary energy resources (primary energy and primary energy resources as raw materials)	MJ	72.62
Non- renewable primary energy as energy carrier	MJ	714.55
Non- renewable primary energy resources as raw materials	MJ	0.00
Total non- renewable primary energy resources (primary energy and primary energy resources as raw materials)	MJ	714.55
Use of net fresh water	m^3	1.41

Table 11. Other indicators for 1000 kg average GGBS

Parameters	Unit	Module A1-A3
Non-hazardous waste	kg	0.19
Hazardous waste	kg	4..70E-07
Radioactive waste	kg	0.00

Table 12. Supplementary indicators for 1000 kg average GGBS

Parameters	Unit	Module A1-A3
Use of secondary material	kg	1009.74
Use of secondary renewable fuels	MJ	0.00
Use of secondary non-renewable fuels	MJ	0.00
Components for reuse	kg	0.00
Materials for recycling	kg	0.00
Materials for energy recovery	kg	0.00
Exported energy	MJ	0.00
Electricity use	kWh	47.01
Dust	kg	8.79E-06

4.8 Interpretation

Table 13. Interpretation of life cycle parameters for 1000 kg average GGBS

Parameter	Interpretation
ADP elements	Abiotic depletion potential (ADP element) is 2.85E-06 kg Sb-Equiv. in which 80% contribution is from GGBS grinding process and packaging process contributes 20%. Considering GGBS grinding process impacts as 100%, electricity contributes 70% and water granulation process contributes 23%.
ADP Fossil	Abiotic depletion potential (ADP Fossil) is 696.82 MJ of which 84% is contributed by GGBS grinding process and Packaging process contributes 20%.
Acidification Potential	Acidification Potential is 0.65 kg SO2-Equiv. The contribution of GGBS grinding process is 95% and the packaging process contributes 5%.
Eutrophication Potential	Eutrophication Potential is 0.03 kg Phosphate-Equiv. The highest contribution is from GGBS grinding process i.e. 95% and the packaging process contributes only 5%.
Global Warming Potential	Global Warming Potential is 60.21 kg CO2-Equiv. The contribution of GGBS grinding process is 92% and packaging process contributes 8%. Considering GGBS grinding process impacts as 100%, electricity contributes 60% and water granulation process contributes 20%.
Ozone Depletion Potential	Ozone Layer Depletion Potential is 9.32E-14 kg CFC11-Equiv. The contribution of GGBS grinding process is 82% and packaging process contributes 18%.
Primary Energy Demand	Primary Energy Demand is 787.18 MJ. The contribution of GGBS grinding process is 82% and packaging process contributes 15%.
Photochemical Ozone Creation Potential	Photochemical Ozone Creation Potential is 0.03 kg Ethene-Equiv. The major contribution of POCP comes from GGBS grinding process i.e. 92%, and packaging process contributes only 7%.
Waste Generation	The total amount of hazardous waste generated is 4.70E-07 kg and the non-hazardous waste is 0.19 kg, while no radioactive waste is generated. Most of the hazardous waste is contributed by electricity production with 73% and water granulation process giving 24%. The non-hazardous waste is coming from electricity production which contributes 74%.
Water Demand	The net fresh water used is 1.41 m3. The GGBS grinding contributes the highest with 98% in which water granulation process contributes 75%.

5. Other Environmental Information

The constituent materials used within our products are responsibly sourced and we apply the principles of Sustainable Development and of Environmental Stewardship as a standard business practice in our operations. Protecting the environment by preserving non-renewable natural resources, increasing energy efficiency, reducing the environmental emissions, limiting the impact of materials transportation to and from our operations is part of our way in doing business.

Products do not contain any substances that can be included in “Candidate List of Substances of Very High Concern for Authorization” and raw materials used are not part of the EU REACH regulation.

6. References

- EN 15804:2012+A1:2013, Sustainability of construction works - Environmental Product Declarations - Core rules for the product category of construction products
- PCR for Construction Products and CPC 54 Construction Services/ Prepared by IVL Swedish Environmental Research Institute, Swedish Environmental Protection Agency, SP Trä, Swedish Wood Preservation Institute, Swedisol, SCDA, Svenskt Limträ AB, SSAB, The International EPD System, 2012:01 Version 2.2, Date 2017-05-30.
- EVS-EN 16908:2017, Sub-PCR Cement and building lime- Environmental product declarations- Product category rules complementary to EN 15804. (Estonian Centre for Standardization)
- GABI 8: 2017. thinkstep AG; GaBi 8: Software-System and Database for Life Cycle Engineering. Copyright. Leinfelden, Echterdingen, 1992-2017.
- ISO 14020:2001 Environmental labels and declarations - General principles
- ISO 14025:2006 Environmental labels and declarations - Type III environmental declarations - Principles and procedures
- ISO 14040:2006 Environmental management - Life cycle assessment - Principles and framework
- ISO 14044:2006 Environmental management - Life cycle assessment - Requirements and guidelines
- ISO 21930:2007 Sustainability in building construction - Environmental declaration of building products.

7. Annexure

7.1 LCIA of 3 cement plants of JSW Cement Limited

7.1.1 JSW (Nandyal Cement Plant)

LCIA	A1-A3
Global Warming Potential (GWP 100 years) [kg CO_2-Equiv.]	71.60
Ozone Layer Depletion Potential (ODP, steady state) [kg CFC11-Equiv.]	1.02E-13
Acidification Potential (AP) [kg SO_2-Equiv.]	0.72
Eutrophication Potential (EP) [kg Phosphate-Equiv.]	0.05
Photochemical Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	0.03
Abiotic Depletion Potential (ADP elements) [kg Sb-Equiv.]	3.30E-06
Abiotic Depletion Potential (ADP-fossil fuels) (net cal. value) [MJ]	893.00
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE) (net cal. value) [MJ]	74.30
Use of renewable primary energy resources used as raw materials (PERM) (net cal. value) [MJ]	0.00
Total use of renewable primary energy resources (PERT) (net cal. value) [MJ]	74.30
Use of non- renewable primary energy excluding non- renewable primary energy resources used as raw materials (PENRE) (net cal. value) [MJ]	912.00
Use of non- renewable primary energy resources used as raw Materials (PENRM) (net cal. value) [MJ]	0.00
Total use of non- renewable primary energy resources (PENRT) (net cal. value) [MJ]	912.00
Use of secondary material [kg]	1010
Use of renewable secondary fuels (net cal. value) [MJ]	0.00
Use of non- renewable secondary fuels (net cal. value) [MJ]	0.00
Use of net fresh water [m^3]	1.45
Hazardous waste disposed [kg]	4.94E-07
Non-hazardous waste disposed [kg]	0.20
Radioactive waste disposed/stored [kg]	0.00
Components for re-use [kg]	0.00
Materials for recycling [kg]	0.00
Materials for energy recovery [kg]	0.00
Exported energy [MJ]	0.00
Electricity use [kWh]	46.84
Dust [kg]	9.55E-06

7.1.2 JSW (Dolvi Cement Plant)

LCIA	A1-A3
Global Warming Potential (GWP 100 years) [kg CO_2-Equiv.]	58.50
Ozone Layer Depletion Potential (ODP, steady state) [kg CFC11-Equiv.]	8.84E-14
Acidification Potential (AP) [kg SO_2-Equiv.]	0.67
Eutrophication Potential (EP) [kg Phosphate-Equiv.]	0.03
Photochemical Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	0.03
Abiotic Depletion Potential (ADP elements) [kg Sb-Equiv.]	2.58E-06
Abiotic Depletion Potential (ADP-fossil fuels) (net cal. value) [MJ]	615.00
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE) (net cal. value) [MJ]	75.50
Use of renewable primary energy resources used as raw materials (PERM) (net cal. value) [MJ]	0.00
Total use of renewable primary energy resources (PERT) (net cal. value) [MJ]	75.50
Use of non- renewable primary energy excluding non- renewable primary energy resources used as raw materials (PENRE) (net cal. value) [MJ]	633.00
Use of non- renewable primary energy resources used as raw Materials (PENRM) (net cal. value) [MJ]	0.00
Total use of non- renewable primary energy resources (PENRT) (net cal. value) [MJ]	633.00
Use of secondary material [kg]	1015
Use of renewable secondary fuels (net cal. value) [MJ]	0.00
Use of non- renewable secondary fuels (net cal. value) [MJ]	0.00
Use of net fresh water [m^3]	1.51
Hazardous waste disposed [kg]	4.79E-07
Non-hazardous waste disposed [kg]	0.18
Radioactive waste disposed/stored [kg]	0.00
Components for re-use [kg]	0.00
Materials for recycling [kg]	0.00
Materials for energy recovery [kg]	0.00
Exported energy [MJ]	0.00
Electricity use [kWh]	50.08
Dust [kg]	8.61E-06

7.1.3 JSW (Vijaynagar Cement Plant)

LCIA	A1-A3
Global Warming Potential (GWP 100 years) [kg CO_2-Equiv.]	55.70
Ozone Layer Depletion Potential (ODP, steady state) [kg CFC11-Equiv.]	9.14E-14
Acidification Potential (AP) [kg SO_2-Equiv.]	0.62
Eutrophication Potential (EP) [kg Phosphate-Equiv.]	0.03
Photochemical Ozone Creation Potential (POCP) [kg Ethene-Equiv.]	0.03
Abiotic Depletion Potential (ADP elements) [kg Sb-Equiv.]	2.77E-06
Abiotic Depletion Potential (ADP-fossil fuels) (net cal. value) [MJ]	645.00
Use of renewable primary energy excluding renewable primary energy resources used as raw materials (PERE) (net cal. value) [MJ]	70.40
Use of renewable primary energy resources used as raw materials (PERM) (net cal. value) [MJ]	0.00
Total use of renewable primary energy resources (PERT) (net cal. value) [MJ]	70.40
Use of non- renewable primary energy excluding non- renewable primary energy resources used as raw materials (PENRE) (net cal. value) [MJ]	662.00
Use of non- renewable primary energy resources used as raw Materials (PENRM) (net cal. value) [MJ]	0.00
Total use of non- renewable primary energy resources (PENRT) (net cal. value) [MJ]	662.00
Use of secondary material [kg]	1007
Use of renewable secondary fuels (net cal. value) [MJ]	0.00
Use of non- renewable secondary fuels (net cal. value) [MJ]	0.00
Use of net fresh water [m^3]	1.35
Hazardous waste disposed [kg]	4.55E-07
Non-hazardous waste disposed [kg]	0.18
Radioactive waste disposed/stored [kg]	0.00
Components for re-use [kg]	0.00
Materials for recycling [kg]	0.00
Materials for energy recovery [kg]	0.00
Exported energy [MJ]	0.00
Electricity use [kWh]	45.57
Dust [kg]	8.53E-06