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Limiting Global Warming: Industry

There are many options to reduce emissions in industry but some practices/technologies are very new, underused, or require policy attention to reach their full potential.

THE BIG PICTURE

Sector Share & Breakdown

24%
of all emissions come from industry
from fuel combustion, process emissions, product use and waste

This share jumps to **34%** when we consider emissions from electricity and heat production generated elsewhere but used in industry

Emissions Growth

Slowing

Emissions growth has slowed (from 3.4% to1.4%).

Use of steel, cement, plastics, and other materials is increasing globally

Net Zero

Intensive industry (steel, plastics, ammonia, cement) can get close to net zero emissions by 2050, but this requires transformational changes in energy and feedstock sourcing, materials efficiency, and more circular material flows. It will also mean compensating with negative emissions in other sectors.

WHAT CAN BE DONE

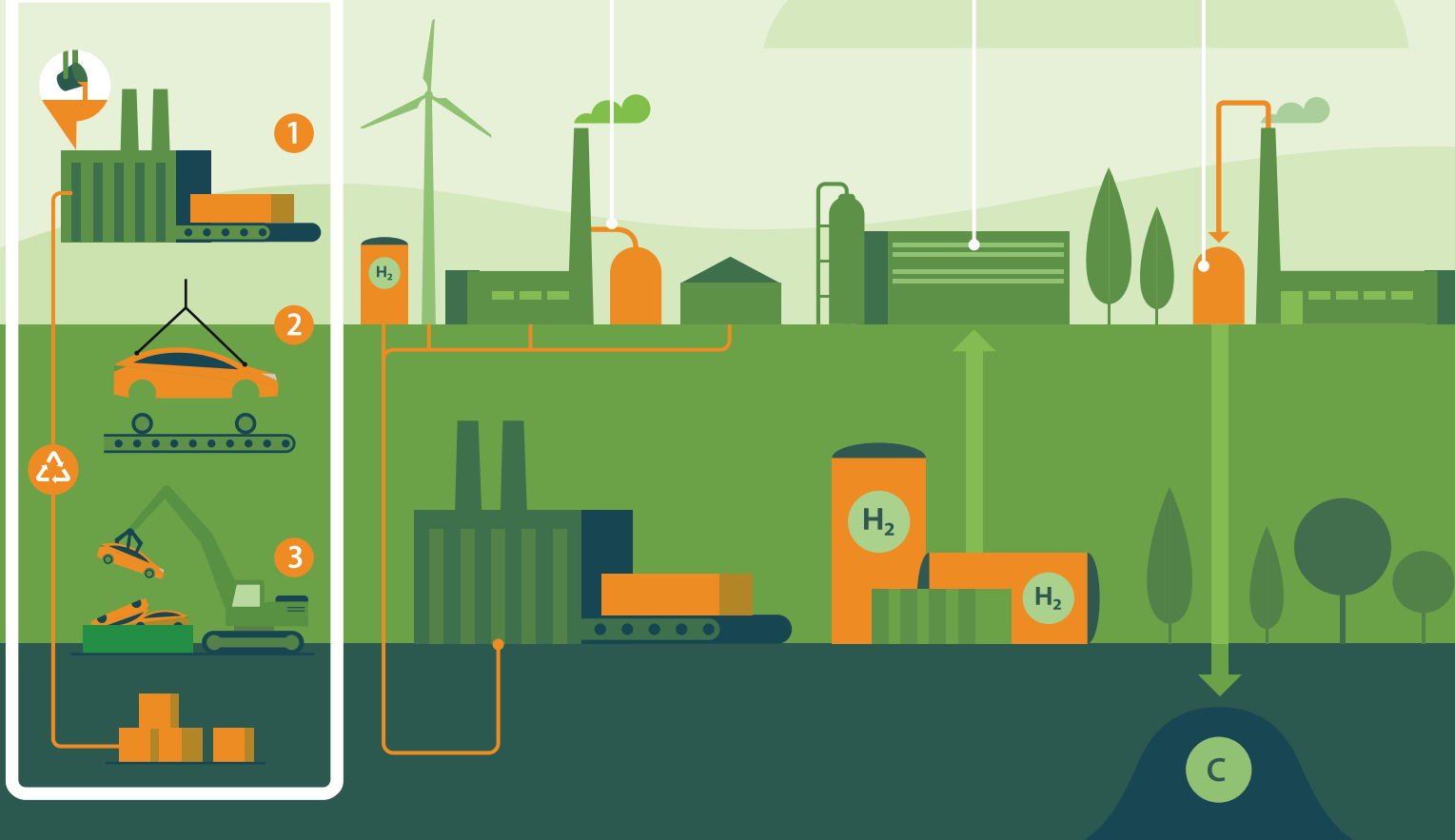
There are many options available now in industry to reduce emissions. The lowest cost options include energy efficiency and reducing non-CO_2 emissions. Overall, options include:

Sustainable practices (demand management, energy efficiency, materials efficiency, circular material flows) reduce the need for primary production. For example, more sustainable consumption, such as through intensive use of longer-lived repairable products.

Establishing **low emissions or zero emissions production processes** e.g. by using electricity, hydrogen, biofuels, and carbon capture and utilization (CCU) for carbon feedstock. Many of these processes are at commercial or near-commercial stage.

Electrification, using electricity directly, or indirectly via hydrogen from electrolysis for high temperature and chemical feedstock requirements

Carbon capture and storage (CCS) for remaining CO_2 emissions, provided geological storage is available.



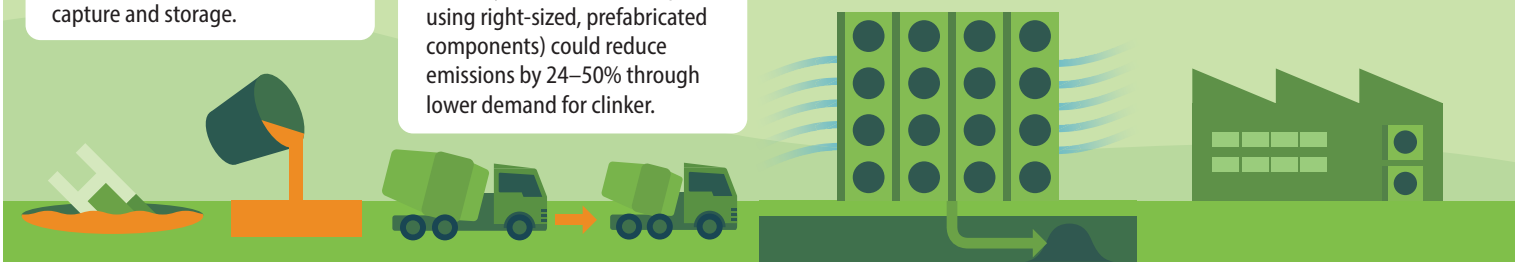
SPECIFIC INDUSTRIAL PRACTICES

Steel:
- **Material efficiency** (designing for less steel use, long life, reuse, high quality recycling, constructability, and low contamination recycling) could reduce steel demand by up to 40%.
- **Production decarbonisation** will also be required and includes methods such as switching to hydrogen direct reduced iron (DRI) and possibly electrolysis for iron ore reduction, or carbon capture and storage.

Cement: until new chemistries are mastered, reducing emissions will rely on;
- substituting with already existing cement-like materials (these materials reduce emissions from calcination processes by up to 50%)
- availability of Carbon Capture and Storage (CCS).
- basic material efficiency - using well-made concrete thoughtfully and only where needed (e.g., using right-sized, prefabricated components) could reduce emissions by 24–50% through lower demand for clinker.

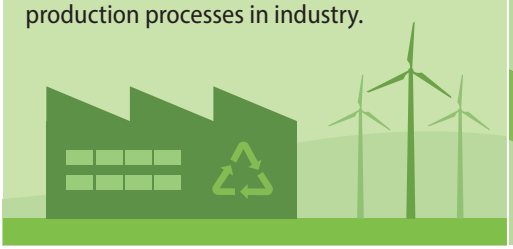
Chemicals: Reducing emissions relies on a life cycle approach, including increased plastics recycling, fuel and feedstock switching, and carbon sourced through biogenic sources. CCU, direct air CO_2 capture (DACCS), as well as CCS can help reduce emissions.

Light industry, mining and manufacturing have the potential to be decarbonised through available abatement technologies (e.g., material efficiency, circularity), electrification (e.g., electrothermal heating, heat pumps) and low- or zero-GHG emitting fuels (e.g., hydrogen, ammonia, and bio-based and other synthetic fuels).



ENABLERS

Substantial scale-up of electricity, hydrogen, recycling, and phase-out or conversion of existing industrial plants will help to achieve low/zero emission production processes in industry.

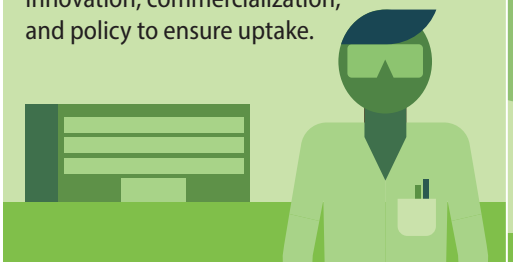


International cooperation may be particularly important in enabling change in emissions-intensive and highly-traded basic materials industries.

National and sub-national policy strategies reflecting regional contexts will be required for sustainable industrial transitions. For example for transparent GHG accounting and standards, materials and energy efficiency, and socially inclusive phase-out plans of emissions-intensive facilities (within the context of just transitions).

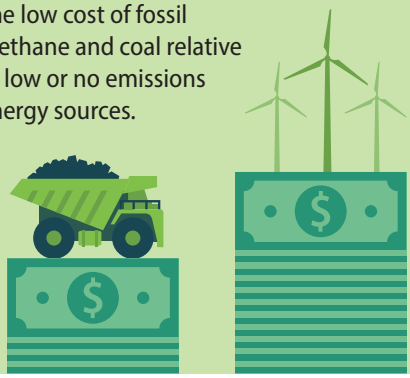
BARRIERS

Technologies exist to take all industry sectors to very low or zero emissions, but require 5–15 years of intensive innovation, commercialization, and policy to ensure uptake.



Plastics have seen the strongest growth in demand since 1970. They are almost entirely reliant on fossil fuels to produce, have low recycling rates, and have high emissions from the petrochemical processes involved. It is a challenge to reach net-zero emissions in plastics.

The low cost of fossil methane and coal relative to low or no emissions energy sources.



LINKAGES

Just Transitions in Industry: Actions that reduce industry sector emissions may change the location of emissions-intensive industries and the organisation of value chains. Regions with abundant low-emission energy and feedstocks have the **potential to become exporters of hydrogen-based** chemicals and materials processed using low-carbon electricity and hydrogen. Such reallocation will have **global distributional effects on employment and economic structure.** The transition for industry requires a **clear direction.** This includes toward net zero, technology development, market demand for low-carbon materials and products, and governance capacity and learning. It also means **socially inclusive phase-out plans** and international coordination of climate and trade policies.

To read full AR6 Working Group III report, please visit www.ipcc.ch/report/ar6/wg3

INTERGOVERNMENTAL PANEL ON ipcc climate change

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