Australia's Industry
Inefficient and standing still

KEY FACTS

CLIMATE ANALYTICS

Australia's industrial greenhouse emissions make up almost a third of Australia's overall emissions.

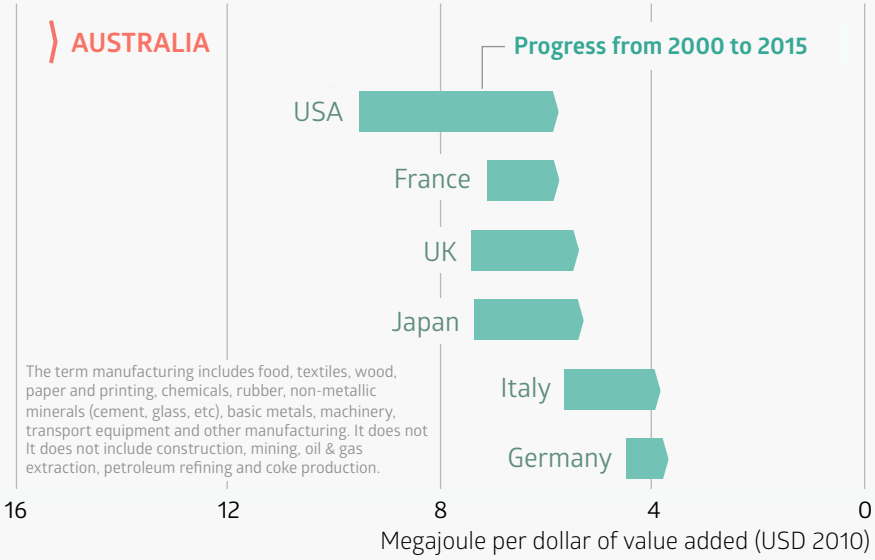
Australia's industry energy efficiency performance is ranked worst of the developed countries among the top 25 energy consuming countries of the world.

Australia has no effective policy to reduce greenhouse gas emissions in the industry sector.

Australia's industry: one of the world's worst in energy efficiency

Australia's manufacturing sector - one of the main sources of greenhouse gas emissions from industry - is effectively standing still on energy efficiency, losing out on the benefits other countries' industries are getting from improving their energy efficiency.
The International Energy Agency (IEA) tracks progress in energy efficiency across countries and sectors. Most countries are making progress on overall energy efficiency improvement, in particular Member States of the European Union (EU), where effective policies are in place. Australia is one of the few countries of a total of 28 analysed by the IEA that is making no real progress. The IEA highlights the importance of policy development examples in the EU and China.

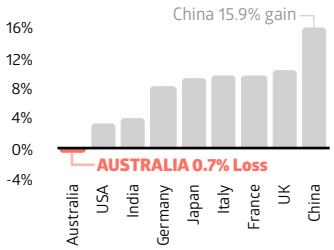
Energy Intensity of all Manufacturing 2000 - 2015



Overall Economy Efficiency Improvement

% improvement 2008 - 2016

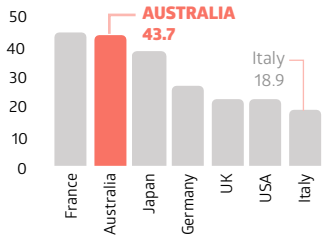
2016 Rank: Last of 9



Basic Metals Energy Intensity

MJ energy / $ USD value added

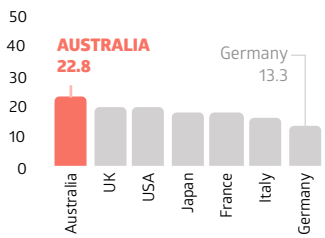
2015 Rank: 2nd last of 7



Non-Metallic Minerals Energy Intensity

MJ energy / $ USD value added

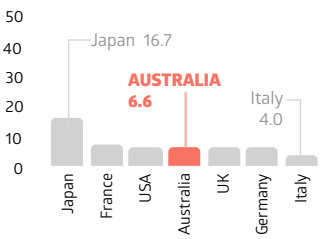
2015 Rank: Last of 7



Mining Energy Intensity

MJ energy / $ USD value added

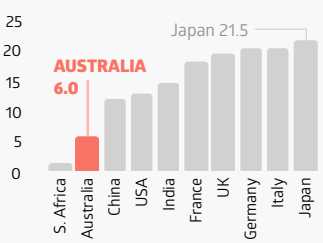
2015 Rank: 4th last of 7



Industry Ranking Total Score

ACEEE Total Score (out of 25)

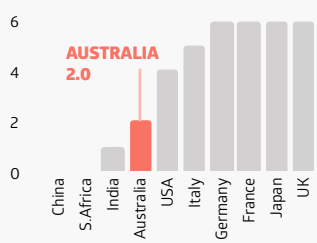
2018 Rank: 2nd last of 10



Industry Ranking on Energy Intensity

ACEEE Score (out of 6)

2018 Rank: 4th last of 10



AUSTRALIAN INDUSTRY RANKED 22ND OUT OF 25

2018 ACEEE INTERNATIONAL ENERGY EFFICIENCY SCORECARD

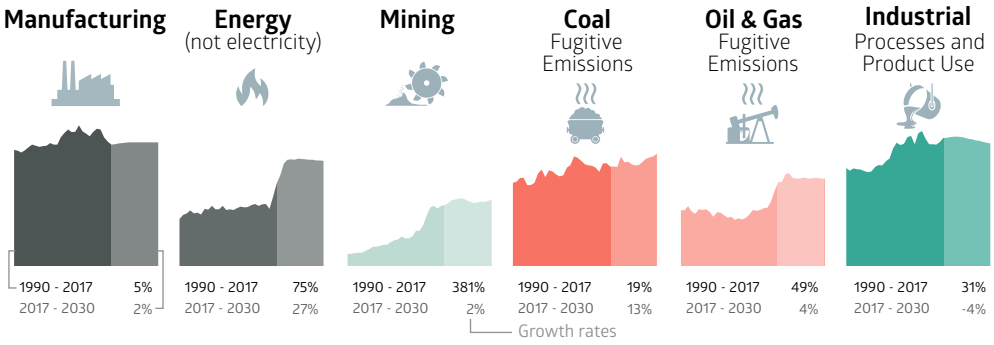
The American Council for an Energy-Efficient Economy (ACEEE) regularly assesses and ranks efficiency policy and performance of 25 of the world's top energy-consuming countries using policy and performance metrics.

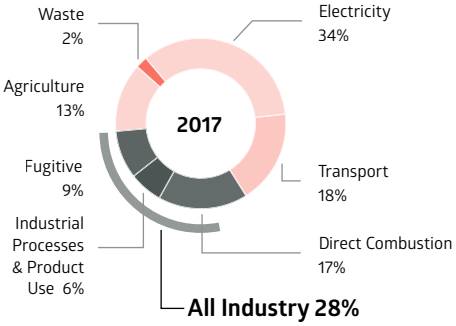
The 2018 International Energy Efficiency Scorecard for the industry sector gave Australia a total score of 6, placing it 22nd of 25 countries. It scored the worst of developed countries by a wide margin, only better than Saudi Arabia, UAE, and South Africa.

Importantly, while European countries, China and India are making improvements, Australia is lagging further behind, falling from rank 10 in 2014 to rank 22 in 2018. Australia ranks poorly both on performance and on policy efforts.

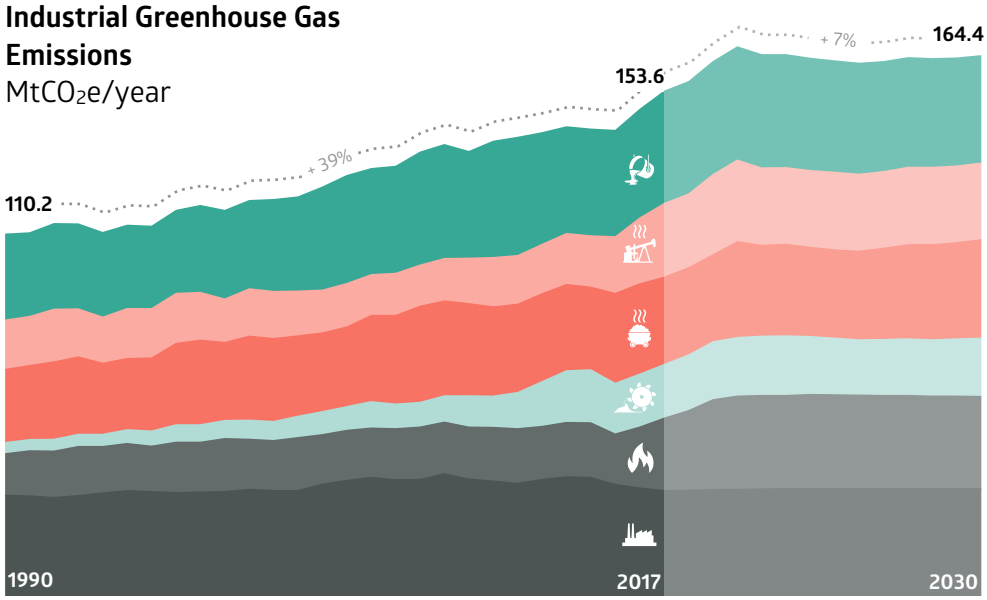
AUSTRALIA'S INDUSTRIAL EMISSIONS ARE RISING

In Australia, greenhouse gas emissions from the industrial sector make up 28% of total emissions. They are mainly caused by "direct combustion", in other words burning fossil fuels for heat, steam or pressure in either the manufacturing, energy or mining sectors. With a rapid increase in production of liquified natural gas (LNG) for export, LNG processing is one of the fastest-growing sources of emissions. Increasing gas extraction is also leading to more fugitive emissions.





Emissions from industrial processes and product use are projected to decrease slightly between 2020 and 2030 due to a recently-legislated phase-down of industrial fluorinated gases (HFCs), which will reduce the permitted amount of bulk HFC gas imports into Australia from 2018. Not shown here are emissions caused by electricity demand in industry, as these are accounted where power is generated.



INDUSTRIAL EMISSIONS STILL RISING...

Australia's industry emissions are continuing to increase, mostly from increasing extraction and production of liquified natural gas (LNG) for export. Emissions from manufacturing and mining are not projected to decrease, nor are fugitive emissions released during coal mining or gas extraction and processing. Australia has minimal policies in place to reduce these emissions. Implementing energy efficiency policies across all industry sectors are key steps in reducing emissions and saving money.

...WHEN THEY SHOULD BE STEADILY DROPPING

Meeting Australia's climate commitments through the Paris Agreement will require steep reductions in emissions across the entire economy. A paradigm shift towards zero emissions and decarbonisation of key industry sectors is critical.

THE PARIS AGREEMENT TEMPERATURE GOAL
WHAT DOES IT MEAN FOR INDUSTRY?

The Paris Agreement,[1] ratified by 181 governments, is a remarkable achievement for multilateralism and a landmark in the global fight against climate change. It aims to reduce the risks and impacts of climate change by by holding warming to well below 2°C and pursuing efforts to limit it to 1.5°C above pre-industrial levels.

Achieving the Paris 1.5°C limit requires urgent and comprehensive action. Every sector of the economy will be required to play its part in the deep and rapid decarbonisation of the overall economy.

Decarbonising Australia's industry sector, which accounted for more than 40% of global total GHG emissions in 2010, needs to be achieved through increasing energy efficiency as well as emissions efficiency (fuel switching and process changes/innovation), material efficiency, demand reductions, and full decarbonisation. The Industry sector is incredibly varied and challenges differ significantly, but technologies are available across the board. Electrification and green - renewable - hydrogen with zero emissions power is the key.

181 COUNTRIES
HAVE RATIFIED

1.5°C
TEMPERATURE LIMIT

ENERGY AND MATERIAL EFFICIENCY

REDUCE DEMAND

DECARBONISATION
REPLACE GAS, CHANGE PROCESSES, INNOVATE

ELECRIFICATION
BUILD GREEN HYDROGEN SUPPLY CHAIN

POLICY CHECKLIST

The industrial sector involves a broad range of activities from the extraction of raw materials to the manufacture of highly engineered products. Policy recommendations for one specific industrial process might not apply to another. However reducing energy consumption, eliminating waste by closing loops and having well managed processes are the hallmarks of good policy. Addressing the growing fugitive emissions in energy extraction and processing is also a key policy area to get right. There is concern that actual loss rates of methane, a potent greenhouse gas, could be much higher than estimated in present Australian inventories.

Improving energy efficiency is one of the key strategies in reducing emissions across all sectors, particularly in the wide range of industry sectors. Many countries are applying a range of policies, not only to reduce emissions, but also to reduce costs and increase competitiveness. While other countries are making progress - in Europe, China, and India - Australia is one of the few countries in the world that is going backwards and is ranked the worst performing major developed country. Australia is even lagging behind some developing countries such as India.

Disclaimer: Given the heterogeneous nature of the industry sector, the list below is by no means exhaustive, but should provide a first ground for action. While focus is on non-electricity, efficiency policies are relevant also for reduced electricity demand.

DEDICATED POLICY TO ENCOURAGE ENERGY MANAGEMENT

National governments can improve energy efficiency in industries by encouraging the implementation of energy management systems (EnMS). An EnMS standard provides guidance for industrial and commercial facilities to integrate energy efficiency into their management practices. The ISO 50001 energy management system standard provides a common framework for industrial or commercial facilities. Some countries have policies in place but only a limited number of facilities with the standard.

Australia has no policy to encourage EnMS and only a very limited number of facilities have the ISO 50001 standard.

SPOTLIGHT ON: GERMANY

The increasingly large acceptance in German companies of the ISO 50001 is largely due to the legal requirements but is also encouraged by a number of incentives. The introduction of Energy Management Standard ISO 50001 is one of the driving forces for industrial energy efficiency in Germany.

Australia	USA	China	Japan	S.Africa	India	France	UK	Germany	Italy	EU
⊗	⊖	✓	⊖	⊗	✓	✓	✓	✓	✓	✓

MANDATORY ENERGY AUDITS

Mandatory energy audits are an important policy tool that requires obligated parties to undertake energy audits. Energy audits can help businesses identify opportunities to improve energy efficiency, benchmark improvements, and identify negative trends.

Australia does not require industrial facilities to conduct regular energy audits. The voluntary 2006 *Energy Efficiency Opportunities Act* was abandoned in 2014.

SPOTLIGHT ON: EUROPEAN UNION

The Energy Efficiency Directive (2012/27/EU) places requirements on governments, power plants, and large enterprises. The directive requires all large enterprises in Europe to carry out an energy audit every four years.

Australia	USA	China	Japan	S.Africa	India	France	UK	Germany	Italy	EU
⊗	⊗	✓	✓	⊗	✓	✓	✓	✓	✓	✓

AGREEMENTS WITH INCENTIVES FOR INDUSTRY

National governments can enter into agreements with businesses in the manufacturing sector to improve energy efficiency. They can link this to incentives or other financial support for achievements and/or participation and scores by country.

Australia does not have any agreement with industry nor any financial incentive to improve energy efficiency.

SPOTLIGHT ON: GERMANY

An agreement with industry sets targets for reductions in energy intensity until 2022 with a tax exemption as incentive. Government funding is available to certain companies to replace inefficient engines, pumps, and compressors and auction for efficiency solutions.

Australia	USA	China	Japan	S.Africa	India	France	UK	Germany	Italy	EU
⊗	⊗	⊗	✓	⊗	✓	✓	✓	✓	✓	N/A

EFFICIENCY STANDARDS FOR ELECTRIC MOTORS (MEPS)

Electric motors account for 70% of electricity consumption in industry. Many countries have established mandatory motor efficiency standards to limit the amount of energy that motors can consume, but their stringency varies. These so called MEPS (Minimum Energy Performance Standard) on efficiency classes (IE1 - IE4) are considered the best way to ensure significant and timely market penetration of high efficiency motors.

Australia's mandated efficiency standards are weak in international comparison, especially to other high-income countries.

SPOTLIGHT ON: JAPAN

Japan belongs to the countries with the most ambitious standards for motors. Importers must provide a self declaration for efficiency level. This is only one example of a wide range of mandatory standards and benchmarks applied in Japan for designated industries efficiency targets (IIP 2018b).

Australia	USA	China	Japan	S.Africa	India	France	UK	Germany	Italy	EU
⊖ ≤IE2	✓ ≥IE3	⊖ ≤IE2	✓ ≥IE3	⊗ No MEPS	⊖ ≤IE2	✓ ≥IE3	✓ ≥IE3	✓ ≥IE3	✓ ≥IE3	✓ ≥IE3

THERE ARE MANY REASONS TO DECARBONISE

Beyond honouring Australia's commitments made under the Paris Agreement, there are a great many reasons to decarbonise the industrial sector beyond just avoiding dangerous climate change. It is a win-win-win strategy for people, the environment and the economy.

ENERGY SAVINGS = MONEY SAVINGS

Energy savings directly translate into monetary savings, too. Industrial energy users implementing improved energy efficiency also benefit from reduced exposure to energy price volatility, which in itself has an economic benefit. Companies that implement ISO 50001 or similar standards can achieve annual energy and financial savings of over 10%.

TRICKLE DOWN - NON ENERGY SAVINGS

Additional non-energy benefits at the energy user level can include improved productivity, removing production constraints, and an improved working environment.
Firms with low energy productivity can increase their profits substantially by increasing energy efficiency to the standard achieved by their better performing peers.

BENEFIT FROM CIRCULAR ECONOMY

Moving from the traditional linear economy (make, use and dispose) to the circular economy (make, use, reuse) offers triple benefits: economic, environmental and employment. It helps businesses to mitigate "linear risks" - supply chain failures due to utilisation of scarce and non-renewable resources as well as fines or lawsuits due to changing legislation.

THE RENEWABLE OPPORTUNITY FOR STEEL PRODUCTION

Options for zero carbon primary steel production are the combination of renewable energy with an electrolysis reduction process route and the production of primary steel through direct reduction of iron ore with renewables-based hydrogen. Australia with its huge potential for wind and solar energy can become a world leader in zero emissions still production.

GLOBAL RENEWABLE ENERGY SUPERPOWER

With high renewable potential, high level technical and engineering capabilities, infrastructure and proximity to Asian markets to develop a carbon free energy system for domestic use and exports, Australia has an unprecedented opportunity to make a transition from a leading LNG and coal exporter to a global renewable energy superpower exporting zero emissions products

BOOST EMPLOYMENT

Energy efficiency creates three types of jobs: direct employment through the installation of the desired measures, indirect employment through the production of the materials and tools used and through the production and services bought with the money saved from not spending it on energy, With Australia transforming to a renewable energy superpower, more jobs can be created with zero emissions products.

NEW MATERIALS, NEW POTENTIAL

An illustration from the building industry: compared with concrete as a building material, timber is cheaper and easier to assemble, which means its potential could be significant as we build sustainable and affordable housing. Timber is, somewhat counterintuitively, fire-resistant and it is a carbon sink, storing the CO2 it absorbed during growth when it is used for long-lived structures.

GREENER GROWTH

The economies of the future need to be less polluting and less materially intensive if growth is to be sustained. Economists are also realising that the low-carbon transition can itself can be a source of economic growth.
The global efficiency market is expanding, and Australia risks losing out on opportunities.

EXAMPLES WORTH FOLLOWING

GERMANY
EFFICIENCY AND DECARBONISATION

Germany's policy measures range from voluntary agreements with industry to reduce emissions, coupled with tax exemptions for large companies if targets are achieved - to providing funding to small and medium size companies to replace inefficient systems with energy saving measures, policies to encourage implementing energy management systems. It has one of the largest number of facilities certified to the ISO 50001 standards.
Germany is also taking further steps to reduce emissions: it has a dedicated sectoral greenhouse gas emissions reduction target for the industry sector for 2030 and is starting to develop a strategy to fully decarbonise the industry sector.

SWEDEN
STEEL WITHOUT FOSSIL FUELS

Sweden is one of the first to take decisive action to encourage industrial decarbonisation and using its abundant renewable energy as a comparative advantage in the process. The Swedish Government and manufacturers have jointly teamed up to explore. Among other examples, creating zero carbon steel with green - renewable energy-based - hydrogen instead of coking coal. This is an important step towards achieving the target of becoming fossil free by 2045. This is an example that Australia can follow - with one of the best renewable energy resources in the world - and the world's largest iron ore resources exported to markets that have a strong interest in decarbonisation.

NATIONAL POLICY PERFORMANCE

SAFEGUARD MECHANISM
NO BARRIER TO EMISSIONS GROWTH

There is no effective policy to reduce greenhouse gas emissions from burning fossil fuels in the industry sector.

The so-called centrepiece of Australia's climate policy, the Emission Reduction Fund (ERF), has barely any industrial sector projects in its portfolio. Instead, it is dominated by projects in the land-use sector: only 5.2 million tonnes of a total of 192 million tonnes of abatement contracted through the ERF so far are from projects related to energy efficiency, and four million tonnes for industrial fugitive emissions.

The safeguard mechanism under the Direct Action Plan was established in 2016 to limit significant emissions increases from large industrial sources to a baseline emissions level. The idea is to ensure "that emissions reductions paid for through the crediting and purchasing elements of the ERF are not displaced by significant increases in emissions above business-as-usual levels elsewhere in the economy."

Clearly, business-as-usual is far away from an appropriate benchmark for the future. And baselines are defined generously, allowing for increasing emissions.
High-emitting industrial facilities covered by the safeguard mechanism are projected to drive up national emissions growth through to 2030, leading to a projected increase of emissions from these facilities by 16% since the commencement of the scheme, potentially cancelling out taxpayer-funded emissions reductions under the ERF.

The government is now consulting with industry stakeholders on how to make the safeguard mechanism "fairer and simpler", with the proposed changes risking an increase in the level of emissions allowances and therefore fewer incentives to drive efficiency and transformation in the industry sector.

ENERGY EFFICIENCY
NEPP: PLAN BUT NO ACTION

Almost four years after the Government's publication of the "National Energy Productivity Plan 2015-2030" its impact is yet to materialise - in other words, commitment is lacking.

The plan aims to improve energy productivity (that is economic output per unit of energy used) by 40% between 2015 and 2030. Australia has not implemented any of the policies that have proven key to increasing efficiency and reducing emissions in the industry sector, such as high efficiency standards and regulation, encouragement for energy management and energy auditing.

ELECTRIFICATION AND GREEN HYDROGEN
INDUSTRY: THE FUTURE IS RENEWABLE

Many studies have shown that Australia can decarbonise its industry sector and transition away from fossil fuels by 2050.

Many heating processes in industry can be replaced to use electricity which can be produced 100% from renewable energy sources, mainly wind and solar.

In other processes such as high temperature heating or ammonia production, fossil fuel gas can be replaced by green - renewable - hydrogen - based on 100% renewable energy power.

The IEA has pointed out the vast opportunities in Australia based on the "extreme abundance of solar and wind resources" to spur international trade in renewables-based, hydrogen-rich chemicals and fuels.

STATES AND CITIES LEADING THE WAY

SOUTH AUSTRALIA
HYDROGEN ROAD MAP

South Australia is betting on a hydrogen economy on the horizon, having recognised the tremendous benefits and opportunities attached to it. Experts say with the right conditions, exports of Australian hydrogen could be worth $1.7 billion a year and could generate 2800 jobs by 2030. It's no wonder South Australia has its eye on the prize, and it has developed a Hydrogen Road Map that sets out a clear course towards a hydrogen economy. South Australia aims to capitalise on its competitive advantages, including high renewable energy deployment, and wind and solar resources, to accelerate the transition to being a producer, consumer and exporter of hydrogen. It will host Australia's first renewable-hydrogen electrolyser plant, a.k.a. "liquid sunshine" producer.

Other states are starting to recognise their potential, with the Premier of Western Australia (WA) recently announcing the establishment of a Renewable Hydrogen Council to develop a state strategy, building on WA's vast potentials, extensive experience with natural gas infrastructure that can be applied to hydrogen, and specific opportunities including for export to existing and future markets for LNG.

KARRATHA, WA
PIONEERING GREEN HYDROGEN

The City of Karratha in the Pilbara region of Western Australia is looking to establish itself as "the renewable hydrogen capital of Australia", building on the exceptionally good solar and wind potential in the Pilbara, as well as its gas processing and export infrastructure.

The company, Yara Pilbara, based in Dampier, Karratha, is investigating the feasibility of a pilot project to produce renewable hydrogen and feed it into its existing facilities for ammonia production. Ammonia is currently produced with natural gas, but can also be produced from green hydrogen through electrolysis of water with electricity from solar energy - with zero carbon emissions. Ammonia is used for fertiliser production and can also be used to export green hydrogen.

This is an example of vision and commitment from local government, with the private sector leading the way.

ELECTRICITY → H_2 HYDROGEN → NH_3 AMMONIA

ABOUT THE AUTHOR

CLIMATE ANALYTICS

Supporting science-based policy to prevent dangerous climate change, enabling sustainable development.

Climate Analytics is a non-profit climate science and policy institute based in Berlin, Germany with offices in New York, USA, Lomé, Togo and Perth, Australia, which brings together interdisciplinary expertise in the scientific and policy aspects of climate change. Our mission is to synthesise and advance scientific knowledge in the area of climate change.

climateanalytics.org

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Graph: Mining Energy Efficiency
Graph: Basic Metals Energy Efficiency
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Graph: Industry Ranking Total Score
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Footnote

1 - Conceptualising the Paris Agreement's temperature goal
More than two decades of international climate negotiations laid the groundwork for the Paris Agreement and it is with this rich history in mind this treaty should be understood and conceptualised, particularly with regards to the long-term temperature goal.

At the Earth Summit in Rio de Janeiro in 1992 the UN Framework Convention on Climate Change (UNFCCC) was adopted with the ultimate objective being the "stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system" (United Nations, 1992). Importantly, it had neither been clarified what level of climate change is to be considered "dangerous", nor was there an agreement on the exact concentration levels required to reach that objective. It was only in the Copenhagen Accord from 2009 that the first long-temperature goal of limiting the global temperature increase to **below 2 degrees Celsius** was mentioned (UNFCCC, 2010). During the subsequent COP16 in Cancun in 2010 the Parties adopted the 2°C limit, expressed as the aim "to hold the increase in global average temperature below 2°C above preindustrial levels".

Notwithstanding this decision, in 2010 the UNFCCC established a review process to evaluate whether the long-term global temperature goal of holding warming below 2°C was adequate to avoid dangerous climate change and to consider "strengthening the long-term global goal on the basis of the best available scientific knowledge, including in relation to a global average temperature rise of 1.5°C". In 2015 the Structured Expert Dialogue ended with the conclusion that a warming of 2°C cannot be considered safe (UNFCCC, 2015b). This has ultimately led to the Paris Agreement's objective to "pursue efforts to limit" global warming to 1.5°C above preindustrial, while holding warming to "**well below 2°C"**.

The Paris Agreement's long-term temperature goal therefore goes beyond the Cancun Agreements' 2°C temperature limit.

Under the long-term temperature goal (Article 2.1) of the Paris Agreement, Parties agreed to "holding the increase in the global average temperature to well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognising that this would significantly reduce the risk and impacts of climate change".

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