

GHG Inventory report for the Steel sector in India

2009-10

cBalance Solutions Pvt. Ltd.



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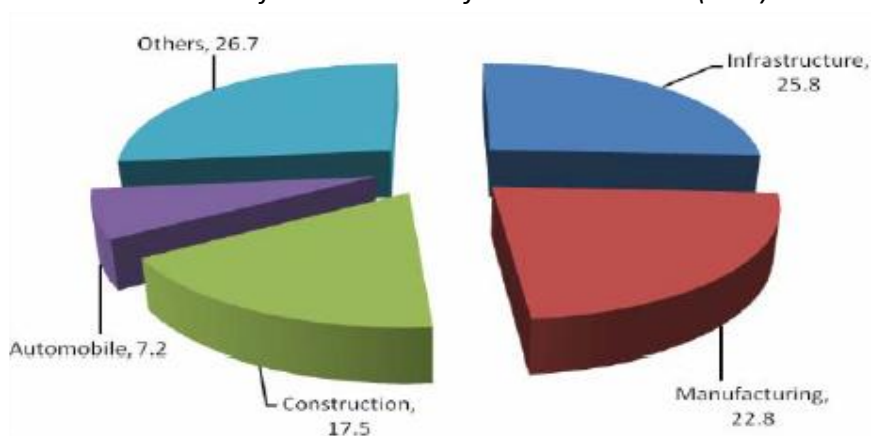
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2. Introduction

The Indian steel industry is a century old industry with applications in a wide range of sectors as shown below in Chart 1.

The purpose of this report is to showcase the GHG intensity of sector and the distribution of emissions within the sector using data collected from annual reports of public companies in the industry. It also ranks the public companies based on the KPI of TCO_{2e}/Tons of steel produced. This enables building of India specific steel sector emission factors which include industry specific emission factors and will enable downstream consumers of steel to evaluate the environmental impact when making procurement decisions from the various manufacturers.

Chart 1: Major consumers of steel in 2005-06 (in %)



Source: Care steel industry report

1.1 Indian steel sector at a glance

In the year 2011-2012 India produced 73.42 Metric Tonnes of steel.¹

Steel production in India has increased by a compounded annual growth rate (CAGR) of 8 percent over the period 2002-03 to 2006-07. Going forward, growth in India is projected to be higher than the world average, as the per capita consumption of steel in India, at around 46 kg, is well below the world average (150 kg) and that of developed countries (400 kg). Indian demand is projected to rise to 200 million tonnes by 2015. As per United Nations Framework Convention on Climate Change (UNFCCC) 2012, India's steel sectors total emission in the year 2000 was 52641.44 GgCO_{2e}.² This is 5% of total emissions from the Energy Sector and 3% of total emissions in India in 2000.³

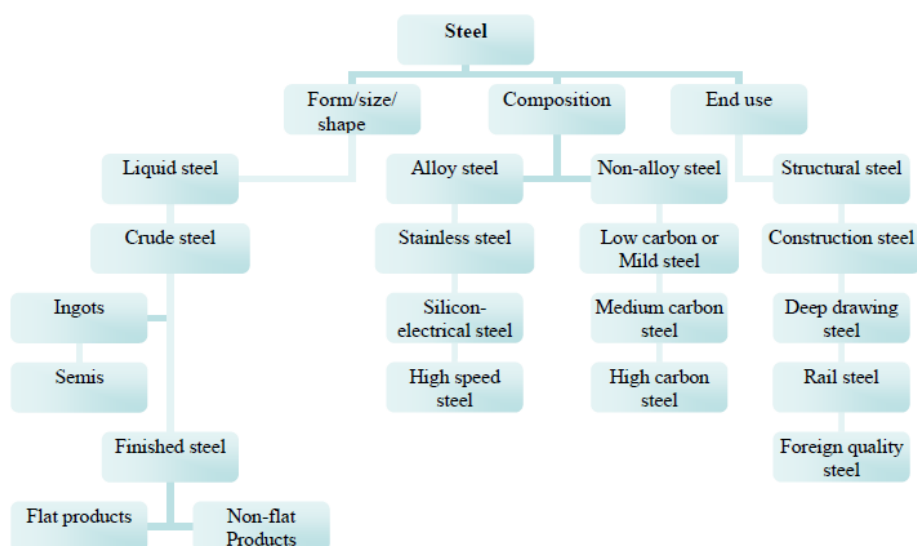
3. Types of Steel Producers

Broadly there are two types of players in the steel industry: Steel producers and steel processing companies. The steel producers further can be divided into integrated producers and secondary producers. Integrated steel producers traditionally have integrated steel units with captive plants for iron ore and coke, which are main inputs to these units. Secondary producers use steel scrap or sponge iron/direct reduced iron (DRI) or hot briquetted iron (HBI). It comprises mainly of Electric Arc Furnace (EAF) and Induction Furnace (IF) units, apart from other manufacturing units like the independent hot and cold rolling units, rerolling units, galvanizing and tin plating units, sponge iron producers, pig iron producers, etc.

Steel processing companies are the ones who convert raw steel into finished products after processing.

4. Types of Steel

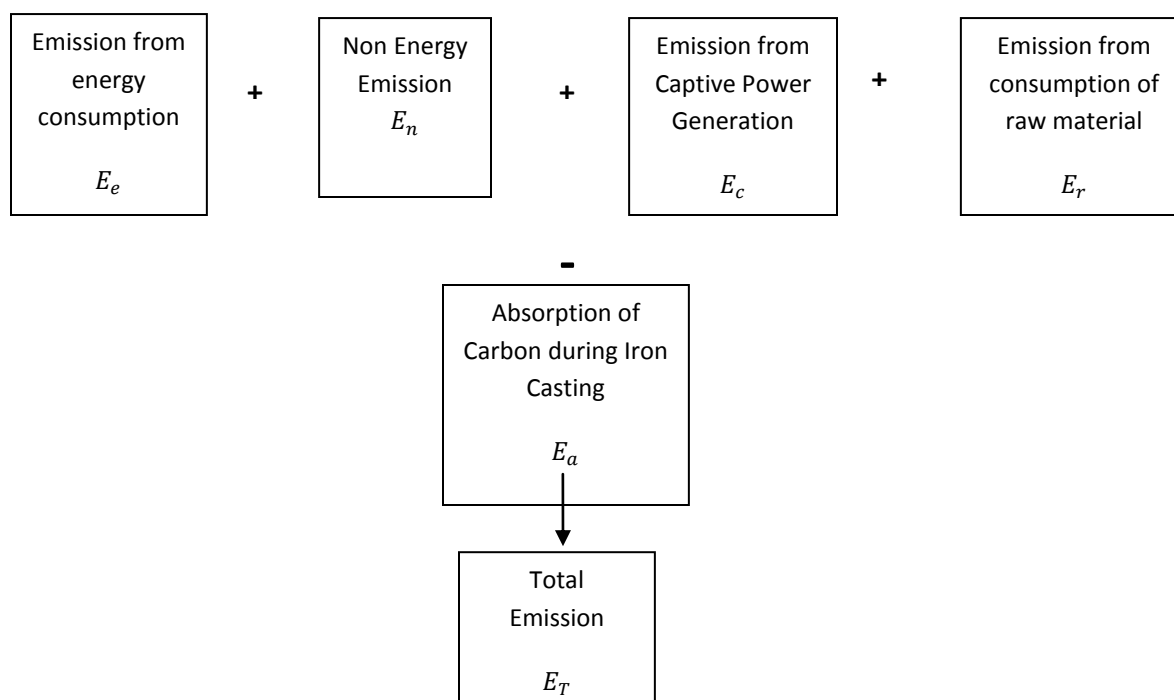
Though steel is a complex product and can be divided into various types as shown in the chart below¹, in this report we are only concerned with the process emissions related to each type. Hence, steel is classified into only High carbon steel typically having carbon content of 1% and Low carbon steel typically with carbon content of 0.4%. The non-energy emissions that occur during the manufacturing process are attributed to each company using the IPCC guidelines for the two types of steel. The classification of the various products by carbon content is provided in Appendix A



¹ Source: PUBLIC ENTERPRISES, GOVERNMENT POLICY AND IMPACT ON COMPETITION, Indian Steel Industry, Indicus Analytics

5. Methodology & Scope

The emissions for 126 companies for the FY 2009-10 were calculated using data from their respective Annual Reports in accordance with the IPCC 2006 guidelines. To enable comparison between the various companies their emission factors were calculated which highlights their emissions per ton of steel produced. The process to calculate their total emissions and emission factor is as follows:



Total emissions for each company are calculated as follows:

$$\text{Total emission } E_{Ti} = E_{ei} + E_{ni} + E_{ci} + E_{ri} - E_{axi}$$

Where:

i is the company whose emission is being calculated
 x is either h if high carbon steel or l if low carbon steel
 and

E_e = Scope 1 emission due to energy fuels such as fossil fuels, wood, municipal waste, peat fuels. This can be classified as Scope 1 emissions.

E_n = Non Energy Emissions are *Scope 3* emissions resulting from the chemical processing during manufacturing of steel

- They depend upon the quality of steel being made. Hence emissions are taken from the IPCC guidelines based on the categorization of manufactured steel as either Low Carbon steel (0.01-0.04% carbon content) or High Carbon Steel (0.05% and above carbon content).

E_c = Captive power emissions are *Scope 1* emissions from the self generation of electricity to meet internal requirements

- A company can produce electricity through various technologies like diesel generator, gas generator, steam generator etc. Depending on the technology and the fossil fuel used emissions from captive power generation is calculated.
- In cases where company specific captive generation emission factors are not available an India average for that particular technology has been used

E_r = *Scope 3* emissions that are attributed to a company for the *raw materials* used

- Wherever Steel is used as Raw material and company from which this steel is purchased is known, then company specific factor is being used to estimate emission from Steel consumption. If it is not known then, emission is estimated by using Average India emission factor for steel consumption.
- Wherever Iron is used as raw material then, emission from this activity is estimated by using Average India emission factor for iron consumption.

E_a = Carbon Dioxide emissions that are *absorbed* during the manufacturing process

- During the manufacturing process such as Iron Casting in the Sintering & Blast Furnace, released Carbon Dioxide gets absorbed by intermediate products. Hence, this emission is subtracted from Total Emission of respective companies.

E_T = Total emissions from the company in FY

The KPI for each company is calculated as follows:

$$EF_i \left(\frac{TCO2e}{Tons\ of\ steel} \right) = \frac{E_{Ti}}{P_{Ti}}$$

Where P_{Ti} is the quantity of steel produced by the company in the financial year

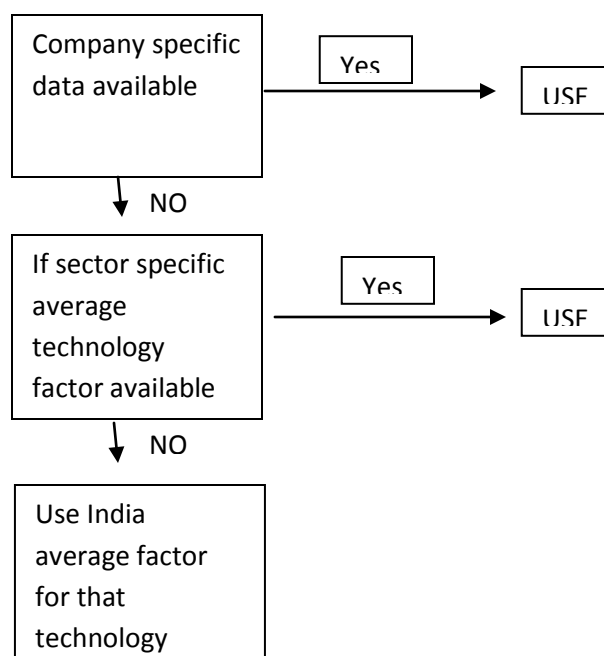
The benchmark for the sector is calculated as follows:

$$EF_{Benchmark,integrated} = \frac{\sum_{i=1}^n E_{Ti}}{\sum_{i=1}^n P_{Ti}}$$

$$EF_{Benchmark,processing} = \frac{\sum_{i=1}^n E_{Ti}}{\sum_{i=1}^n P_{Ti}}$$

Where, n = 1, 210 for Integrated steel companies and
n= 11, 12.....127 for steel processing companies

The basic rules followed for data is as follows:



6. Results

Following is the ranking index of steel manufacturing companies based on their Key Performance Indicator (TCO₂e/Ton of Steel Production)

6.1 Integrated Steel Plants

Sr. No.	Company Name	Production (MT)	GHG Emission (MT CO ₂ e)	MT CO ₂ e/MT of Steel Production
1	Sunflag Iron & Steel Co. Ltd.	309600	284832	0.92
2	Essar Steel Ltd.	3449230	3276768.5	0.95
3	Mukand Ltd.	830730	1221173.1	1.47
4	J S W Steel Ltd.	13206110	21525959.3	1.63
5	Steel Authority Of India Ltd.	26460940	45512816.8	1.72
6	Bhushan Steel Ltd.	1560375	2699448.75	1.73
7	Tata Steel Ltd.	7416860	17132946.6	2.31
8	Super Smelters Ltd.	251870	685086.4	2.72
9	M S P Steel & Power Ltd.	332920	1168549.2	3.51
10	Rashtriya Ispat Nigam Ltd.	3467000	15740180	4.54

6.2 Steel processing companies

Sr. No.	Company Name	Production (MT)	GHG Emission (MT CO ₂ e)	MT CO ₂ e/MT of Steel Production
1	Tata Steel Processing & Distribution Ltd.	1402960	589243.2	0.42
2	Vandana Ispat Ltd.	97530	40962.6	0.42
3	Tayo Rolls Ltd.	29280	14347.2	0.49
4	O C L Iron & Steel Ltd.	172000	110080	0.64
5	Rajinder Alloys Ltd.	1350	985.5	0.73
6	Jai Balaji Inds. Ltd.	1460680	1226971.2	0.84
7	A P Steel Re-Rolling Mill Ltd.	18780	21033.6	1.12
8	Steel Complex Ltd.	11030	12353.6	1.12
9	Apollo Metalex Pvt. Ltd.	40020	45222.6	1.13
10	Paramount Steels Ltd.	19810	22385.3	1.13
11	Panchmahal Steel Ltd.	66710	81386.2	1.22
12	Mukesh Steels Ltd.	20240	24895.2	1.23
13	Jainex Metaliks Ltd.	8450	10478	1.24
14	Narbada Steels Ltd.	32970	42861	1.3

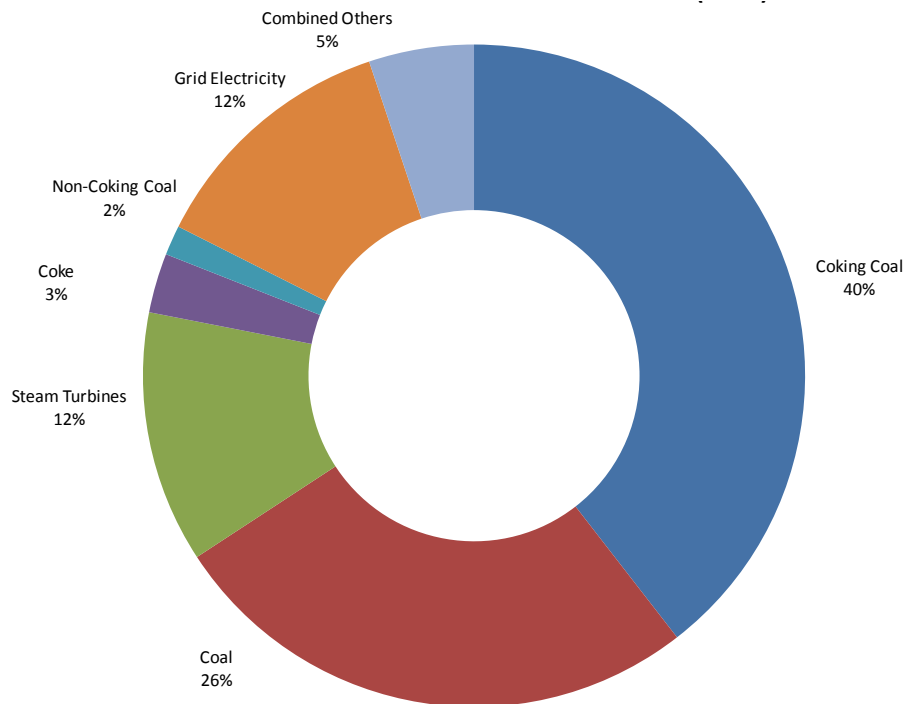
15	Kalyani Steels Ltd.	419450	566257.5	1.35
16	Unison Metals Ltd.	15380	21070.6	1.37
17	Ranjeev Alloys Ltd.	14850	20641.5	1.39
18	S P S Steels Rolling Mills Ltd.	369360	513410.4	1.39
19	Modern Steels Ltd.	81489	115714.38	1.42
20	A M L Steel Ltd.	32970	48136.2	1.46
21	Gyscoal Alloys Ltd.	16180	23784.6	1.47
22	Mangalam Alloys Ltd.	42250	63797.5	1.51
23	Marmagoa Steel Ltd.	90730	138816.9	1.53
24	Kanishk Steel Inds. Ltd.	72160.2	117621.126	1.63
25	Uttam Galva Steels Ltd.	1417900	2538041	1.79
26	Pennar Engineered Building Systems Ltd.	5490	9882	1.8
27	Anugraha Valve Castings Ltd.	3800	7068	1.86
28	Sujana Towers Ltd.	131180	246618.4	1.88
29	Ankit Ispat Pvt. Ltd.	21990	41781	1.9
30	Garg Furnace Ltd.	36629.952	70329.50784	1.92
31	Rathi Steel & Power Ltd.	290040	562677.6	1.94
32	Upper India Steel Mfg. & Engg. Co. Ltd.	109572	212569.68	1.94
33	Vardhman Industries Ltd.	67070	131457.2	1.96
34	Pennar Industries Ltd.	190510	390545.5	2.05
35	Mahavir Rolling Mill Ltd.	23370	50245.5	2.15
36	Gangotri Iron & Steel Co. Ltd.	105210	231462	2.2
37	Tulsyan N E C Ltd.	212430	477967.5	2.25
38	Shah Alloys Ltd.	136370	312287.3	2.29
39	I S M T Ltd.	367180	844514	2.3
40	Steelco Gujarat Ltd.	138040	317492	2.3
41	Gallantt Metal Ltd.	327000.739	755371.7071	2.31
42	Balmukund Concast Ltd.	85270	198679.1	2.33
43	Electrotherm (India) Ltd.	357425	836374.5	2.34
44	Kashi Vishwanath Steels Ltd.	86640	204470.4	2.36
45	Mittal Corp Ltd.	59060	140562.8	2.38
46	Adhunik Metaliks Ltd.	1965364	4697219.96	2.39
47	Ashiana Ispat Ltd.	86210	206041.9	2.39
48	Ambica Steels Ltd.	54080	129792	2.4
49	Garg Inox Ltd.	28500	68685	2.41
50	Jindal Steel & Power Ltd.	5997060	14572855.8	2.43
51	Rajputana Stainless Ltd.	24380	59243.4	2.43
52	R R Ispat Ltd. [Merged]	101730	251273.1	2.47
53	Dina Iron & Steel Ltd.	47203.81	118009.525	2.5
54	Viki Industries Pvt. Ltd.	96850	243093.5	2.51

55	Hira Steels Ltd.	87920	222437.6	2.53
56	Indian Steel Corpn. Ltd.	183900	467106	2.54
57	V V S Alloys Ltd.	28050	71527.5	2.55
58	Unique Structures & Towers Ltd.	23970	61363.2	2.56
59	Aditya Ispat Ltd.	2422.698	6274.78782	2.59
60	Kamdheni Ispat Ltd.	79048	207105.76	2.62
61	Prakash Industries Ltd.	1025630	2697406.9	2.63
62	Sulekhram Steels Pvt. Ltd.	49560	130838.4	2.64
63	Sujana Metal Products Ltd.	270210	716056.5	2.65
64	Ankit Metal & Power Ltd.	252438	671485.08	2.66
65	Rathi Rajasthan Steel Mills Ltd.	42470	114244.3	2.69
66	Shree Yogi Steel Ltd.	14720	39596.8	2.69
67	Ruchi Strips & Alloys Ltd.	94020	253854	2.7
68	R H L Profiles Ltd.	38840	105256.4	2.71
69	R K K R Steels Ltd.	37080	101228.4	2.73
70	Chandi Steel Inds. Ltd.	16270	44579.8	2.74
71	Sirhind Steel Ltd.	24990	68472.6	2.74
72	Adhunik Industries Ltd.	105500	291180	2.76
73	G E I Power Ltd.	3575.63	9868.7388	2.76
74	Shri Bajrang Alloys Ltd.	47710	133588	2.8
75	Orient Steel & Inds. Ltd.	36740	103606.8	2.82
76	Mahindra UGINE Steel Co. Ltd.	173160	491774.4	2.84
77	Shree Sidhali Steels Ltd.	17340	49245.6	2.84
78	Bhuwarka Steel Inds. Ltd.	152220	433827	2.85
79	Gopal Iron & Steels Co. (Gujarat) Ltd.	16919.04	49065.216	2.9
80	R S Infra-Transmission Ltd.	52730	153971.6	2.92
81	Atma Steels Ltd.	900	2655	2.95
82	Sanvijay Rolling & Engg. Ltd.	297690	878185.5	2.95
83	Mahamaya Steel Inds. Ltd.	282660	859286.4	3.04
84	Facor Steels Ltd.	34291	105616.28	3.08
85	National General Inds. Ltd.	6300	19404	3.08
86	Action Ispat & Power Pvt. Ltd.	316370	980747	3.1
87	Mahalakshmi Profile Ltd.	22930	71312.3	3.11
88	Beekay Steel Inds. Ltd.	96590	301360.8	3.12
89	A H W Steels Ltd.	36690	115206.6	3.14
90	Balls & Cylpebs Ltd.	4120	13019.2	3.16
91	Jeevaka Industries Ltd.	75970	246142.8	3.24
92	Real Strips Ltd.	23990	80606.4	3.36
93	Gontermann-Peipers (India) Ltd.	8894	30239.6	3.4
94	Prakash Steelage Ltd.	10700	36380	3.4

95	Balaji Industrial Corpn. Ltd.	18508	63482.44	3.43
96	Shree Electromelts Ltd.	16490	57220.3	3.47
97	Raajratna Metal Inds. Ltd.	22390	79036.7	3.53
98	Goa Ispat Ltd.	59960	213457.6	3.56
99	Anil Special Steel Inds. Ltd.	16470	58962.6	3.58
100	Banyan & Berry Alloys Ltd.	33480	121867.2	3.64
101	Sri Nath Ji Ispat Ltd.	3480	12945.6	3.72
102	Chandan Steel Ltd.	23430	89971.2	3.84
103	J M D Alloys Ltd.	43060	166211.6	3.86
104	Kamper Concast Ltd.	18350	73216.5	3.99
105	J V Strips Ltd.	33150	133926	4.04
106	Hisar Metal Inds. Ltd.	13419	55152.09	4.11
107	Sharda Ispat Ltd.	6700	27537	4.11
108	Godawari Power & Ispat Ltd.	361851	1501681.65	4.15
109	India Steel Works Ltd.	13431	58559.16	4.36
110	Lloyds Steel Inds. Ltd.	470516	2079680.72	4.42
111	Monnet Ispat & Energy Ltd.	916080	4168164	4.55
112	I U P Jindal Metals & Alloys Ltd.	7190	33793	4.7
113	Remi Metals Gujarat Ltd.	89510	427857.8	4.78
114	J S W Ispat Steel Ltd.	7772885	50834667.9	6.54
115	J S L Stainless Ltd.	1023350	7449988	7.28
116	Bihar Foundry & Castings Ltd.	41710	313242.1	7.51
117	Sri Vasavi Inds. Ltd.	41570	478886.4	11.52

7. Analysis

Graph 1: Source of GHG Emissions in the Indian steel sector (2010)



As can be seen in the graph above the largest source of emissions (~66%) is from Coal & coking coal

7.1 Integrated Steel companies

- **Most efficient** steel production in the country turned out to be **0.92 TCO2e/Ton of Steel production**.
- While least efficient steel production is **4.54 TCO2e/Ton** of Steel production
- The average Greenhouse Gas (GHG) intensity of steel integrated plants or the benchmark turned out to be **1.91 TCO2e/ Ton of Steel Production**, based on 2009-2010 data.
- Considering **1.91 TCO2e/Ton of Steel Production as a benchmark value**, 60% companies are performing better than benchmark while 40% are below benchmark.

7.2 Steel Processing companies

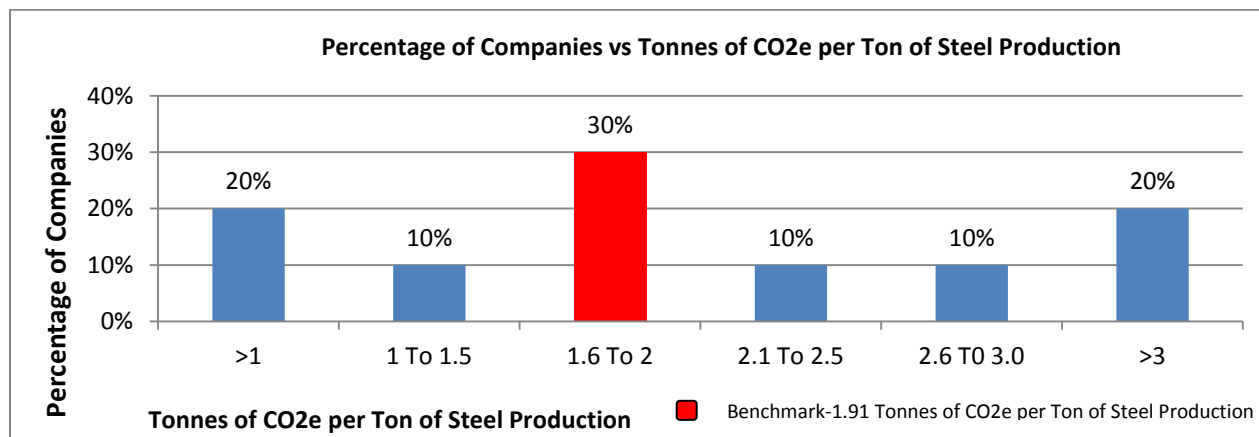
- **Most efficient** steel product production in the country is **0.42 TCO₂e/ Ton of Steel processing²**.
- While least efficient steel production is **11.52 TCO₂e/Ton of Steel** processing.
- The average Greenhouse Gas (GHG) intensity of steel processing companies is **3.49 TCO₂e/Ton of Steel** processed, based on 2009-2010 data.
- Considering **3.49 Tones of CO₂e per Ton of Steel Processing as a benchmark value**, 82% companies are performing better than the benchmark.

² Steel Processing: Companies which do not manufacture Steel, but produced steel end products from purchased steel.

8. Distribution of emission intensities of companies

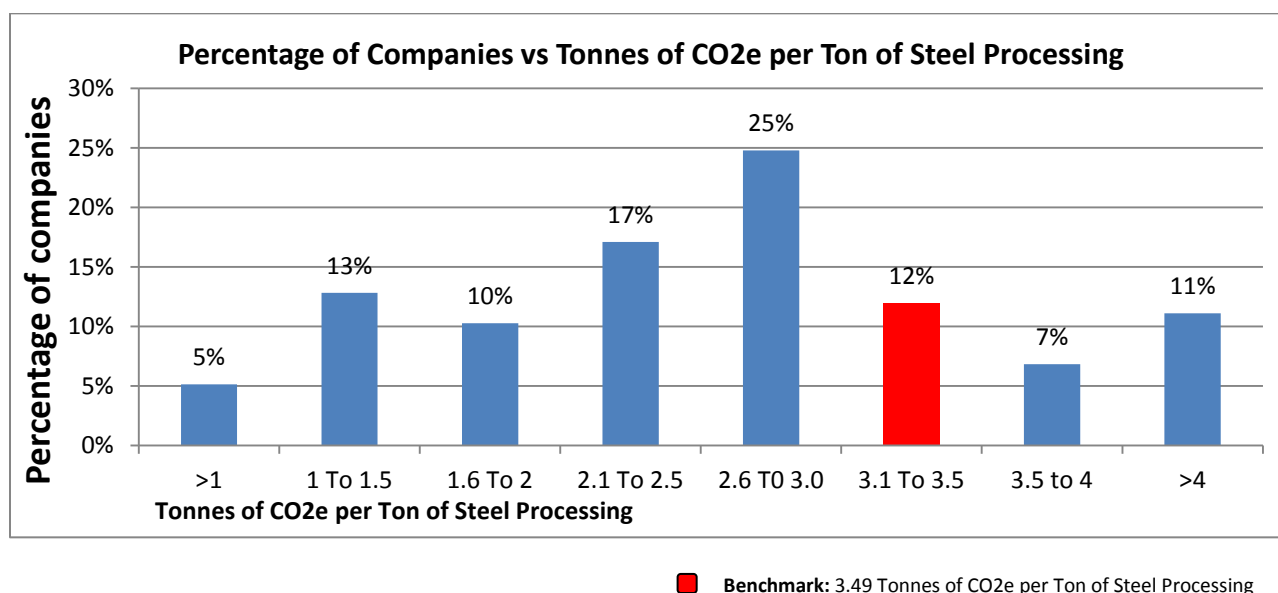
8.1 Integrated Steel companies

Percentage of companies v/s Tonnes of CO₂e per Ton of Steel Production (FY 2009-2010)



8.2 Steel Processing Companies

Percentage of companies v/s Tonnes of CO₂e per Ton of Steel Processing (FY 2009-2010)



9. Conclusions

Given the strong demand scenario, most global steel players are into a massive capacity expansion mode, either through the brownfield or greenfield route. By 2020, the steel production capacity in India is expected to touch 275 million tonnes. While greenfield projects are slated to add 28.7 million tonnes, brownfield expansions are estimated to add 40.5 million tonnes to the existing capacity of 55 million tonnes³. While expansion of production capacity is key for the development of the country the government through incentive based policy as well as the companies themselves should work towards improving the overall efficiency of the sector in order to reduce overall emissions and help India reach its target of 20% reduction in emissions over 2005 levels by 2020.

A low hanging fruit for the Integrated steel companies is to improve the efficiency of the companies that lie within 25% below the benchmark level to atleast the benchmark value. These companies contribute 10% of total emissions of the sector and such action could lead to a reduction of 2988470 MT CO₂e. If all companies below the benchmark move up to atleast the benchmark value then it would lead to reduction of 12855235 MT CO₂e. In the best case scenario, if all companies improve their efficiency to reach the best in class level of 1.92 TCO₂e/Ton of steel, it would lead to a reduction of 56544976 MT CO₂e.

In the case of processing companies since very few companies lie below the benchmark (18%),it would be easier to provide some incentives to help them move up the benchmark level. This would result in a savings of 12151996 MTCO₂e. In the best case scenario, if all companies moved upto the best in class level of 0.42 TCO₂e/Ton of steel a annual reduction of 56.4 MTCO₂e from current levels is possible.

³ PUBLIC ENTERPRISES,GOVERNMENT POLICY AND IMPACT ON COMPETITION - *INDIAN STEEL INDUSTRY*, *Indicus Analytics*

10. APPENDIX

A) Classification of steel products by carbon content

Product	Category
Crude Steel	High-Carbon Steel (1%)
high-strength wires	High-Carbon Steel (1%)
Finished Steel	High-Carbon Steel (1%)
Saleable Steel	High-Carbon Steel (1%)
Saleable Steel (Alloy Steel)	High-Carbon Steel (1%)
Pig Iron (Alloy Steel)	High-Carbon Steel (1%)
Liquid Steel (Alloy Steel)	High-Carbon Steel (1%)
Welded Steel Tubes	High-Carbon Steel (1%)
Wire Rods	High-Carbon Steel (1%)
Wires	High-Carbon Steel (1%)
Hot rolled	Low Carbon Steel (0.4%)
Cold rolled	Low Carbon Steel (0.4%)
structural plates and sections	Low Carbon Steel (0.4%)
sheet or strip	Low Carbon Steel (0.4%)
shafts, axles, gears, crankshafts, couplings and forgings	Low Carbon Steel (0.4%)
railway wheels and rail axles	Low Carbon Steel (0.4%)
Bars	Low Carbon Steel (0.4%)
Billet	Low Carbon Steel (0.4%)
Bloom	Low Carbon Steel (0.4%)
M S Ingot (Mild Steel Ingot)	Low Carbon Steel (0.4%)
Mild & Alloy Rolled Products	Low Carbon Steel (0.4%)
H.B. Wire	Low Carbon Steel (0.4%)
Seamless steel tubes	High-Carbon Steel (1%)
Components and spares	Low Carbon Steel (0.4%)
Coins blank	Low Carbon Steel (0.4%)
Iron and steel products	50% Iron and 50% low carbon steel
Flats	Low Carbon Steel (0.4%)
Semi finished products	High-Carbon Steel (1%)
Finished products	Low Carbon Steel (0.4%)
Beams	Low Carbon Steel (0.4%)
Rounds	Low Carbon Steel (0.4%)
Fabricated Structures	Low Carbon Steel (0.4%)
Forged rolls	Low Carbon Steel (0.4%)