



thinkstep

# Life Cycle Assessment (LCA)- Case Studies

Webinar on Life Cycle Analysis- best Practices in  
GreenCo Certified Companies, CII GreenCo, 31<sup>st</sup> March 2017



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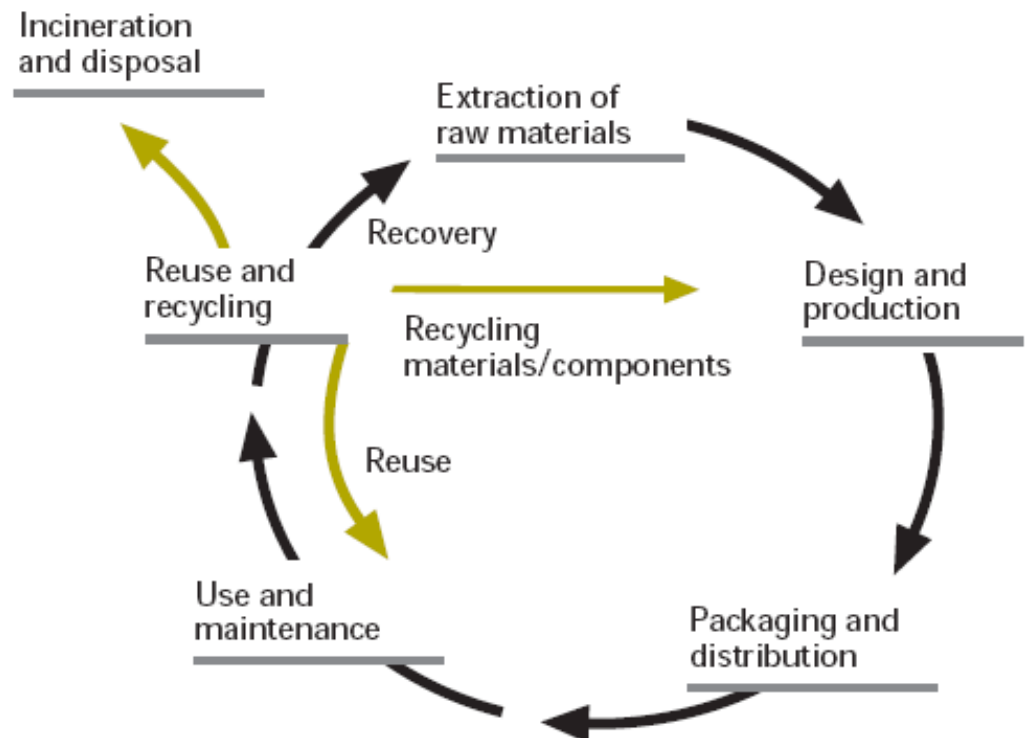
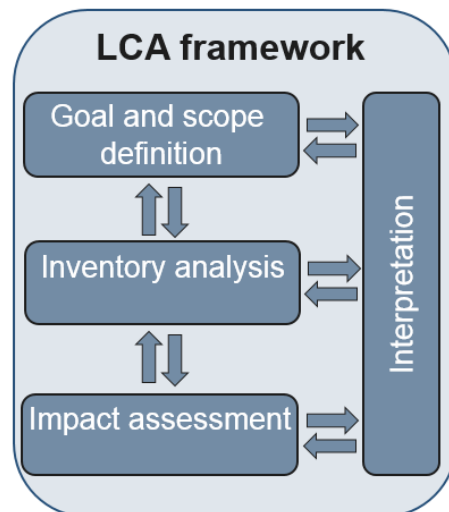
- LCA is holistic environment assessment tool for sustainability assessment and strategy deployment at product level
- Converts science into insight
- ISO 14040/44 (LCA) , ISO 14067 (PCF), ISO 14044 (WF), ISO 14025(EPD)
- Lens to visualize value chain of products- upstream raw materials, transport, manufacturing, transport, use and disposal
- European Union recognizes LCA as one of the most important tool for holistic environment management
- Around 90% of fortune 500 global companies practice LCA for decision support
- More than 50 companies in India practice LCA

# LCA Practitioners in India

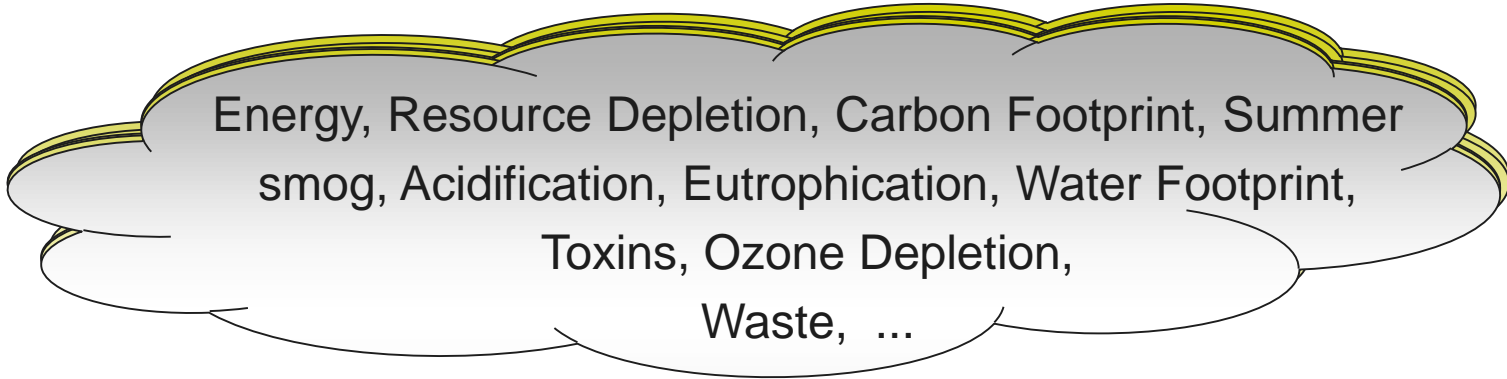


- Hot-spots identification
- Material selection and major design decisions
- Benchmarking with peers/competitors
- Future scenario modelling for target setting, marketing and branding,
- Voluntary requirements (BRR- SEBI, ISO 14001:2015, Customer Demand, Responsible care, GRI G4, CDP, DJSI)
- CII GreenCo and GreenPro
- Green Building Certification Schemes LEEDv4, EPD, Communication
- Other Indian sustainability awards requirements

*Compilation of the inputs, outputs and evaluation of the potential environmental impacts of a product system throughout its life cycle*

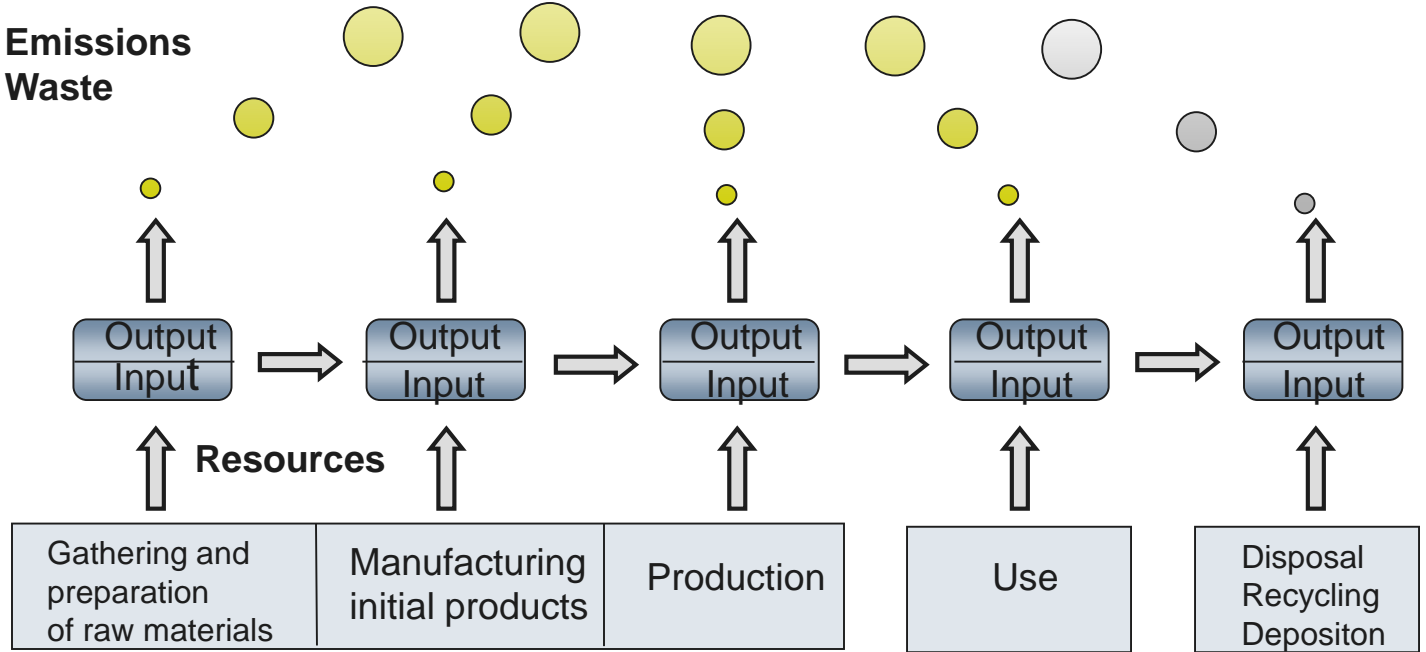


**Impact assessment**



**Emissions  
Waste**

**Inventory analysis**



**Life cycle stages**

**Phases of the life cycle**

Production phase

Use phase

End of Life

- Cross functional team (Environment, R&D, Utilities, supply chain, Operations etc)
- Goal and scope definition (cradle to grave or cradle to cradle), functional unit, comparative LCA ?, assumptions
- System Boundary- foreground and background processes
- Foreground processes- breakdown in various units
- Data collection questionnaire
- Data collection and validation/consistency check
- Allocation, biogenic, recycled content, EoL etc.
- Development of LCA model in GaBi software
- Modelling check
- Generation of results for life cycle phases, by major contributors, process-wise etc
- Interpretation and significance assessment
- Scenario assessment
- Recommendations

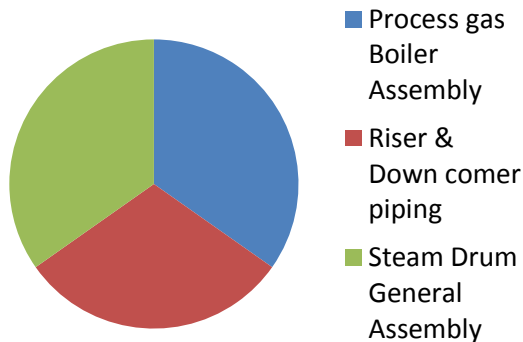
# LCA Case Study : L&T Process Gas Boiler



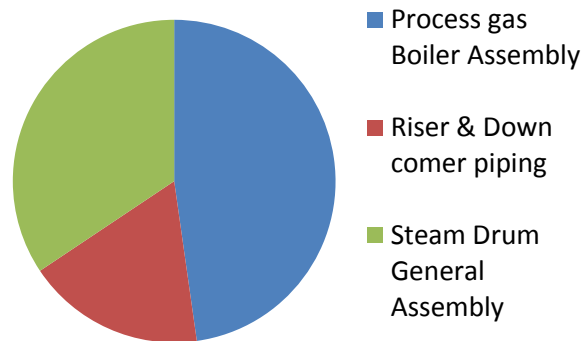
- Objective: To evaluate the “*cradle-to-gate lifecycle*” i.e. from raw material acquisition, material production, transport, assembly and fabrication data for Process Gas Boiler system in order to calculate life cycle inventories (“Life Cycle Inventory” or “LCI”).
- To fulfil the requirements of GreenCo Rating system



### Global Warming Potential



### Total freshwater consumption



Life Cycle Stages

Raw material acquisition

Material processing

Production

Use and maintenance

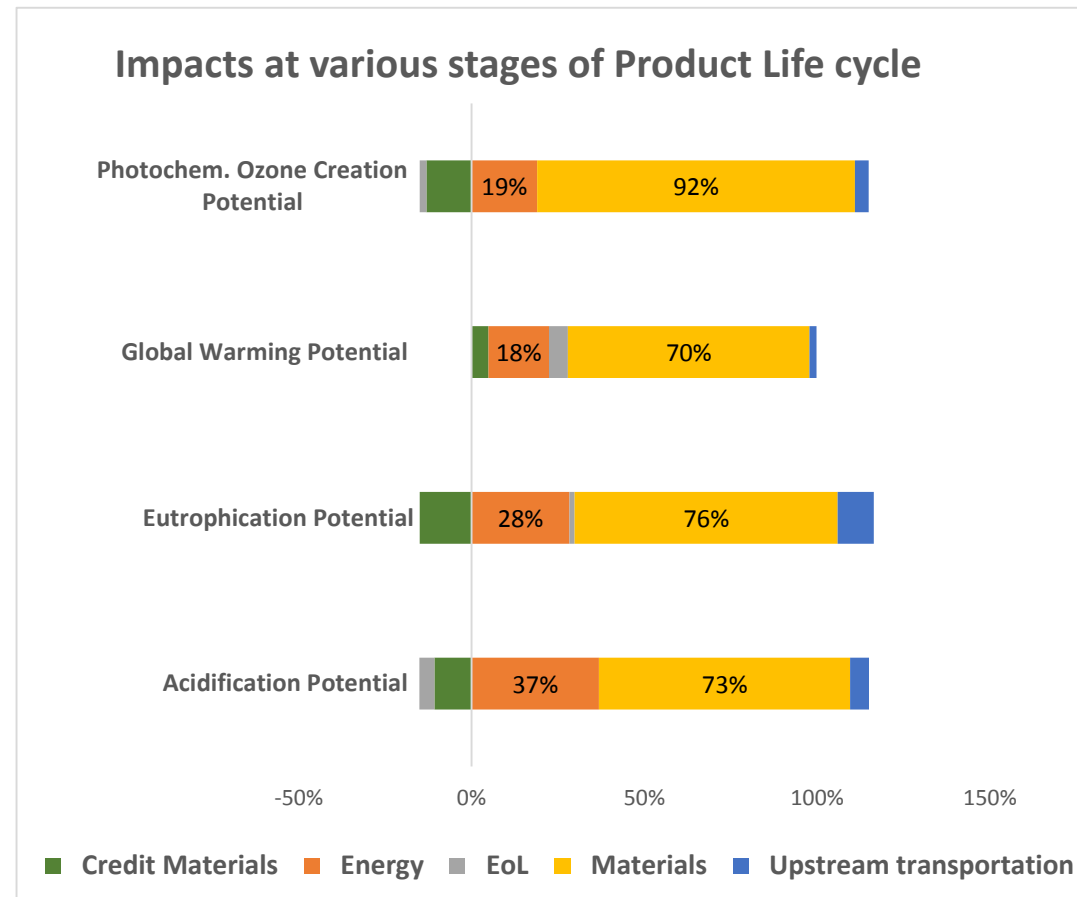
End-of-life



## LCA result for 1 SQM of Workstation



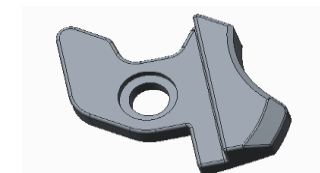
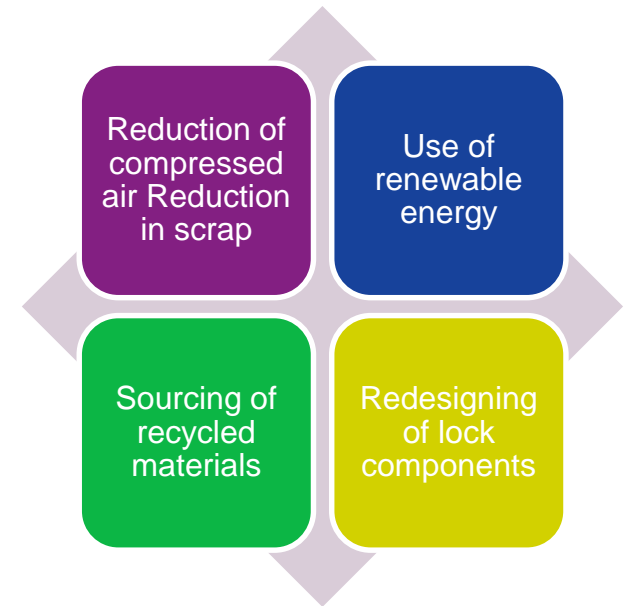
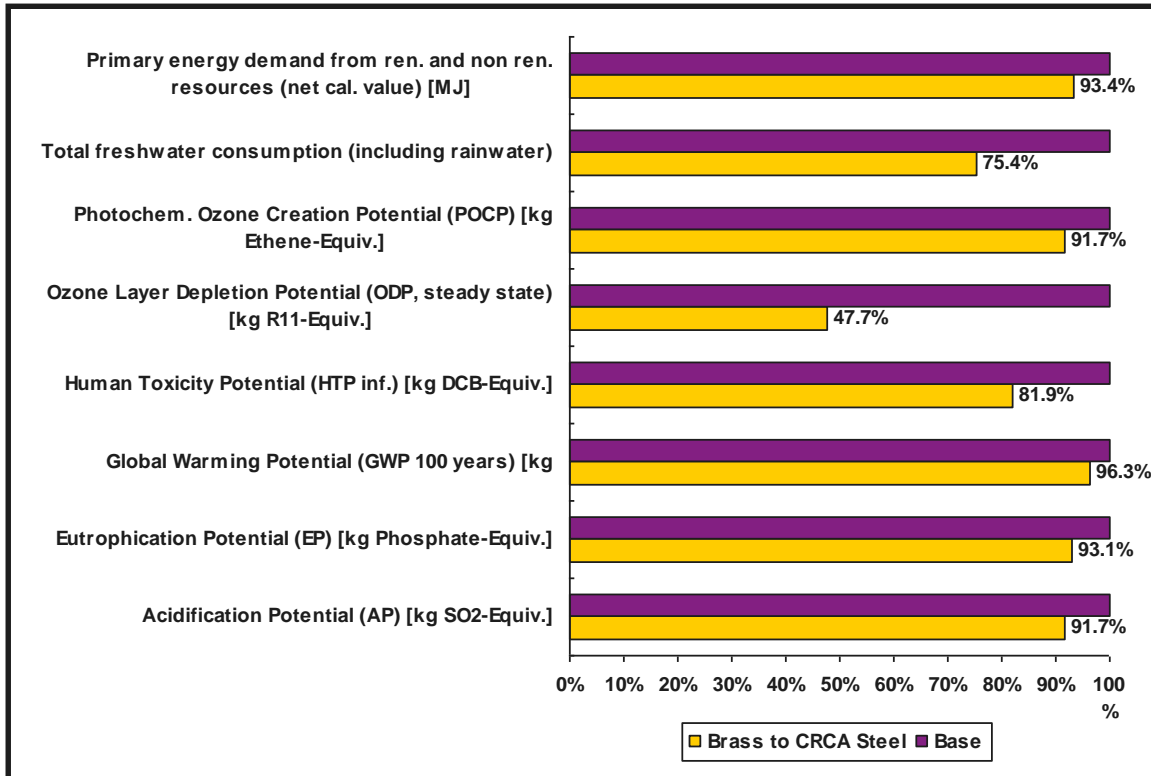
- Identification of hot spots to improve environmental performance
- Using scenario creation for decision making tool for any modification in product
- Using LCA for communication as a marketing tool and to make Green Assurance more robust
- Communicating quantified benefits to stakeholders through various environment related initiatives



**BIFMA PCR for office furniture products : UNCPC 3814**

Source: Godrej Interio, thinkstep workshop 2016

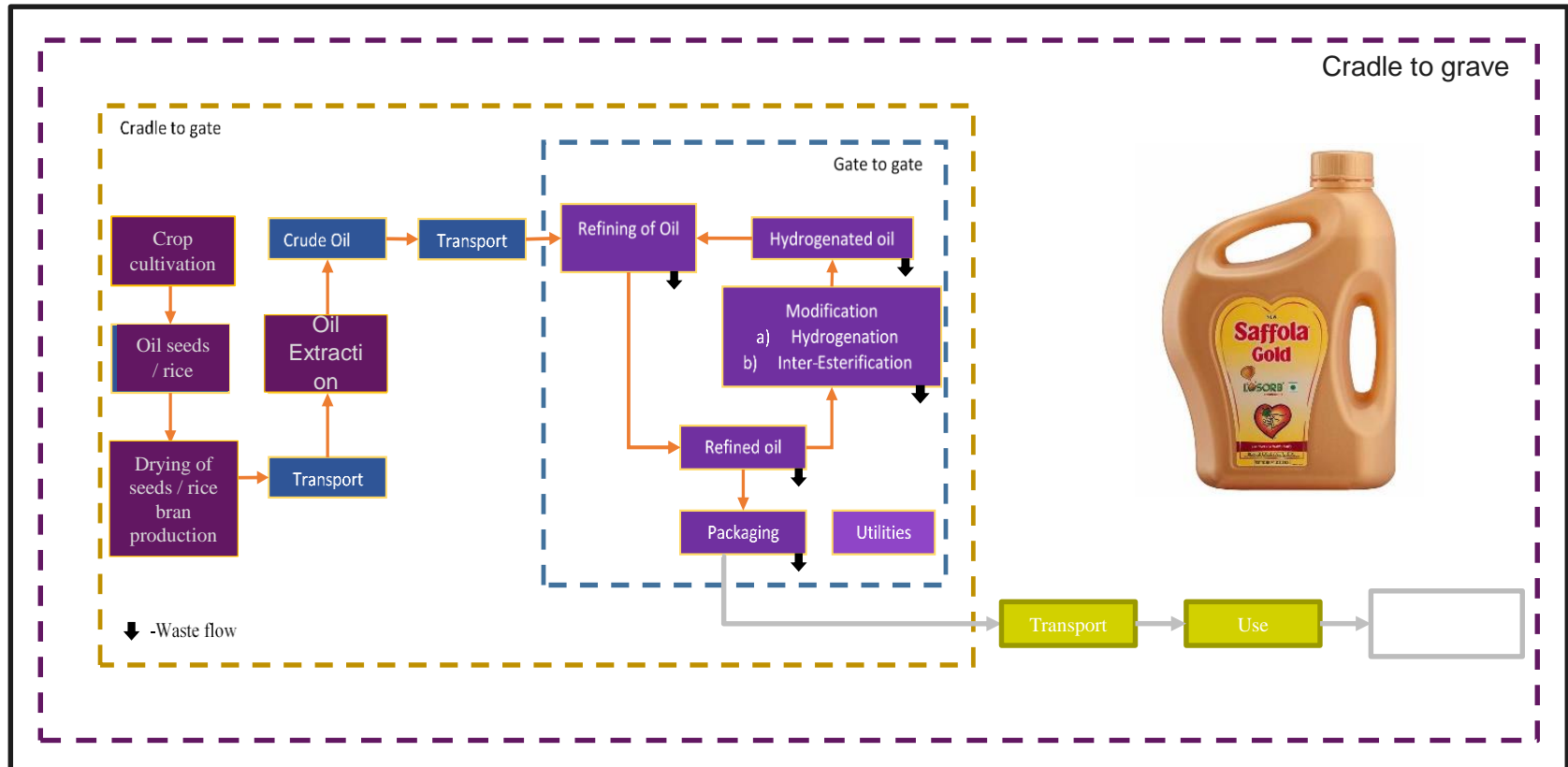
# Godrej Locks: Alternative Materials



# LCA – Marico Limited- Edible Oil



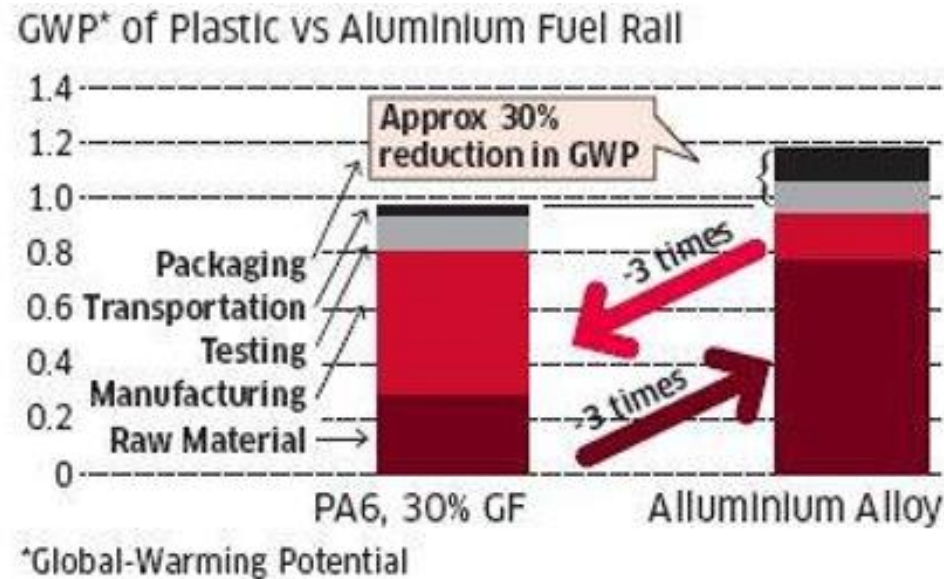
**Strategy:** Integrate sustainability considerations throughout the product life cycle by institutionalizing innovation within organization and stakeholders.



# LCA- Tata Motors

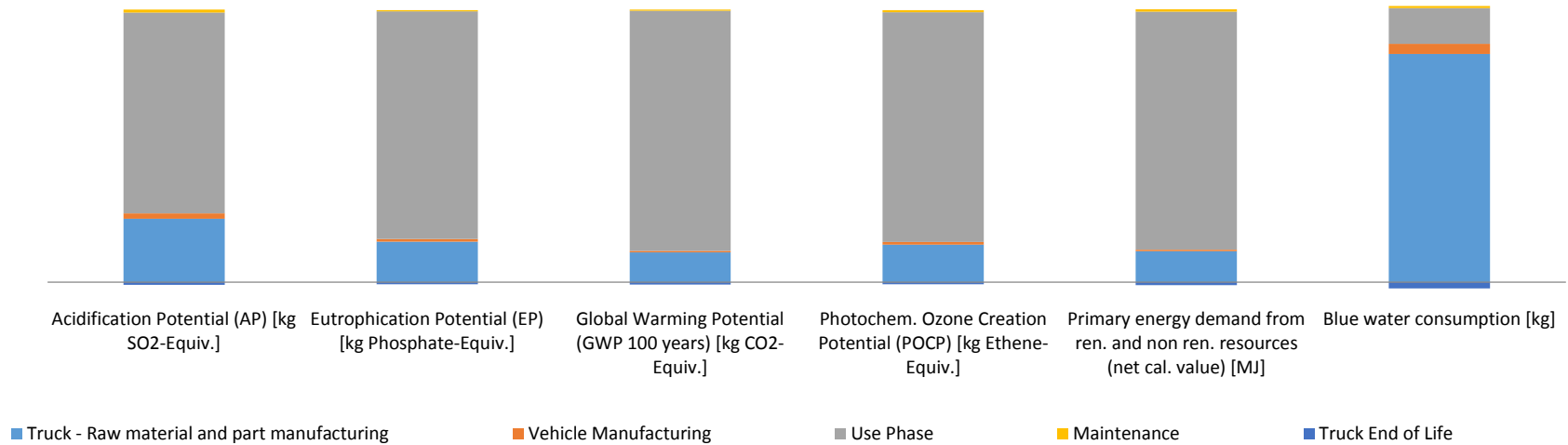


- Quantification of life cycle environmental impacts and run various scenarios for resource efficiency
- Getting Vendors on Board
- LCAs of several vehicles including the Safari, Ace CNG and the ACE diesel.



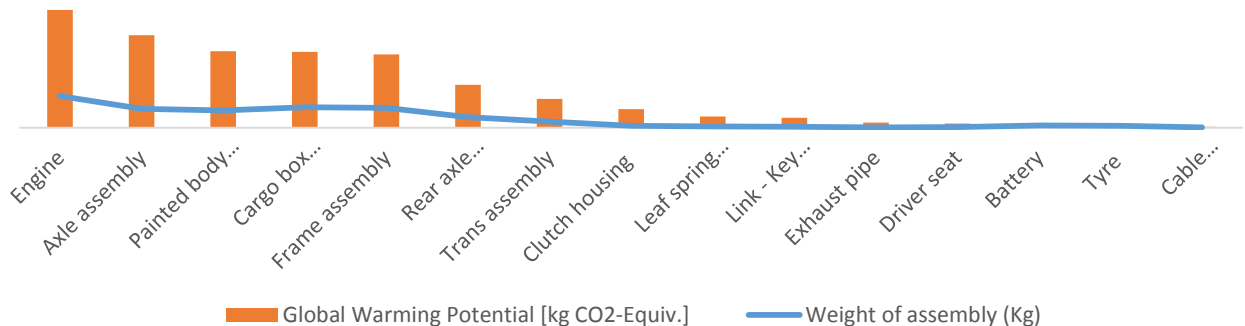
**Plastic fuel-rail is more environment friendly than aluminium alloy rail**

## Environmental Impacts of 1 Vehicle



- Steel replacement by Advanced High Strength Steel (AHSS)
- Steel replacement by Thermoplastics leading to 100 kg weight reduction
- Fuel Efficiency Increase
- Machining scrap reduction leading to increase in process yield
- Steel replacement by primary Aluminium

## Assembly wise weights and global warming potential (kg CO2 eq)



Source: Godrej Interio, thinkstepworkshop 2016

## Life Cycle Assessment of Copier Paper

Functional unit of this LCA study is 1 corrugated container of copier paper, which is equivalent 24.26 Kg or of 5000 A4 sheets of 75 gsm

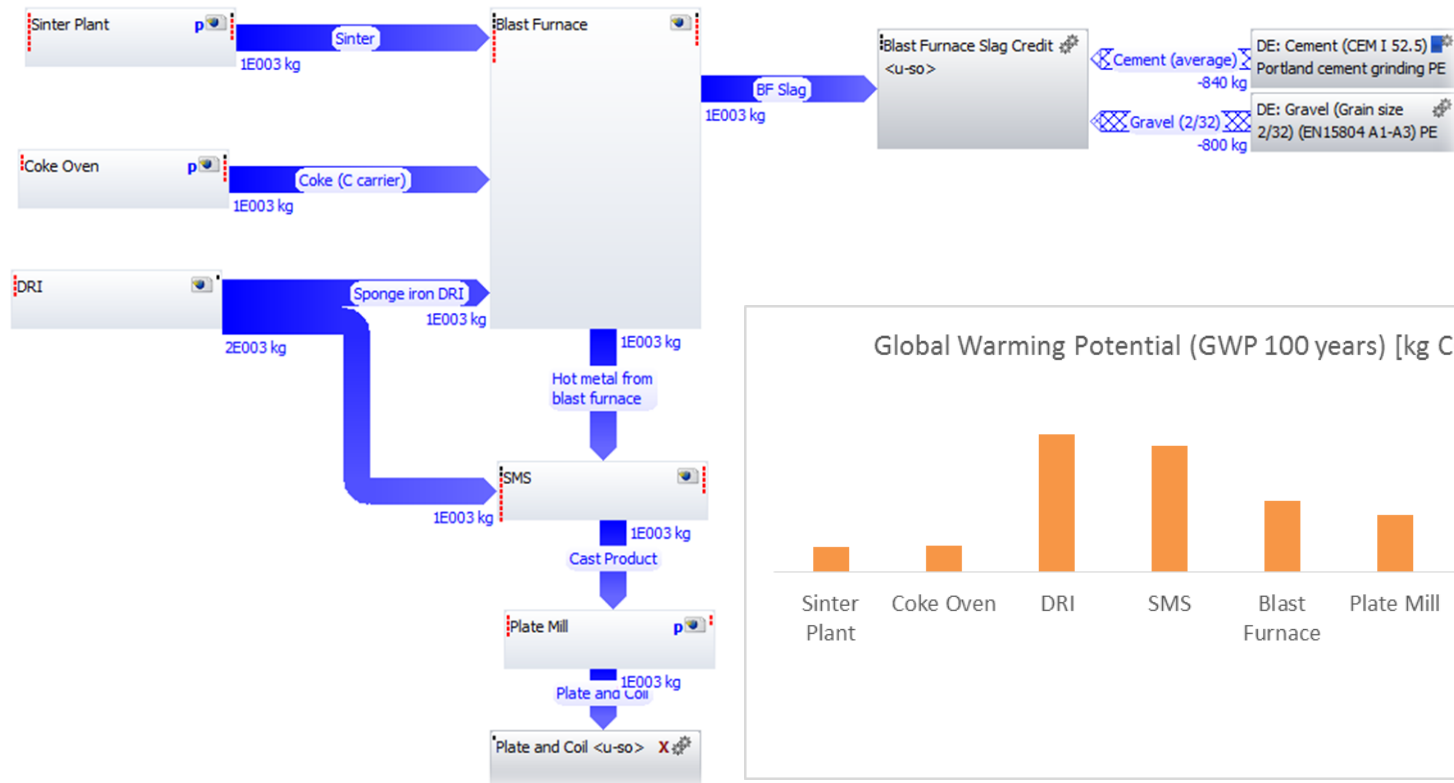
- 135.5 Kg of CO<sub>2</sub> emission in the life cycle of 1 corrugated container ( 5000 A4 sheets ) of copier paper
- 195 kg is sequestered by our forestry project making the product a carbon positive one
- 1018 liters of fresh water is used for making one functional unit. Around 60% of this water is returned to the environment
- 44% of the total energy required is met by renewable sources



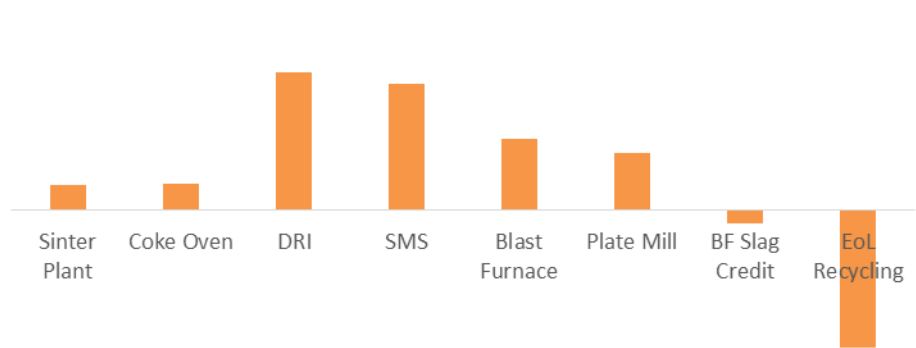
## Life Cycle Assessment of Plate Product

### LCA of Steel

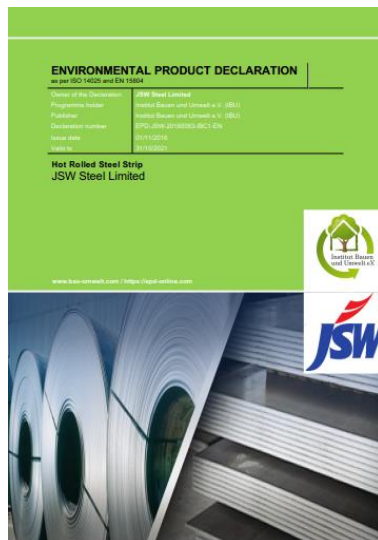
Process plan: Mass [kg]  
The names of the basic processes are shown.



Global Warming Potential (GWP 100 years) [kg CO<sub>2</sub>-Equiv.]



- JSW Steel Limited  
(<https://epd-online.com/EmbeddedEpdList/Download/8955>)
- Saint-Gobain Gyproc India  
(<http://gryphon.environdec.com/data/files/6/10162/epd538%2012.5%20mm%20Gypboard%20Plain.pdf>)
- Ambuja Cements Limited (Internal)





## RESULTS OF THE LCA - ENVIRONMENTAL IMPACT: declared unit and product

Parameter	Unit	A1-A3	C3	D
Global warming potential	[kg CO <sub>2</sub> -Eq.]	2799.11	2.42	-1285.24
Depletion potential of the stratospheric ozone layer	[kg CFC11-Eq.]	2.98E-6	3.86E-9	4.11E-5
Acidification potential of land and water	[kg SO <sub>2</sub> -Eq.]	27.56	0.01	-3.07
Eutrophication potential	[kg (PO <sub>4</sub> ) <sup>3</sup> -Eq.]	1.77E+0	2.01E-3	-8.00E-2
Formation potential of tropospheric ozone photochemical oxidants	[kg ethene-Eq.]	1.36E+0	1.39E-3	-6.90E-1
Abiotic depletion potential for non-fossil resources	[kg Sb-Eq.]	7.73E-3	8.89E-5	-2.88E-3
Abiotic depletion potential for fossil resources	[MJ]	35541.59	31.57	-13563.28

## RESULTS OF THE LCA - RESOURCE USE: declared unit and product

Parameter	Unit	A1-A3	C3	D
Renewable primary energy as energy carrier	[MJ]	275.01	3.23	699.24
Renewable primary energy resources as material utilization	[MJ]	0.00	0.00	0.00
Total use of renewable primary energy resources	[MJ]	275.01	IND	699.24
Non-renewable primary energy as energy carrier	[MJ]	35700.11	32.89	-12094.83
Non-renewable primary energy as material utilization	[MJ]	0.00	IND	0.00
Total use of non-renewable primary energy resources	[MJ]	35700.11	32.89	-12094.83
Use of secondary material	[kg]	0.00	IND	0.00
Use of renewable secondary fuels	[MJ]	0.00	IND	0.00
Use of non-renewable secondary fuels	[MJ]	0.00	IND	0.00
Use of net fresh water	[m <sup>3</sup> ]	3.84	0.02	0.40



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## Services

### GaBi Training & workshops

Increase knowledge and expertise from basic to expert user.

### EPD Development

Turn-key service for EPD development (HPDs can be offered)

### LCA Services

LCA Screening  
Comparative LCA  
ISO Compliant LCA  
PEF

### PSRT

Join top product sustainability leads and openly share and learn.



## Software

### GaBi ts Software

Drive product sustainability during design and planning providing modelling, reporting and diagnostic tools.

### GaBi DfX

Rapid analysis of products containing complex assemblies right from BoM.

### GaBi Server

Collaborate on projects, improving quality assurance and return on investment.

### GaBi Envision

Quick evaluation of 'what-if' scenarios, optimising product design and communication of performance.

### LCA Hub

Data collection application to accelerate LCA, increase data quality and consistency.



## Content

### GaBi Professional & Extension Databases

### 3<sup>rd</sup> Party LCA Database ecoinvent

### Trucost NCA Factors

- First Indian specific LCI data available in the market.
- Over 300 India specific datasets.
- Full system level data for:
  - Energy grid mix
  - Transportation
  - Metal and Mining
  - Plastics
  - Construction
  - Chemicals
  - End of Life



thinkstep  
**GaBi**

Product Sustainability  
Performance