World Benchmarking Alliance

Climate and Energy Benchmark: Heavy industries

Methodology Report

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Introduction

The heavy industry sector is positioned at the end of the global decarbonization journey. Representing 18% of global CO_2 emissions (IEA 2023) in 2022, the sector requires substantial investment in non-mature technologies, changes in century-old production practices and the transformation of the power system in order to meet its climate goals. How are keystone companies tackling these challenges and to what net-zero deadline are they committing us to?

The heavy industries sector finds itself situated at the tail-end of the world's decarbonization journey. Not only does it necessitate the establishment of a clean energy grid, but many of the technologies essential for the transition are either in prototype or demonstration stage, or their upfront costs are prohibitive in a highly competitive global market for industrial commodities. Anticipated increases in demand for industrial production over the medium term until 2030 will pose additional challenges. Wind industries steel consumption is expected to double between 2021-2030 (S&P 2021) while an overall increase of 28% is forecasted to take place between 2022 and 2030 under International Energy Agency's Net-Zero scenario (IEA NZE 2023). The aluminium sector plays a crucial role in supplying battery enclosures for Electric Vehicles (EVs), charging stations and overall charging infrastructure as well as usages in power transmission lines. This underlines the dual role of heavy industries as both delivering the material production crucial for the transition but also as the sector in which emissions are particularly hard to abate. Long investments cycles of typically 40 years means that facilities in place today will likely remain emitting well past 2050.

Overall, in 2022, the industrial sector was a significant contributor to the global carbon footprint, with direct emissions totalling 9 Gt of CO_2, representing a quarter of the overall emissions from the global energy system (IEA 2023). For this benchmark the focus is on the heavy industry segments of iron and steel, cement and aluminium. In 2019 these segments constituted about 40% of direct industrial emissions. Global crude steel production was responsible for approximately 20%, cement production accounted for around 17%, and direct emission of non-ferrous metals like aluminium 3% (IPCC AR6 2022). Although small in terms of global emission share, the aluminium industry is characterised by high intensity factors in the order to 12 tCO_2 per ton of aluminium produced (IEA 2023). These are also some of the segments in which immediate action and technologies available today could bring significant reductions of emissions. Enhancing material efficiency and embracing circular economy solutions can diminish the necessity for primary production and lower steel emission by 40% compared to current production practices (IEA 2019). In cement production, clinker substitution (e.g., limestone + calcined clays) has the potential to reduce emissions up to 50% (Habert et al., 2020).

On the long run, though, a deeper structural change is required to reduce sector emissions in a way that is compatible with a 1.5°C world. By 2050, 95% of CO_2 in cement production will have to be captured and stored, and 96% of primary steel production will need to come from near-zero carbon processes (IEA 2022). Such will imply transitioning to innovative processes utilizing low to zero-carbon energy carriers and feedstocks like electricity, hydrogen, biofuels, and carbon capture and utilization (CCU) for carbon feedstock. Implementing these alternatives mandates a substantial scale-up of infrastructure alongside the phase-out or converted operation of existing industrial plants. These changes will ultimately have an impact on the people working in the sector and their communities. In particular,

lower carbon plants across the heavy industries may benefit from other natural resources than has conventionally been the case. This may lead to some regions benefiting, while other regions may see the important employment from the heavy industries being reduced or relocated elsewhere. In 2017 about 6 Million people were directly employed by the steel industry (World Steel Association 2019) and in 2020 cement and concrete products made up about 38% of the global mineral market (BRC 2021). Heavy industries also tend to employ large numbers of workers concentrated within particular regions impairing labour mobility. And while strong demand can lead to business expansion, required investment in technology can be used as excuse to cut labour costs like transitioning regular employment to contractualization (IUT/JTC 2019).

Heavy industries will establish the global timeline for achieving net-zero emissions as the last coal that kickstarted the industrial revolution will be burnt in its furnaces. Therefore, it is crucial to assess how keystone companies in iron & steel, cement and aluminium segments are preparing for the transition and understand to which future they are locking us in. The benchmark accounts for most of the emission-intense activities along the respective value chains together with a view into the maturity of planning, investments and low-carbon business models of companies.

This sector-specific methodology report complements our general methodology for the Climate and Energy Benchmark.

Benchmarking companies in heavy industries

ACT and Social assessments

The shift towards a renewables-based energy system entails a deep restructuring of global economies, with just transition at the core of this transformation. The Heavy Industries Benchmark takes a holistic approach to assess companies integrating social criteria as part of our methodology. As explained in our general methodology, our benchmark comprises an ACT (Assessing low-carbon transition) assessment (60% of the total score), and a social assessment (20% from just transition indicators and 20% from core social indicators).

Scope of the methodology and the benchmark

For this benchmark, we will assess the heavy industries sector considering three different ACT methodologies based on the scope of companies' activities:

1. The ACT Aluminium methodology applies to companies involved in producing aluminium or alumina. The ACT Aluminium methodology considers eight steps along the sectoral value chain: bauxite mining, aluminium refining, anode production, electrolysis, casting (primary), recycling, semis production, internal scrap remelting. Along the aluminium production value chain, the companies that are not falling in this ACT methodology scope are: pure player bauxite miners, pure player anode producers, and manufacturers of finished products. These exclusions are motivated by the low share of sectoral emissions coming from these activities.

2. The ACT Cement methodology applies to companies that involved in producing cement. The main sources of emissions from the cement industry are the production of clinker and the blinding and griding operations. Along the cement production value chain, the activities that are not falling into this ACT methodology scope are: the extraction of lime (covered by quarries management), and the distribution and manufacturing activities of refractory mortars, concrete, articles of cement, ready-mixed and dry-mix concrete and mortars.

3. The ACT Iron and Steel methodology applies to companies involved in steel making (including the production of iron) and/or steel products shaping activities. The activities not falling in this ACT methodology scope are: iron ore mining, production of ferroalloys, and production of primary inputs for iron-reduction process or steel-making process. These exclusions are motivated by the low share of sectoral emissions coming from these activities, and limited levers to influence the transition of the iron and steel production.

The corresponding Nomenclature of Economic Activities (NACE) codes regarding the scope of activities considered in the ACT Aluminium, Cement, and Iron and Steel methodologies are presented below.

Industry	Activities included in ACT methodologies scope
Aluminium	[24.42]: Aluminium production o Production of aluminium from alumina o Production of aluminium from electrolytic refining of aluminium waste and scrap o Production of aluminium alloys o Semi-manufacture of aluminium [24.53]: Casting of light metals o Casting of semi-finished products of aluminium, magnesium, titanium, zinc etc. o Casting of light metal castings
Cement	[23.51]: Manufacture of cement

Steel	**Steel making** [24.10]: Manufacture of basic iron and steel and of ferro-alloys [24.51]: Casting or iron [24.52]: Casting or steel **Steel shaping** [24.20]: Manufacture of tubes, pipes, hollow profiles and related fittings, of steel [24.31]: Cold drawing of bars [24.32]: Cold rolling of narrow strip [24.33]: Cold forming or folding [24.34]: Cold drawing of wire

For each methodology, the scope of activities assessed is defined in a way that ensures that most of the sectoral emissions sources are covered. For more details about the sectoral activities and how they are taken into account in the assessments, please refer to the section 3 of the ACT Aluminium, Cement, and Iron and Steel methodologies.

The benchmark's social assessment includes just transition and core social indicators. Just transition indicators evaluate companies on their social responsibility, focusing on future plans, commitments, and measurable targets. Core social indicators assess company policies, disclosures, and past performance. Unlike ACT, this social assessment is sector-agnostic, applying the same set of indicators to steel, cement, and aluminium companies. Just transition indicators include:

- Social dialogue and stakeholder engagement.
- Just transition planning.
- Creating and providing or supporting access to green and decent jobs.
- Retaining and re- and/or upskilling.
- Social protection and social impact management.
- Advocacy for policies and regulations

The Heavy Industries Benchmark as a roadmap

The Heavy Industries Benchmark can act as a roadmap for companies to show how can they contribute to achieving the SDGs and the Paris Agreement goals. The ACT assessments place a particular emphasis on the following key areas: alignment of a company's targets across the value chain (i.e., scopes 1 and 2, and scope 3 when relevant); contribution to key sectoral topics such as energy efficiency, contribution to low-carbon energy/electricity generation and consumption, trend in future emissions intensity of own production or sold products. Companies will also be assessed on their low-carbon research and development (R&D) expenditure which are necessary to enable the transition of these manufacturing heavy industries. The ACT methodologies' definitions of low-carbon products and services are aligned with the EU Taxonomy, which includes the manufacture of aluminium, cement, and iron and steel. Further, each company's development of a low-carbon transition plan and scenario analysis, determining the impact on its strategy/business model, are also important elements of the assessments.

All the ACT methodologies were developed with input from a multistakeholder Technical Working Group. Public consultation with a wide range of stakeholders - including companies, civil society, academics and other relevant - and a thorough technical 'road test' were also undertaken. In the context of this 2024 Heavy Industries Benchmark, the ACT Aluminium, Cement, and Iron and Steel methodologies have been applied considering:

- Low-carbon scenarios allowing to define companies' emissions reduction pathways aligned with a 1.5°C ambition. Such scenarios are not mentioned in the current versions of the methodologies since they got published before 1.5°C aligned scenarios and/or sectoral

pathways became available. Since 2021, all companies from sectors covered by the Climate and Energy Benchmark are assessed against 1.5°C aligned pathways.

- Updated performance modules as published by the ACT initiative: modules 5-8 (Management, Supplier engagement, Client engagement, Policy engagement) released in 2022, and module 9 (Business model) released in 2023. Module 1 (Targets) has also been updated to better align assessment of targets with recommendations from the Science-Based Targets initiative (SBTi).

Even if not reflected in the current versions of the ACT Aluminium, Cement, and Iron and Steel methodologies, these updates allow to benefit from latest improvements the ACT initiative brought to some recently developed/updated methodologies.

Notably, the ACT Aluminium, Cement, and Iron and Steel methodologies weigh the different modules that make up the performance scores according to each company's business model's impact on climate change. For each methodology, the sectoral value chain is detailed and activities that can be assessed are listed, as mentioned above. Various company profiles are defined, enabling to fine tune the assessment and reflect as best as possible the levers companies can play with to decarbonise their activities. Typically, the Module 2 (Material investments) and Module 4 (Sold product performance) respective weightings are defined as communicating vessels: the first one reflects the importance of actions linked to companies' owned assets and production, whereas the second one reflects the importance of indirect activities (such as supplying raw materials) and resulting emissions. Some parts of the performance score are given the same weight whatever the industry that is covered, typically Module 1 (Targets), Module 5 (Management), and Module 9 (Business model). This allows a consistent approach of some elements of companies' strategy that are not sector specific and thus a cross-sectoral comparison of assessment results. For more details about the company profiles and respective performance weighting schemes, please refer to the section 6.3. of the ACT Aluminium, Cement, and Iron and Steel methodologies.

The ACT methodologies include indicators that align with the information disclosed by companies using CDP, GRI and SASB reporting frameworks. They are also aligned with and supports the objectives of the recommendations made by the TCFD. Mappings of alignments on transition plan elements across some frameworks can be found in a CDP paper (p. 5) and a GFANZ paper (p. 61).

Selecting the keystone companies in heavy industries

WBA applied systems thinking to identify 12 aluminium , 35 cement, and 45 steel producers that exert a significant influence on achieving the SDGs and the Paris Agreement goals (full company list in Appendix I). Our approach draws from prominent academic research inspired by the notion of 'keystone species' in ecology. The most influential companies in an industry act like keystone species in ecosystems, exerting a disproportionate impact on the structure and system in which they operate.

The companies where identified using the following five criteria and principles established by WBA for selecting keystone companies:

1. The company dominates global production revenues and/or volumes in the aluminium, cement, and steel sectors.
2. The company controls globally significant segments of production and/or service provision, assessed by tons of materials produced and supplied.
3. The company establishes global connections within (eco)systems through subsidiaries and their supply chains.
4. The company wields influence over global governance processes and institutions.
5. The company maintains a global footprint, especially in developing countries.

The distribution of the 92 companies selection among the three industries covered by the 2024 Heavy Industries Benchmark mirrors the respective global production of these materials: roughly 4,300Mt of cement, 2,000 Mt of steel, and 70 Mt of aluminium were produced in 2021. These levels of production lead to resulting global emissions that are much higher for cement and steel industries, compared to the aluminium one. That being said, these three industries are emissions intensive ones and forecast demand is expected to significantly increase, justifying the assessment of companies for each of the three industries in this benchmark. WBA also cross-checked to guarantee overlap between companies assessed in this benchmark and active in low-carbon initiatives[1].

Next steps

1. WBA will contact all 92 companies to encourage their engagement in the benchmarking process. In January 2023, the WBA team will share with companies the ACT and social assessment data collected from public sources for validation. Companies will be provided with resources and materials to learn more about the ACT and social transformation assessments and the WBA Heavy Industries Benchmark.

2. We strongly encourage companies to participate in the data validation process. We will be on hand to answer questions companies have about the assessments and the benchmark. Appeals on the assessment are accepted only from companies actively involved in the data validation process.

3. The benchmark results will be published at the end of Q1 2024.

4. At WBA we intend to contribute to a multi-stakeholder movement. In tandem with the development of the Heavy Industries Benchmark, we will therefore be engaging with our global Alliance and a range of stakeholders to build communities of practice and action to take forward the benchmark findings.

If you have questions about the Climate and Energy Benchmark, please reach out to:

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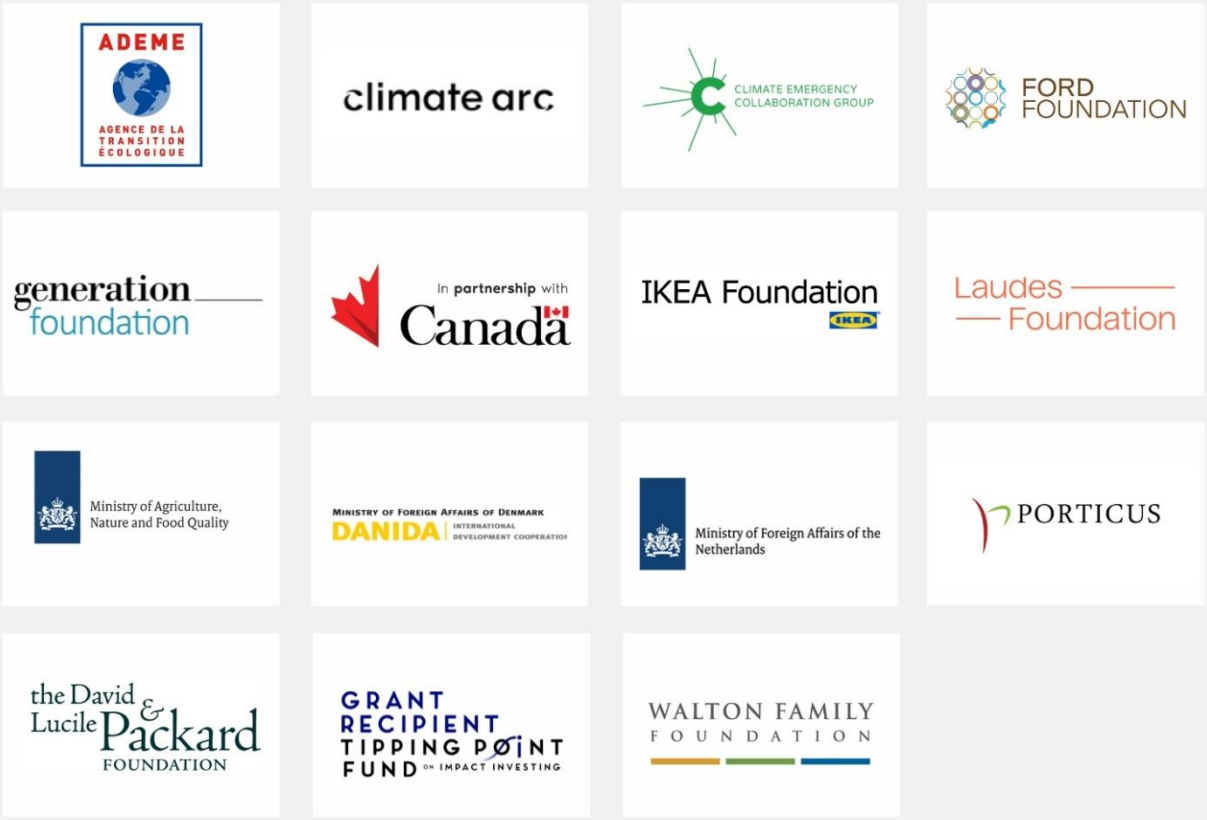
[1] 57% and 20% of company overlap respectively for Transition Pathway Initiative and Climate Action 100+

Appendix I: Companies in the 2024 Heavy Industries Benchmark

N°	**Company name**	**Headquarter**	**Sub-sector**
1	Alcoa	United States of America	Aluminium
2	Anhui Conch Cement	China	Cement
3	Ansteel Group	China	Steel
4	ArcelorMittal	Luxembourg	Steel
5	Arconic	United States of America	Aluminium
6	Asia Cement	Taiwan, China	Cement
7	Baotou Iron and Steel Group	China	Steel
8	Baowu	China	Steel
9	BBMG Corporation	China	Cement
10	Boral	Australia	Cement
11	BUA Cement	Nigeria	Cement
12	Buzzi Unicem	Italy	Cement
13	Cementos Argos	Colombia	Cement
14	Cemex	Mexico	Cement
15	Cemros	Russian Federation	Cement
16	Century Aluminum	United States of America	Aluminium
17	CHALCO	China	Aluminium
18	China Hongqiao Group	China	Aluminium
19	China National Building Material Group	China	Cement
20	China Resources Building Materials Technology	China	Cement
21	China Shanshui Cement Group	China	Cement
22	China Steel	Taiwan, China	Steel
23	China West Construction Group	China	Cement
24	CITIC Pacific Special Steel	China	Steel
25	CRH	Ireland	Cement
26	Dalmia Bharat	India	Cement
27	Dangote Cement	Nigeria	Cement
28	Delong Steel Group	China	Steel
29	Donghai Special Steel	China	Steel
30	Emirates Global Aluminium	United Arab Emirates	Aluminium
31	Evraz	United Kingdom	Steel
32	Gerdau	Brazil	Steel
33	Guangxi Shenglong Metallurgical	China	Steel
34	Hanwa	Japan	Steel
35	Hebei Jingye Group	China	Steel
36	Heidelberg Materials	Germany	Cement
37	Hesteel Group	China	Steel
38	Hindalco	India	Aluminium
39	Holcim	Switzerland	Cement
40	Huaxin Cement	China	Cement
41	Hunan Valin Steel	China	Steel
42	Hyundai Steel	Republic of Korea	Steel
43	InterCement	Brazil	Cement
44	JFE Holdings	Japan	Steel
45	Jiangsu Shagang Group	China	Steel

46	JiuQuan Iron and Steel Group	China	Steel
47	JSW Steel	India	Steel
48	Kobelco Group	Japan	Steel
49	Liuzhou Iron & Steel	China	Steel
50	Maanshan Iron & Steel	China	Steel
51	Martin Marietta	United States of America	Cement
52	Metinvest	Ukraine	Steel
53	Nippon Steel	Japan	Steel
54	NISCO	China	Steel
55	NLMK Group	Russian Federation	Steel
56	Norsk Hydro	Norway	Aluminium
57	Nucor Corporation	United States of America	Steel
58	POSCO	Republic of Korea	Steel
59	Ramco Cements	India	Cement
60	Rio Tinto	United Kingdom	Aluminium
61	Rizhao Steel	China	Steel
62	RUSAL	Russian Federation	Aluminium
63	Salzgitter	Germany	Steel
64	Severstal	Russian Federation	Steel
65	Shougang Group	China	Steel
66	Shree Cement	India	Cement
67	Siam Cement (SCG)	Thailand	Cement
68	Siam City Cement	Thailand	Cement
69	SIG	Indonesia	Cement
70	SISG	China	Steel
71	South32	Australia	Aluminium
72	SSAB	Sweden	Steel
73	Steel Authority of India (SAIL)	India	Steel
74	Steel Dynamics	United States of America	Steel
75	Taiheiyo Cement	Japan	Cement
76	Taiwan Cement	Taiwan, China	Cement
77	Tata Steel	India	Steel
78	Ternium	Luxembourg	Steel
79	thyssenkrupp	Germany	Steel
80	Titan Cement	Belgium	Cement
81	TPI Polene	Thailand	Cement
82	Tsingshan Holding Group	China	Steel
83	U.S. Steel	United States of America	Steel
84	UltraTech Cement	India	Cement
85	UNACEM	Peru	Cement
86	Vedanta	United Kingdom	Aluminium
87	Vicat	France	Cement
88	Voestalpine	Austria	Steel
89	Votorantim Cimentos	Brazil	Cement
90	Xinhua Metallurgical Group	China	Steel
91	Xinyu Iron & Steel	China	Steel
92	Yatai Building Materials	China	Cement



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