# CHINA'S 'GREEN STEEL': UNCHAINING FROM AUSTRALIA

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IN JUNE 2022, the Chinese Ministry of Ecology and Environment and sixteen other government departments jointly released their *National Climate Change Adaptation Strategy 2035*.[1] The document outlined plans for the People's Republic of China (PRC) to become a 'climate-resilient society' by 2035. It emphasised the need for adaptation and mitigation — namely, reducing emissions through new technologies and renewable energy.

Coming less than two years after President Xi Jinping announced the PRC's 2030–2060 targets, the strategy reaffirms China's determination to achieve its decarbonisation goals: a peak in carbon dioxide emissions before 2030 and achieving carbon neutrality before 2060.[2]

The iron and steel industry is the second-largest carbon emitter in China and accounts for about 17 percent of its total emissions.[3] 'Green steel', made from a carbon-free reductant such as hydrogen (produced using renewable energy resources) instead of carbon monoxide (from coal), is being hailed by scientists and policymakers as a global solution for reducing carbon emissions.[4] China's push towards greener steel production, even though this cannot happen overnight and requires

costly changes within the industry, will have a profound impact on Australia's export industry.

## Decarbonising the Steel Industry

Adopting low-emission technologies is just one of the three main approaches the PRC has adopted to accelerate the decarbonisation of its steel industry.

Less production means fewer emissions. In the early 2010s, China addressed the issue of overproduction by closing steel mills that failed to meet pollutant emission and energy consumption standards. In 2018, the Ministry of Industry and Information Technology (MIIT) set up 'capacity replacement' rules under which a new steel mill can only be built if its capacity is less than 80 percent of the one it is replacing.[5] Essentially, new steel mills are required to produce less.

Since the 2030–2060 targets were announced in September 2020, the steel sector has moved further to reduce steel output.[6] In 2021, China's crude steel output was 1.03 billion tonnes — a 3 percent drop from the previous year.[7] It was the first decrease in six years. Steel output during the first five months of 2022 dropped a further 3.81 million tonnes, or 8.7 percent year-on-year.[8]

China also plans to use more scrap steel as feedstock, instead of iron ore, to achieve a circular economy[9] for environmental and political purposes. This will help China to decarbonise its steel sector and reduce reliance on iron ore imports from Australia.[10] Scrap steel comes from various sources including offcuts from the steel industry itself as well as obsolete materials, such as railway tracks, ships, cars, and steel cans. The proportion of China's crude steel production from scrap steel is still relatively low, lagging far behind other big steel producers, like the European Union and the United States, where steel produced from scrap accounts for half of all production.[11] However, things are changing quickly. In 2020, China used 220.3 million tonnes of scrap to produce 20.7 percent of its crude steel, replacing 410 million tonnes of iron ore.[12] The lifting of China's ban on imports of scrap steel in January 2021 is a clear sign of an increased domestic demand for recyclable steel.[13] Experts have projected an

increase of about 500 million tonnes in China's domestic scrap steel resources in the next three decades, with the majority coming from end-of-life steel-containing products.[14]

## Hydrogen-Based Steelmaking Comes Slowly and With a Big Price Tag

There are two ways hydrogen can be used in steelmaking: as an auxiliary reducing agent injected into a blast furnace (technically referred to as $H_2$-BF) or as the sole reducing agent in a process known as direct reduction of iron ($H_2$-DRI).[15] Although the former shows promise, the cooling effect of hydrogen limits injection rates (the volume of hydrogen being injected per minute). This method reduces emissions by only about 15 percent.[16] The second method, on the other hand, requires high-quality iron ore with an iron content of 67 percent or more. High-grade ores are in short supply and can be very costly to produce.[17]

In January 2022, the MIIT, the National Development and Reform Commission, and the Ministry of Ecology and Environment jointly published the *Guiding Opinion on Promoting High-Quality Development of the Iron and Steel Industry*,[18] which stipulates that the steel industry should invest 1.5 percent of its profits in developing green technologies, including the use of hydrogen in production. This is the first time hydrogen-based steelmaking has been formally included in national policy.

Although major state-owned steelmakers like Baowu Steel (the world's top steel producer since 2020) and Ansteel Group have started trialling hydrogen-based steel production, this does not mean China is already entering a new era of carbon-free steelmaking. A shift towards hydrogen entails total reconstruction of the steel industry and its value chain, from producing goods to delivering products.[19]

More than 92 percent of Chinese steel is still produced using blast furnace–basic oxygen furnaces (BF-BOFs) with coking coal acting as both a heating source and a reductant.[20] The average age of China's BF-BOF mills is just over eight years, with most built or rebuilt to meet the high standards on air pollutants emissions set in the early 2010s.[21] Upgrading or rebuilding steel mills is not only

**China is the world's largest importer of iron ore**
Source: Eugene, Adobe Stock

wasteful but also financially risky as new technologies are still under development.

So, for now, reducing steel output remains the primary approach to reducing emissions[22] and is projected to account for 45 percent of China's steel industry decarbonisation by 2060.[23] The use of scrap will reduce emissions by another 39 percent; hydrogen's contribution will be less than 10 percent.[24]

## End of the Road for Australian Iron Ore?

China is the world's largest importer of iron ore. It imports about one billion tonnes of iron ore annually,[25] constituting 82.3 percent of its iron ore consumption. Australian iron ore accounts for about 67 percent of the total imports.[26]

Australia is, however, close to losing its place as China's number one supplier, for several reasons. First, China has been looking for new suppliers of high-grade iron ore. It has previously turned to Brazilian producers[27] and more recently to Guinea to wean itself off reliance on Australia.[28] Second, China is unhappy with Australia's domination of the pricing of iron ore. To counter this, Beijing plans to set up a centrally controlled group that will act on behalf of all Chinese companies to get lower

prices through bulk purchases.[29] Last but not least, China's move to decarbonise its steel sector will reduce demand for Australia's iron ore as well as other raw materials such as coking coal. Recent research projects Australian coal exports will fall by 20 percent by 2025.[30]

Australia has abundant natural resources, but it is not sustainable for its economy and environment to depend on metallurgical coal and iron ore exports to China. Australian policymakers and investors must consider a more sustainable use of Australia's resources, such as shifting to domestic manufacturing of 'green' steel, which, aided by Australia's abundant solar and wind resources, will be of significant value to Australia's future exports.[31]

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