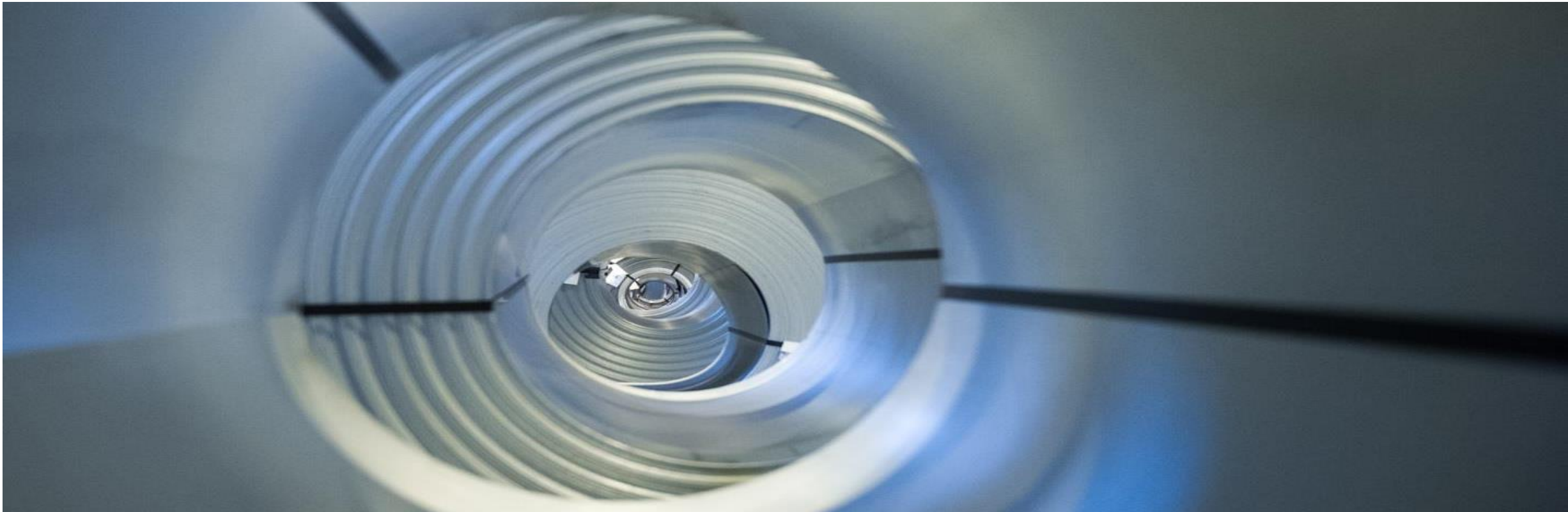


Worldsteel CO₂ Data Collection & reporting
EFDB, 13-14 December, 2017



Disclaimer text

For presentations to Joint IPCC/IEA Expert Meeting on Data,
confidential: Please do not distribute it to third parties.

Background

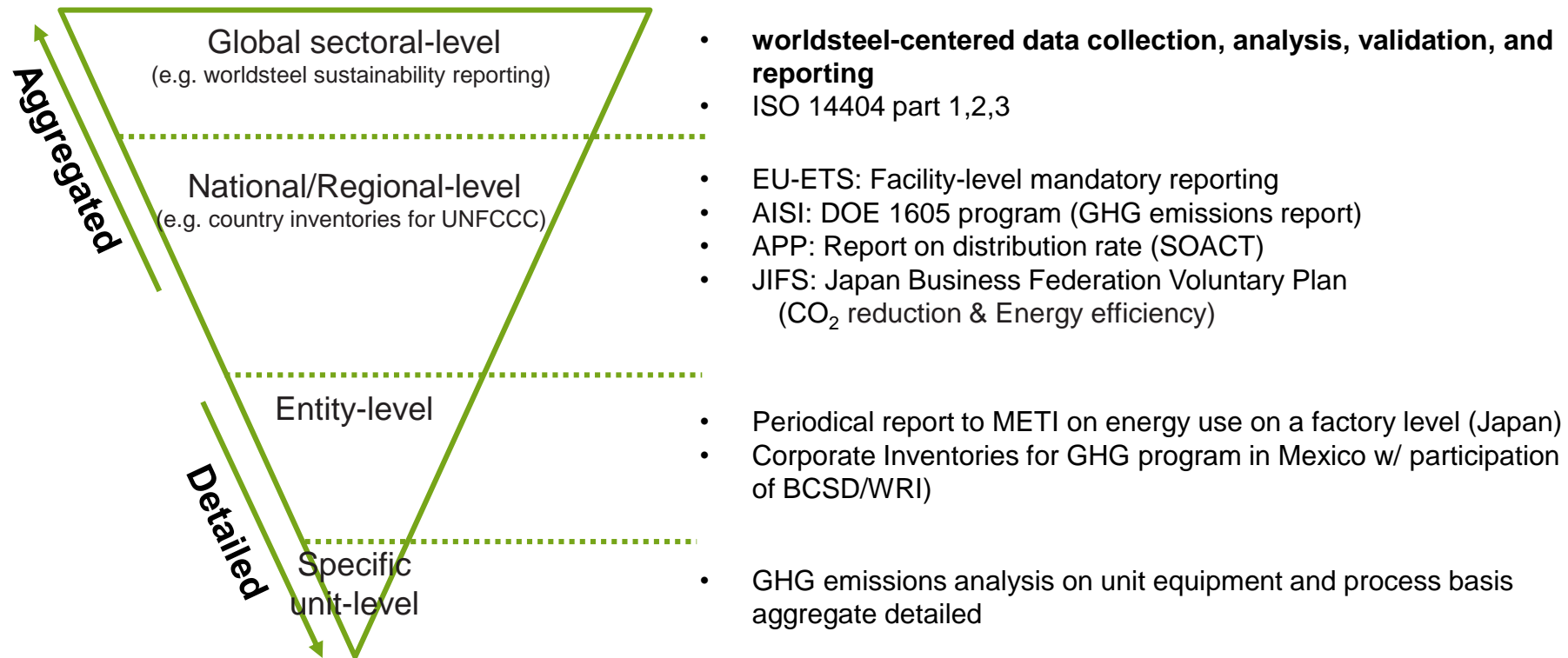
- Climate Change is one of the main challenges for the steel industry in the 21st century
- Steel industry needs to understand and manage its impact on the Environment as well as its potential and opportunity to mitigate Climate Change consequences with steel products
- Data collection, analysis and reporting of CO₂ emissions is a key requirement to establish a base level for the industry and the first step to manage a reduction of CO₂ emissions
- Enables organizations to create a strategy and plan to manage their emissions.

worldsteel CO₂ Data Collection Methodology

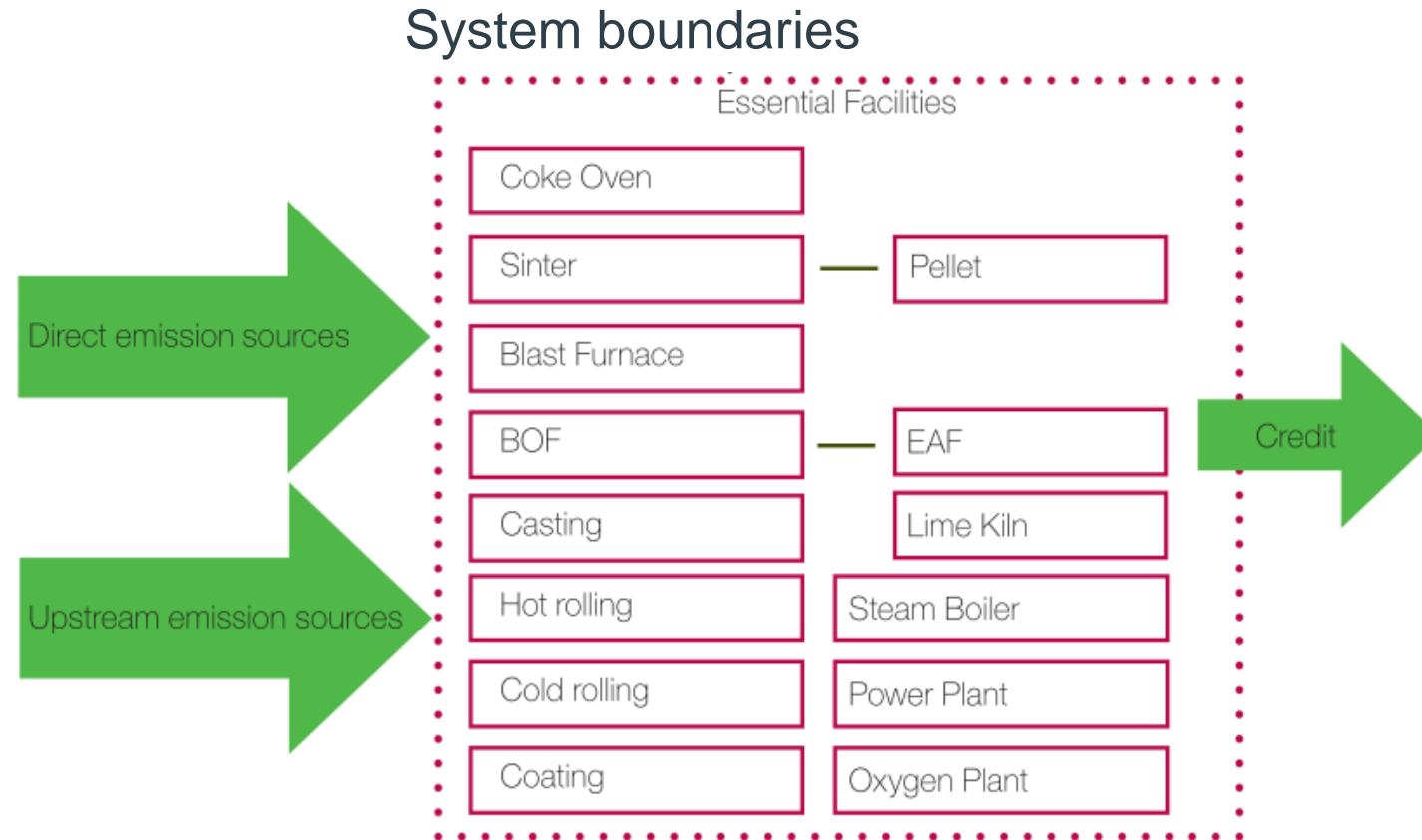
- Common methodology, definitions and boundaries agreed by the worldsteel CO₂ expert group
 - Site-by-site (200 plus sites since 2007)
 - 3 process routes: BF/BOF, EAF, Others
 - Distinction between Scope 1, 2, and 3 emissions
- Similar to GHG protocol 2004 (revised in 2012 & 2014)
- ISO standard for calculation on I&S industry emissions
 - ISO 14404-1 : Steel plant with blast furnace (BF)
 - ISO 14404-2 : Steel plant with electric arc furnace (EAF)
 - ISO 14404-3 : Steel plant with EAF with DRI feed under development by ISO
 - ISO 19694-1,2 : New project approved by ISO (May 2017)
- Open to any steel producing company including non-members of worldsteel.
- Strictly confidential and secure system for data entry (system security to ISO 27001)

Global CO₂ Data Collection Methodologies

■ Detail in accounting & quantifying intensity



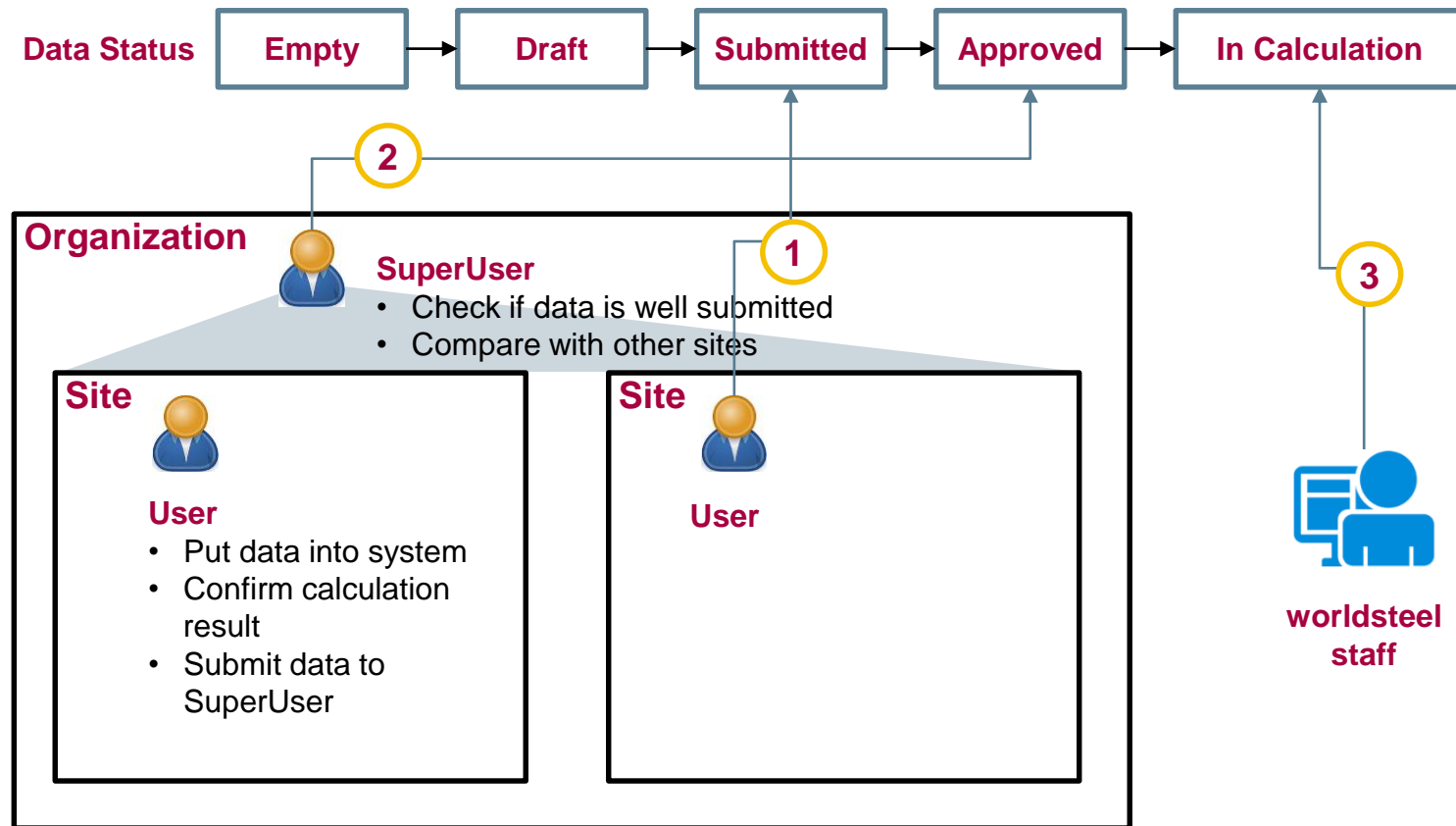
worldsteel CO₂ Data Collection Methodology



- Total CO₂ emissions = Direct + Indirect – Credits
= Sum of Scope 1 + Scope 1.1 + Scope 2 + Scope 3 – Credits
- CO₂ intensity = CO₂ emissions(tonne) / crude steel(tonne)

Steps in worldsteel data submission process

- 1. Users submit their site data on the website, confirm data status
- 2. Superusers approve final data set.
- 3. worldsteel administrator confirms and verifies data



Data Calculation

- Users put data in the yellow boxes, other data is calculated or fixed by expert group.

Legends User input Automated value Fixed value

| CO ₂ emission sources | | Purchased Procured | Sold Delivered | C content (Site measurement) | Energy Equivalent | Conversion Factor tCO ₂ /unit | Upstream CO ₂ value tCO ₂ /unit | Calculation | | | | |
|----------------------------------|--------------------------------------|--------------------|----------------|------------------------------|-------------------|--|---|------------------|------------------|------------------|------------------|--------|
| | | | | | | | | Scope1 | Scope1.1 | Scope2 | Scope3 | Energy |
| | | | | | | | | tCO ₂ | tCO ₂ | tCO ₂ | tCO ₂ | TJ |
| Gas fuel | Coke oven gas (k.m3N) | | 10000 | 0.228 | 19 | 0.835 | 0.977 | -8354 | 8354 | -9771 | | -190 |
| Liquid Fuel | Heavy oil (m3) | 10000 | | N/A | N/A | 2.907 | 0.275 | 29066 | | | 2750 | 377 |
| Solid fuel | Coking coal (dry t) | 5000 | 3000 | 0.834 | 32.2 | 3.056 | N/A | 6111 | | | | 64.4 |
| Alloys | Ferro-nickel (t) | 200 | | 0.01 | N/A | 0.037 | 8.676 | 7 | | | 1735 | |
| Product And By-product | CO ₂ for external use (t) | | 100 | N/A | N/A | 1.000 | N/A | -100 | | | | |
| Auxiliary Materials | Limestone (dry t) | 300 | | N/A | N/A | 0.440 | N/A | 132 | | | | |
| Energy Carriers | Electricity (MWh) | 5000 | 100 | N/A | 9.8 | N/A | 0.504 | | | 2468 | | 48 |
| | Steam (t) | 400 | | N/A | 3.8 | N/A | 0.195 | | | 1953 | | 38 |
| Ferrous Containing Materials | Coal-based DRI(t) | | | N/A | 17.9 | 0.073 | 1.210 | 43.9 | | | 726 | 10.7 |

| | |
|----------------------|--------|
| Steel production (t) | 100000 |
|----------------------|--------|

| | |
|--|-------|
| CO ₂ intensity(tCO ₂ /t Crude Steel) | 0.351 |
| Energy intensity(TJ/t Crude Steel) | 3.478 |

| | |
|--|-------|
| CO₂ intensity without credit (tCO ₂ /t Crude Steel) | 0.352 |
|--|-------|

Emission Factor Comparison

| Unit : tCO2/unit-product | Worldsteel (report 2016) | IPCC |
|--|--|--------------------------|
| Sinter | 0.262 | 0.2 |
| Coke | 0.224 | 0.56 |
| Iron | 1.855 | 1.35 |
| DRI | | 0.7 |
| - Coal Based | 1.21 | |
| - Gas Based | 0.78 | |
| Pellet | 0.137 | 0.03 |
| Steel | | |
| - made by BOF | 2.30 | 1.46 |
| - made by EAF | 0.58 | 0.08 |
| - made by OHF | | 1.72 |
| - Global Average Factor (BOF:EAF:OHF) | 1.87 (74.9%:25.1%) 74.9 includes OHF | 1.06 (65% : 30% : 5%) |

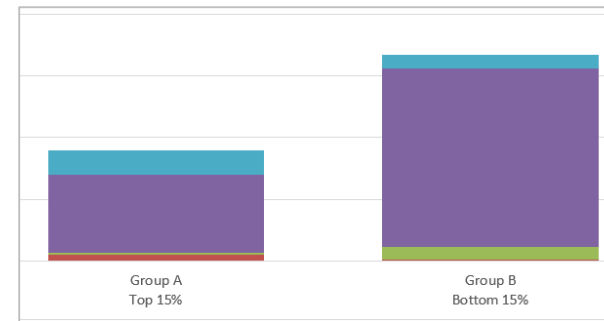
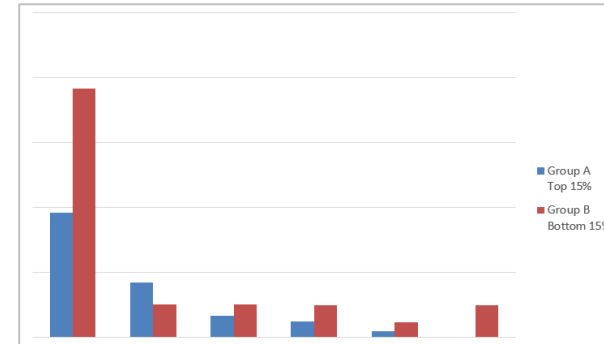
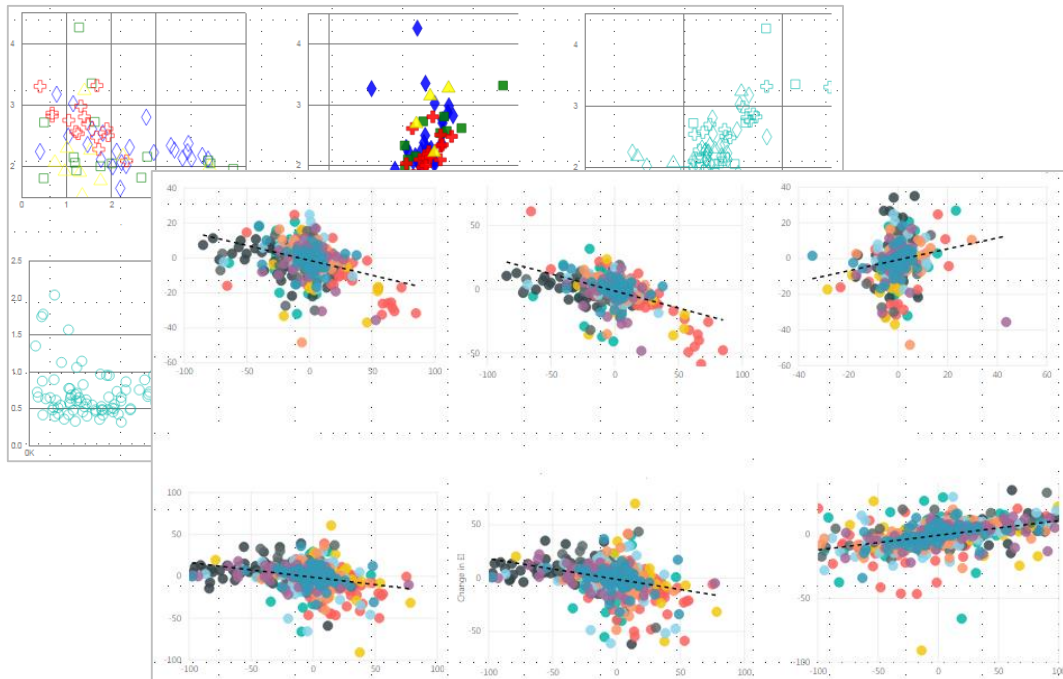
Data Validation Methodology

- Check the data credibility and compare it with known values:
 - CO₂ emission and intensity by scope
 - Fe yield, coke / HM ratio, (pellet + sinter) / HM ratio
 - (Coal + Coke) energy input / ton-crude steel
 - Utility input / ton-crude steel
 - By-product gases export / ton-crude steel
 - (Coal + Benzole) export / ton-crude steel

- If irregular, outlier or unreasonable input is found, then each input is rechecked and confirmed through discussions with SuperUsers.

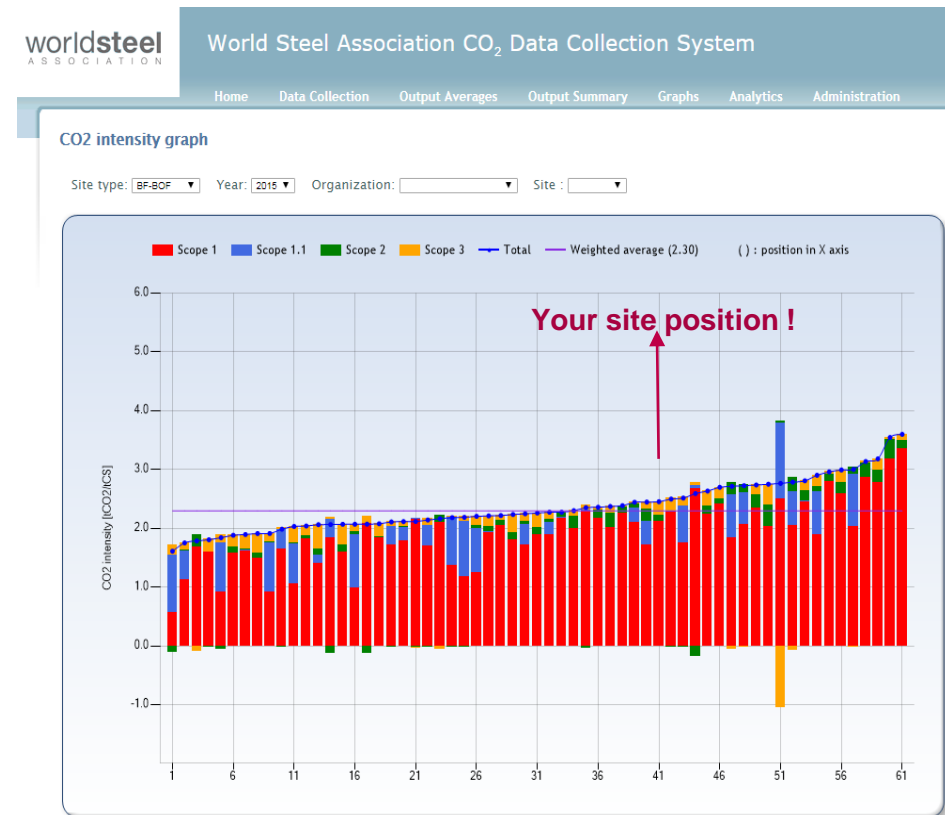
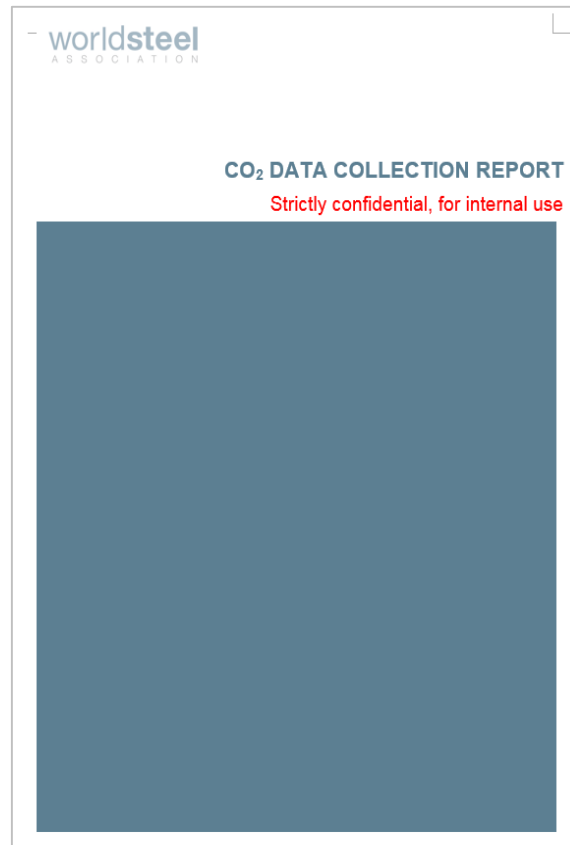
Data Analysis

- Use verified data only, calculate various statistics and find relationship if any.
 - Include comparisons between top 15% and bottom 15% of performers



Report and website

- Reports only sent to participating companies
- Participants can confirm their statistics on the worldsteel website



Climate Action Recognition

- Scheme recognizes that a steel producer has fulfilled its commitment of the worldsteel CO₂ data collection program
- Data must be complete, verified and approved

| Year | 2007 | 2008 | 2009 | 2010 | 2011 | 2012 | 2013 | 2014 | 2015 |
|---------|------|------|------|------|-------------|-------------|-------------|-------------|-------------|
| Company | 38 | 49 | 45 | 51 | 52 (33*) | 50 (37*) | 49 (37*) | 50 (36*) | 48 (35*) |
| Site | 188 | 207 | 208 | 212 | 212 | 210 | 212 | 215 | 198 |

* Companies eligible if they submitted data for 5 consecutive years

- Participants are recognized on the worldsteel website

<https://www.worldsteel.org/steel-by-topic/sustainability/environmental-sustainability/climate-change/Members.html>



Thank you for your attention.

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A S S O C I A T I O N

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