The Sustainable Development Goals Extended Report 2023

9 INDUSTRY, INNOVATION AND INFRASTRUCTURE



Note: This unedited 'Extended Report' includes all indicator storyline contents as provided by the SDG indicator custodian agencies as of 30 April 2023. For instances where the custodian agency has not submitted a storyline for an indicator, please see the custodian agency focal point information for further information. The 'Extended Report' aims to provide the public with additional information regarding the SDG indicators and is compiled by the Statistics Division (UNSD) of the United Nations Department of Economic and Social Affairs.

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Target 9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and trans-border infrastructure, to support economic development and human well-being, with a focus on affordable and equitable access for all

Indicator 9.1.1 Proportion of the rural population who live within 2 km of an all-season road

Custodian agency(ies): World Bank

Indicator 9.1.2 Passenger and freight volumes, by mode of transport

Custodian agency(ies): ICAO,ITF-OECD

Target 9.2 Promote inclusive and sustainable industrialization and, by 2030, significantly raise industry's share of employment and gross domestic product, in line with national circumstances, and double its share in least developed countries

Indicator 9.2.1 Manufacturing value added as a proportion of GDP and per capita

LDCs are off track to meet industry-related SDG 9 targets, although with regional disparities

After the collapse of manufacturing in 2020 caused by the COVID-19 pandemic and the subsequent recovery in 2021, global manufacturing production is expected to slow down in 2022. Manufacturing value added is estimated to grow moderately by 3.0 per cent in 2022 strongly affected by the conflict in Ukraine and implementation of COVID-19 containment policies in China. Growth of global manufacturing has also dampened due to high inflation and an energy price shock, persistent disruptions in the supply of raw materials and intermediate goods, global economic deceleration, weakened confidence and high uncertainty. The manufacturing outlook thus remains uncertain facing multiple economic, financial, geopolitical and environmental risks.

Despite the expected slowdown in manufacturing worldwide in 2022, the share of manufacturing in GDP expanded globally from 16.2 per cent in 2015 to 16.7 per cent in 2022. Eastern and South-Eastern Asia expanded its share from 25.5 to 25.9 per cent over the same period. Although manufacturing in the region remained strong during the pandemic, the recovery has been modest probably due to the implementation of COVID-19 containment policies in China. The recent reopening has however paved the way for a fast recovery in this region in 2023.

Global MVA per capita increased from \$1,643 (constant 2015 prices) in 2015 to \$1,870 in 2022. While Europe and Northern America reached an all-time high of \$5,052 in 2022, MVA per capita in sub-Saharan Africa reached only \$167.

MVA per capita in least developed countries (LDCs) reached only \$159, far from the target of doubling their value of \$126 in 2015. Although the share of manufacturing in LDCs increased from 12.1 per cent in 2015 to 14.0 per cent in 2022, this pace might not be sufficient to reach the SDG target 9.2 by 2030. While LDCs in Asia have made considerable progress and are on track to meet SDG target 9.2 by 2030, other LDCs would need to change the ongoing trajectory and significantly accelerate progress for the goal to remain attainable by 2030.

Moreover, there is concern about the longer-term impact of the COVID-19 crisis on LDCs' sustainable development and graduation prospects through a variety of channels, including integration in value chains, international trade, remittances, tourism, terms of trade and external finance. This could represent a setback in their fight against poverty and inequality.





Manufacturing value added per capita and as a share of GDP in LDCs, 2000-2022

Additional resources, press releases, etc. with links:

- <u>https://stat.unido.org/content/publications/-international-yearbook-of-industrial-statistics-2022</u>
- <u>https://stat.unido.org/content/publications/world-manufacturing-production</u>
- <u>https://iap.unido.org/articles/are-we-track-achieving-sdg-9-industry-related-targets</u>
- <u>https://iap.unido.org/articles/least-developed-countries-and-race-meet-2030-agenda</u>

Storyline authors(s)/contributor(s): Petra Kynclova, UNIDO; Fernando Cantu-Bazaldua, UNIDO

Custodian agency(ies): UNIDO

Indicator 9.2.2 Manufacturing employment as a proportion of total employment

By the end of 2022, the recovery of labour markets from the COVID-19 crisis was still incomplete and progressing at an uneven pace across the world. Low-income and middleincome countries have been especially affected, and their incomplete recovery was further hampered by multiple crises, including the aftermath of the conflict in Ukraine, accelerating climate change and unprecedented humanitarian challenges. Persistent disruptions to supply chains threaten employment prospects and job quality, especially in manufacturing. After a plunge caused by the coronavirus outbreak in 2020, global manufacturing employment returned to the pre-pandemic level in 2021. However, the share of manufacturing employment in total employment continued to decline, falling from 14.3 per cent in 2015 to 13.6 per cent in 2021 worldwide.

Additional resources, press releases, etc. with links:

- <u>https://www.ilo.org/wcmsp5/groups/public/---dgreports/---inst/documents/publication/wcms_865332.pdf</u>
- https://www.unido.org/sites/default/files/files/2019-12/UNIDO%20IDR20%20main%20report.pdf

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Custodian agency(ies): UNIDO

Target 9.3 Increase the access of small-scale industrial and other enterprises, in particular in developing countries, to financial services, including affordable credit, and their integration into value chains and markets

Indicator 9.3.1 Proportion of small-scale industries in total industry value added

Custodian agency(ies): UNIDO

Indicator 9.3.2 Proportion of small-scale industries with a loan or line of credit

Uncertainty arising from multiple crises deterring new investments and the availability of credit for small-scale industrial firms

Small enterprises have always been a backbone of the economy, providing a wide range of job opportunities and supporting livelihoods. They are key drivers of employment, decent jobs and entrepreneurship for women, youth and groups in vulnerable situations, thus playing a critical role in closing the gaps as they promote the full and effective participation of women and other groups in the economy and society.

The COVID-19 pandemic hit all entrepreneurs as lockdowns and workspace closures were imposed to contain the spread of the virus. However, small businesses were hit harder as they are more vulnerable to economic downturns than larger ones. This typically stems from their smaller scale, limited financial resources and greater supply chain dependencies.

According to the most recent available data, almost one in three small manufacturing enterprises has a loan or line of credit. However, access to credit remains uneven across countries and regions of the world. Sub-Saharan African countries and least developed countries (LDCs) suffer the most from a lack of credit. Only 15.4 per cent and 16.9 per cent, respectively, have access to financial services, well below the global average. On contrary, Latin American and Caribbean and Oceania (excluding New Zealand and Australia) have the largest proportions of small manufacturing firms with a loan or line of credit – 44.2 per cent and 45.0 per cent, respectively.

Worldwide, many small enterprises were still struggling to recover from the pandemic, when the conflict in Ukraine provoked a massive energy price shock taking a heavy toll on the world economy. The overlapping multiple crises are directly affecting all enterprises, particularly small firms which are most vulnerable to shocks, with those in low- and lower middle-income countries more prone to financial risk. Entrepreneurs are now facing higher interest rates on loans and rising operational costs due to inflation in energy and transportation. This aggravated existing pressures due to ongoing global supply chain disruptions characterized by increased costs to produce and transact globally, delays at borders and higher shipping and logistics costs. Furthermore, small businesses are less prepared for the impacts of climate change.

The COVID-19 pandemic accelerated the process of digitalization that can make small businesses more resilient and competitive, as well as facilitate their access to international markets. However, the increasing uncertainty has deterred the new investments that are needed to create the conditions for innovation and growth. To achieve the SDG 9.3 Target, inclusive industrial policies are essential for small enterprises to facilitate the uptake of new technologies and increase their resilience. Moreover, enhancing safety net provisions will support employability, especially of female, youth, low-skilled and informal workers.



Proportion of small-scale manufacturing industries with a loan or line of credit (%)

Additional resources, press releases, etc. with links:

- https://unctad.org/system/files/official-document/a77d254 en.pdf
- <u>https://www.ilo.org/wcmsp5/groups/public/---dgreports/---inst/documents/publication/wcms_865332.pdf</u>
- <u>https://stat.unido.org/content/publications/-international-yearbook-of-industrial-statistics-2022</u>

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Custodian agency(ies): UNIDO,World Bank

Target 9.4 By 2030, upgrade infrastructure and retrofit industries to make them sustainable, with increased resource-use efficiency and greater adoption of clean and environmentally sound technologies and industrial processes, with all countries taking action in accordance with their respective capabilities

Indicator 9.4.1 CO₂ emission per unit of value added

In a year marked by energy price shocks, rising inflation, and disruptions to traditional fuel trade flows, global growth in emissions was lower than feared

Global carbon dioxide (CO₂) emissions from energy combustion and industrial processes grew 0.9 per cent or 321 million tonnes in 2022 to a new all-time high of 36.8 billion tonnes. This follows two years of exceptional oscillations in energy-related emissions. Emissions shrank by more than 5 per cent in 2020, as the COVID-19 pandemic cut energy demand. In 2021, emissions rebounded past pre-pandemic levels, growing more than 6 per cent in tandem with economic stimulus and a surge in coal demand even as renewables capacity additions scaled record heights. CO₂ growth in 2022 was well below global GDP growth of 3.2 per cent, reverting to a decade-long trend of decoupling emissions and economic growth that was broken by 2021's sharp rebound in emissions.

In a year marked by energy price shocks, rising inflation, and disruptions to traditional fuel trade flows, global growth in emissions was lower than feared, despite gas-to-coal switching in many countries. Increased deployment of clean energy technologies such as renewables, electric vehicles, and heat pumps helped prevent an additional 550 million tonnes in CO₂ emissions. Industrial production curtailment, particularly in China and Europe, also averted additional emissions.

CO₂ growth in 2022 was well below global GDP growth of 3.2 per cent, reverting to a decade-long trend of decoupling emissions and economic growth that was broken by 2021's sharp rebound in emissions. However, improvements in the CO₂ intensity of energy use were slightly slower than the past decade's average. Specific challenges in 2022 also contributed to the global increase in emissions. Of the overall increase of 321 million tonnes CO₂, extreme temperatures contributed 60 million tonnes from heating and cooling for buildings. The decline in nuclear power generation, due to both maintenance and continued phase-outs, led to another 55 million tonnes CO₂.

Emissions from natural gas decreased by 1.6 per cent or 118 million tonnes in 2022, as an already tight gas supply was exacerbated by the Ukraine war and the widespread trade

disruptions that followed. Coal emissions grew 243 million tonnes to a new all-time high of almost 15.5 billion tonnes. This 1.6 per cent increase was faster than the 0.4% annual average growth over the past decade. Emissions from oil grew by 2.5 per cent (or 268 million tonnes) to 11.2 billion tonnes in 2022. Around half of the year-on-year increase came from aviation as air travel continued its recovery from pandemic lows. The rebound to pre-pandemic emissions levels was faster in advanced economies, where last year's aviation emissions reached 85 per cent of 2019 levels, compared with 73 per cent in emerging market and developing economies.

In 2020, global CO₂ emissions from manufacturing accounted for almost 19 per cent of total CO₂ emissions from fuel combustion. Although CO₂ emissions from manufacturing declined sharply in 2015-2017, they reverted the trend from 2017 onwards and stagnated accounting for 5.9 billion tons in 2020. The global manufacturing CO₂ emissions intensity continued to decline from 0.49 kg/USD in 2015 to 0.44 kg/USD in 2020. However, there is a wide disparity among regions. For example, the manufacturing CO₂ emissions intensity in Central and Southern Asia remained much higher than in Europe and Northern America, 1.08 kg/USD and 0.21 kg/USD in 2020 respectively.



Global CO2 emissions from energy combustion and industrial processes, 2000-2022





Additional resources, press releases, etc. with links:

- <u>https://www.iea.org/news/defying-expectations-co2-emissions-from-global-fossil-fuel-combustion-are-set-to-grow-in-2022-by-only-a-fraction-of-last-year-s-big-increase</u>
- https://www.iea.org/data-and-statistics/data-tools/greenhouse-gas-emissions-from-energy-data-explorer

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Custodian agency(ies): UNIDO, IEA

-2.5

Target 9.5 Enhance scientific research, upgrade the technological capabilities of industrial sectors in all countries, in particular developing countries, including, by 2030, encouraging innovation and substantially increasing the number of research and development workers per 1 million people and public and private research and development spending

Indicator 9.5.1 Research and development expenditure as a proportion of GDP

Despite the resilience indicated during the COVID-19 pandemic, fostering increased investment in research and development (R&D) needs to be continued.

The global investments in research and development (R&D) has continued to grow despite the drawbacks in the global economic situation due to the COVID-19 pandemic. It represented an average annual growth rate of 4.7% over the last decade (2010-2020) when adjusted for inflation, though there was a slowdown in 2020, where global R&D went up only by 3.0%. This indicates that the worldwide economic downturn has not caused a decline in the global investment in R&D. Further, it reflects how investment in R&D may have played an important role in surmounting the challenges faced during the pandemic.

With regard to the regional situation, Europe and Northern America continued to lead the global investments in R&D representing a share of 47.7% in 2020, though it fell from 54.9% in 2010 and 49.3% in 2015. Meanwhile, Eastern and South-Eastern Asia has been catching up by increasing its share from 32.2% in 2010 and 38.1% in 2015 to 41.6% in 2020. While these two regions accounted for almost 90% of global investments in R&D, the latter has been one of the regions which drove the growth in global R&D during this period (2010-2020), which also showed the highest average annual growth rate of 7.4%.

In relative terms, the proportion of global GDP invested in R&D (in other words, R&D expenditure as a proportion of GDP) has increased from 1.61% in 2010 and 1.69% in 2015 to 1.93% in 2020. The significant increase in 2020 was mainly due to the resulting effect of growth in R&D investments and substantial declines in GDP, where growth in R&D investments have outpaced the growth in GDP. Nonetheless, a wide difference between the various regions of the world continues to prevail. Europe and North America, and Eastern and South-Eastern Asia spent 2.62% and 2.31% of GDP on R&D respectively, representing the highest level across the regions in 2020. Most of the developing regions still fall short of the world average, spending less than 1% of GDP on R&D. The proportion of GDP spent on R&D in developing regions ranged from 0.90% in Northern Africa and Western Asia, to 0.32% in Sub-Saharan Africa. Least developed and landlocked developing countries have been spending a fraction of their GDP on R&D, which stayed around 0.27% and 0.20% respectively in 2020.

The importance of investing in R&D has never before been more apparent as during the global COVID-19 pandemic. Crucially also however, is the need to further harness the advances in innovation to accelerate recovery from the pandemic, tackle the post-COVID-19 challenges, and to fast-track progress towards sustainable development. In this sense, strong policy commitments towards fostering a higher level of financing in R&D, especially in developing economies, need to be continued and supported.



Research and development expenditure as a proportion of GDP, 2010, 2015 and 2020 (percentage)

Note: There is insufficient data coverage for Oceania to calculate a regional aggregate.

Additional resources, press releases, etc. with links:

- <u>http://data.uis.unesco.org/index.aspx?queryid=3684</u>
- <u>http://uis.unesco.org/en/news/uis-releases-new-data-sdg-9-5-research-and-development</u>

Storyline authors(s)/contributor(s): UNESCO Institute for Statistics (UIS)

Custodian agency(ies): UNESCO-UIS

Indicator 9.5.2 Researchers (in full-time equivalent) per million inhabitants

In order to better prepare for responses to future crises, it is necessary to substantially increase research personnel while addressing the gender imbalances.

The number of researchers worldwide has continued to grow, representing an average annual growth rate of 3.9%, during the last 10 years (2000-2020), with a slight slowdown in 2020 (having only 2.9% growth) compared to previous years. In relative terms, globally, the number of researchers per million inhabitants increased from 1,022 in 2010 and 1,160 in 2015 to 1,342 in 2020.

The regional situation regarding researchers per million inhabitants showed wide variations across the regions following a similar pattern to that of the regional trends in R&D expenditure (SDG indicator 9.5.1). Australia and New Zealand, and Europe and Northern America were the highest performers of this indicator which registered 4,894 and 4,062 researchers per million inhabitants respectively in 2020, whilst in Sub-Saharan Africa, the figure was as low as 98 researchers per million inhabitants. The other regions stood at: Eastern and South-Eastern Asia (1,763), Northern Africa and Western Asia (963), Latin America and the Caribbean (614), and Central and Southern Asia (308).

In addition to the significant gaps between regions on the volume of researchers per million inhabitants, the representation of women in the research profession also displayed wide variations across regions. Globally, women represented only 31.2% of total researchers in 2020 (based on headcounts measurements). At regional and sub-regional levels, Central Asia, and Latin America and the Caribbean were leading, having reached the highest share of women researchers, at 45.4% and 44.2% respectively in 2020. This was followed by Northern Africa (43.5%), and South-Eastern Asia (41.5%). Around one in three researchers was a woman in Europe and Northern America (34.8%), Western Asia (33.8%) and Sub-Saharan Africa (31.3%). In contrast, the share of women researchers fell to 24.3% and 22.3% in Southern Asia and Eastern Asia respectively, being the lowest among the regions.

The critical role played by the researchers not only engaged in finding solutions to the COVID-19 crisis through rapid development of vaccines and drugs, but also in advising the governments and the public regarding the measures to be taken to control and manage the crisis is unprecedented. Strong policy commitments towards substantial increase in the number of research personnel, especially in developing regions, as well as harnessing all talents and potential by addressing gender imbalances in the research workforce need to be continued and strengthened, in order to better prepare for challenges and mitigate similar future crises.



Researchers (in full-time equivalent) per million inhabitants, 2010, 2015 and 2020 (per

Note: There is insufficient data coverage for Oceania to calculate a regional aggregate.

Additional resources, press releases, etc. with links:

- http://data.uis.unesco.org/index.aspx?queryid=3685
- <u>http://uis.unesco.org/en/news/uis-releases-new-data-sdg-9-5-research-and-development</u>

Storyline authors(s)/contributor(s): UNESCO Institute for Statistics (UIS)

Custodian agency(ies): UNESCO-UIS

Target 9.a Facilitate sustainable and resilient infrastructure development in developing countries through enhanced financial, technological and technical support to African countries, least developed countries, landlocked developing countries and small island developing States

Indicator 9.a.1 Total official international support (official development assistance plus other official flows) to infrastructure

Custodian agency(ies): OECD

Target 9.b Support domestic technology development, research and innovation in developing countries, including by ensuring a conducive policy environment for, inter alia, industrial diversification and value addition to commodities

Indicator 9.b.1 Proportion of medium and high-tech industry value added in total value added

Higher-technology industries continue to outperform other sectors

Structural transformation, one of the most promising strategies for reaching sustainable economic growth and improving the population's living standards involves a stable transition of economic activity from the primary sector into manufacturing and higher value-added services, and from lower- to higher-productivity activities. In addition to its benefits to diversification and structural change, a transition to higher-technology and innovation-focused industries is essential to support green growth as these activities are generally less energy- and emission-intensive.

As demonstrated by the COVID-19 crisis, higher-technology industries recovered faster and proved to be more resilient. The recovery of manufacturing was mainly attributable to

industries such as computers, electronics and optical products, electrical equipment as well as pharmaceuticals driven by increased demand for these goods during the pandemic.

In 2022, growth of global manufacturing slowed down due to high inflation and an energy price shock, persistent disruptions in the supply of raw materials and intermediate goods, global economic deceleration, weakened confidence and high uncertainty. The growth rate of medium-high and hightechnology industries remained solid as a result of a recovery in the automotive sector and consistently strong production of computers, electronics and optical products, and electrical equipment. On the other hand, production of basic pharmaceuticals experienced a loss for the first time in 2022 because of the strong performance in the previous year and as a response to a global medicine shortage.

According to 2020 data, medium-high and high-technology manufacturing activities accounted for 45.1 per cent of total manufacturing. However, medium- and high-tech manufacturing remained unequally distributed among regions. While the share of medium-high and high-technology manufacturing in total manufacturing in Europe and Northern America was 47.7 per cent, it reached only 21.6 per cent in sub-Saharan Africa. Although higher-technology manufacturing is essential for promoting sustainable economic growth, the share of medium-high and high-technology manufacturing in LDCs reached only 10.6 per cent in 2020.

Year-over-year growth rate of global manufacturing production by technology, fourth quarter of 2019 to third quarter of 2022



Additional resources, press releases, etc. with links:

- <u>https://stat.unido.org/content/publications/world-manufacturing-production</u>
- https://stat.unido.org/content/publications/world-manufacturing-production-in-november-2022
- <u>https://iap.unido.org/articles/are-we-track-achieving-sdg-9-industry-related-targets</u>
- https://stat.unido.org/content/publications/-international-yearbook-of-industrial-statistics-2022

Storyline authors(s)/contributor(s): Petra Kynclova, UNIDO; Fernando Cantu-Bazaldua, UNIDO

Custodian agency(ies): UNIDO

Target 9.c Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020

Indicator 9.c.1 Proportion of population covered by a mobile network, by technology

The mobile broadband coverage gap persists at five per cent

In most developing countries, mobile broadband (3G or above) is the main way — and often the only way — to connect to the Internet. This kind of access is available to 95% of the world population. Bridging the "coverage gap", that is, connecting the remaining five percent still off the grid is proving difficult: since crossing the 90% threshold in 2018, global 3G coverage has increased only by four percentage points.

In Sub-Saharan Africa, the gap constitutes 18%, predominantly affecting the population of central and western Africa. The coverage gap is almost the same in LDCs and LLDCs, falling short of SDG Target 9.c to "significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020."

Between 2015 and 2022, 4G network coverage doubled to reach 88% of the world's population; but, as for previous technologies, growth is slowing down. 4G technology is now available to more than 90% of the population in most of the regions, except Latin America and the Caribbean (88% of the population), Northern Africa and Western Asia (83%), Oceania (excluding Australia and New Zealand, 59%) and Sub-Saharan Africa (49%).

In many countries older-generation networks are being switched off in favour of networks that are more efficient and allow the development of a digital ecosystem compatible with 5G. This is particularly the case for 3G, which is often shut down so that the freed-up spectrum can be re-used for 5G, while keeping 2G for older legacy devices. This is the case for most European operators, who are planning to have their 3G networks switched off by December 2025, and for the Asia-Pacific

region. However, in other regions of the world the path is less clear, mainly because 2G and 3G networks retain a significant presence. This is the case notably in lower-income countries, where both technologies are an important means of communication. In those countries, the main obstacles to 5G deployment include high infrastructure costs, device affordability, and regulatory and adoption barriers.

Preliminary data show that 19% of the global population was covered by a 5G network in 2021. The highest roll-out was in Europe at 52%, followed by the Americas (38%) and the Asia-Pacific region (16%).





Proportion of population covered by a mobile network, 2022

Additional resources, press releases, etc. with links:

- ITU, Measuring digital development: Facts and Figures 2022, see https://www.itu.int/itu-d/reports/statistics/facts-figures-2022/
- ITU DataHub, available at <u>https://datahub.itu.int/</u>
- ITU, Digital Development Dashboard, available at https://www.itu.int/en/ITU-D/Statistics/Dashboards/Pages/Digital-Development.aspx

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Custodian agency(ies): ITU