Last updated: March 2020  
  
  
  
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
United Nations Industrial Development Organization (UNIDO)  
  
   
  
Concepts and definitions  
  
  
  
Definition:  
  
  
  
Small-scale industrial enterprises, in the SDG framework also called “small-scale industries”, defined here for the purpose of statistical data collection and compilation refer to statistical units, generally enterprises, engaged in production of goods and services for market below a designated size class.  
  
  
  
Proportion of “small-scale industries” in total industry value added represents an indicator calculating the share of manufacturing value added of small-scale manufacturing enterprises in the total manufacturing value added.  
  
  
  
Rationale:  
  
  
  
Industrial enterprises are classified to small compared to large or medium for their distinct nature of economic organization, production capability, scale of investment and other economic characteristics. “Small-scale industries” can be run with a small amount of capital, relatively unskilled labor and using local materials. Despite their small contribution to total industrial output, their role in job creation, especially in developing countries is recognized to be significant where the scope of absorbing surplus labor force from traditional sectors such as agriculture or fishery is very high. “Small-scale industries” are capable of meeting domestic demand of basic consumer goods such as food, clothes, furniture, etc.   
  
  
  
Concepts:  
  
  
  
International recommendations for industrial statistics 2008 (IRIS 2008) (United Nations, 2011) define an enterprise as the smallest legal unit that constitutes an organizational unit producing goods or services. The enterprise is the basic statistical unit at which all information relating to its production activities and transactions, including financial and balance-sheet accounts, are maintained. It is also used for institutional sector classification in the 2008 System of National Accounts.  
  
  
  
An establishment is defined as an enterprise or part of an enterprise that is situated in a single location and in which only a single productive activity is carried out or in which the principal productive activity accounts for most of the value added. An establishment can be defined ideally as an economic unit that engages, under single ownership or control, that is, under a single legal entity, in one, or predominantly one, kind of economic activity at a single physical location. Mines, factories and workshops are examples. This ideal concept of an establishment is applicable to many of the situations encountered in industrial inquiries, particularly in manufacturing.  
  
  
  
Although the definition of an establishment allows for the possibility that there may be one or more secondary activities carried out in it, their magnitude should be small compared with that of the principal activity. If a secondary activity within an establishment is as important, or nearly as important, as the principal activity, then the unit is more like a local unit. It should be subdivided so that the secondary activity is treated as taking place within an establishment separate from the establishment in which the principal activity takes place.  
  
  
  
In the case of most small-sized businesses, the enterprise and the establishment will be identical. Some enterprises are large and complex with different kinds of economic activities undertaken at different locations. Such enterprises should be broken down into one or more establishments, provided that smaller and more homogeneous production units can be identified for which production data may be meaningfully compiled.   
  
  
  
As introduced in IRIS 2008 (United Nations, 2011), an economic activity is understood as referring to a process, that is to say, to the combination of actions carried out by a certain entity that uses labor, capital, goods and services to produce specific products (goods and services). In general, industrial statistics reflect the characteristics and economic activities of units engaged in a class of industrial activities that are defined in terms of the International Standard Industrial Classification of All Economic Activities, Revision 4 (ISIC Rev.4) (United Nations, 2008) or International Standard Industrial Classification of All Economic Activities, Revision 3.1 (ISIC Rev. 3) (United Nations, 2002).  
  
  
  
Total numbers of persons employed is defined as the total number of persons who work in or for the statistical unit, whether full-time or part-time, including:  
  
Working proprietors  
  
Active business partners  
  
Unpaid family workers  
  
Paid employees (for more details see United Nations, 2011).  
  
  
  
The size of a statistical unit based on employment should be defined primarily in terms of the average number of persons employed in that unit during the reference period. If the average number of persons employed is not available, the total number of persons employed in a single period may be used as the size criterion. The size classification should consist of the following classes of the average number of persons employed: 1-9, 10-19, 20-49, 50-249, 250 and more. This should be considered a minimum division of the overall range; more detailed classifications, where required, should be developed within this framework.  
  
Value added cannot be directly observed from the accounting records of the units. It is derived as the difference between gross output or census output and intermediate consumption or census input (United Nations, 2011). The value added at basic prices is calculated as the difference between the gross output at basic prices and the intermediate consumption at purchasers’ prices. The valuation of value added closely corresponds to the valuation of gross output. If the output is valued at basic prices, then the valuation of value added is also at basic prices (the valuation of intermediate consumption is always at purchasers’ prices).  
  
  
  
All above mentioned terms are introduced to be in line with IRIS 2008 (United Nations, 2011).  
  
  
  
Comments and limitations:  
  
  
  
The main limitation of existing national data is varying size classes by country indicating that data are obtained from different target populations. Data of one country are not comparable to another.   
  
  
  
The definition of size class in many countries is tied up with the legal and policy framework of the country. It has implications on registration procedure, taxation and different waivers aimed to promote “small-scale industries”. Therefore, countries may agree on a common size class for compilation purposes. In this context, UNIDO proposes that all countries compile the employment and value added data by a size class of “small-scale industries” as with less than 20 persons employed. From such data, an internationally comparable data on the share of “small-scale industries” in total could be derived.   
  
  
  
Methodology  
  
  
  
Computation Method:  
  
  
  
The proportion of “small-scale industries” in total value added is an indicator calculated as a share of value added for small-scale manufacturing enterprises in total manufacturing value added:  
  
  
  
  
  
  
  
  
  
Data Sources  
  
  
  
Description:  
  
  
  
Data are collected primary from national sources, from official publications and official web-sites, and from OECD (Structural and Demographic Business Statistics) and EUROSTAT (Structural Business Statistics database).  
  
   
  
Collection process:  
  
  
  
Countries were contacted to provide information on data availability for monitoring small-scale industrial enterprises. The data come mostly from annual industrial surveys, where value added is disaggregated by size classes given in terms of number of employees and from surveys focusing particularly on small enterprises, or small and medium enterprises in general.  
  
  
  
Data Availability  
  
Description:  
  
  
  
Data for around 70 economies were collected  
  
   
  
Time series:  
  
  
  
Data are provided on very irregular basis. Data available from annual industrial surveys show yearly frequency, surveys on small and medium enterprises are conducted either irregularly or with a given time lag (for instance once in five years).  
  
    
  
Data providers  
  
  
  
National statistical offices (NSOs)  
  
  
  
Data compilers  
  
  
  
United Nations Industrial Development Organization (UNIDO)  
  
   
  
References  
  
  
  
United Nations. (2002). International Standard Industrial Classification of All Economic Activities (ISIC Revision 4). New York : United Nations. https://unstats.un.org/unsd/publication/seriesm/seriesm\_4rev4e.pdf  
  
  
  
United Nations. (2008). International Standard Industrial Classification of All Economic Activities (ISIC Revision 3.1). New York : United Nations. https://unstats.un.org/unsd/publication/SeriesM/seriesm\_4rev3\_1e.pdf  
  
  
  
United Nations. (2011). International Recommendations for Industrial Statistics 2008 (IRIS 2008), New York: United Nations. http://dx.doi.org/10.18356/677c08dd-en  
  
  
  
OECD. (2019). Structural and Demographic Business Statistics (SDBS). Paris: OECD. http://www.oecd.org/std/business-stats/structuralanddemographicbusinessstatisticssdbsoecd.htm

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Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
United Nations Industrial Development Organization (UNIDO)  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
Manufacturing value added (MVA) as a proportion of gross domestic product (GDP) is a ratio between MVA and GDP, both reported in constant 2015 USD.  
  
  
  
MVA per capita is calculated by dividing MVA in constant 2015 USD by population of a country or area.  
  
  
  
Rationale:  
  
MVA is a well-recognized and widely used indicator by researchers and policy makers to assess the level of industrialization of a country. The share of MVA in GDP reflects the role of manufacturing in the economy and a country’s national development in general. MVA per capita is the basic indicator of a country’s level of industrialization adjusted for the size of the economy. One of the statistical uses of MVA per capita is classifying country groups according to the stage of industrial development.  
  
  
  
Concepts:  
  
The gross value added measures the contribution to the economy of each individual producer, industry or sector in a country. The gross value added generated by any unit engaged in production activity can be calculated as the residual of the units’ total output less intermediate consumption, goods and services used up in the process of producing the output, or as the sum of the factor incomes generated by the production process (System of National Accounts 2008). Manufacturing refers to industries belonging to the sector C defined by International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4, or D defined by ISIC Revision 3.  
  
  
  
GDP represents the sum of gross value added from all institutional units resident in the economy. For the purpose on comparability over time and across countries MVA and GDP are estimated in terms of constant prices in USD. The current series are given at constant prices of 2015.  
  
  
  
Comments and limitations:  
  
Differences may appear due to different versions of System of National Accounts (SNA) or ISIC revisions used by countries.  
  
  
  
Methodology  
  
  
  
Computation Method:  
  
MVA proportion to GDP = MVA/GDP\*100.  
  
MVA per capita = MVA/population  
  
  
  
Disaggregation:  
  
No disaggregation available.  
  
  
  
Treatment of missing values:  
  
At country level  
  
Boudt, Todorov, Upadhyaya (2009): Nowcasting manufacturing value added for cross-country comparison; Statistical Journal of IAOS  
  
  
  
At regional and global levels  
  
No imputation used.  
  
  
  
Regional aggregates:  
  
Regional, global aggregation of direct summation of country values within the country groups.  
  
  
  
Sources of discrepancies:  
  
Minor differences may arise due to 1) exchange rates for conversion to USD 2) different base years used for constant price data 3) methods for recent period estimation and 4) different versions of SNA and ISIC revisions used by countries.  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
International Recommendations for Industrial Statistics (IRIS) 2008 https://unstats.un.org/unsd/publication/seriesM/seriesm\_90e.pdf  
  
  
  
System of National Accounts (SNA) 2008 https://unstats.un.org/unsd/publication/seriesf/SeriesF\_2Rev5e.pdf  
  
  
  
International Standard Industrial Classification of All Economic Activities (ISIC)   
  
https://unstats.un.org/unsd/cr/registry/regcst.asp?Cl=27  
  
  
  
Quality assurance  
  
UNIDO (2009), UNIDO Data Quality: A quality assurance framework for UNIDO statistical activities https://open.unido.org/api/documents/4814740/download/UNIDO-Publication-2009-4814740   
  
  
  
Data Sources  
  
  
  
Description:  
  
UNIDO maintains MVA database. Figures for updates are obtained from national account estimates produced by UN Statistics Division (UNSD) and from official publications.  
  
  
  
Collection process:  
  
The MVA and GDP country data are collected through a national accounts questionnaire (NAQ) sent by UNSD. More information on the methodology is available on  
  
https://unstats.un.org/unsd/snaama/methodology.pdf.  
  
  
  
Missing or inconsistent values are verified with national sources and World Development Indicators (WDI). The preference is given to the data from national sources.  
  
  
  
Population data are obtained from UN DESA Population Division. More information on the methodology is available on  
  
https://esa.un.org/unpd/wpp/Publications/Files/WPP2015\_Methodology.pdf.  
  
  
  
Data Availability  
  
  
  
Description:  
  
For more than 200 economies  
  
  
  
Time series:  
  
Data for this indicator are available as of 2000 in the UN Global SDG Database, but longer time series are available in the UNIDO MVA database.  
  
  
  
Calendar  
  
  
  
Data collection:  
  
Data collection is carried out by receiving data electronically throughout the year.  
  
  
  
Data release:  
  
UNIDO MVA database is updated between March and April every year.  
  
  
  
Data providers  
  
  
  
United Nations Statistics Division (UNSD) and official publications  
  
  
  
UNSD from national statistical offices (NSOs)  
  
  
  
Data compilers  
  
  
  
United Nations Industrial Development Organization (UNIDO)  
  
  
  
References  
  
  
  
URL:  
  
  
  
www.unido.org/statistics  
  
https://unstats.un.org/unsd/snaama/methodology.pdf  
https://esa.un.org/unpd/wpp/Publications/Files/WPP2015\_Methodology.pdf  
  
  
  
References:  
  
  
  
International Yearbook of Industrial Statistics; UNIDO  
  
International Standard Industrial Classification of All Economic Activities 2008  
  
System of National Accounts 2008

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Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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 9.3.2: Proportion of small-scale industries with a loan or line of credit  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
United Nations Industrial Development Organization (UNIDO)  
  
   
  
Concepts and definitions  
  
  
  
Definition:  
  
  
  
Small-scale industrial enterprises, in the SDG framework also called “small-scale industries”, defined here for the purpose of statistical data collection and compilation refer to statistical units, generally enterprises, engaged in production of goods and services for market below a designated size class.  
  
  
  
This indicator shows the number of “small-scale industries” with an active line of credit or a loan from a financial institution in the reference year in percentage to the total number of such enterprises.  
  
  
  
Rationale:  
  
  
  
Industrial enterprises are classified to small compared to large or medium for their distinct nature of economic organization, production capability, scale of investment and other economic characteristics. “Small-scale industries” can be run with a small amount of capital, relatively unskilled labor and using local materials. Despite their small contribution to total industrial output, their role in job creation, especially in developing countries is recognized to be significant where the scope of absorbing surplus labor force from traditional sectors such as agriculture or fishery is very high. “Small-scale industries” are capable of meeting domestic demand of basic consumer goods such as food, clothes, furniture, etc.   
  
  
  
Thus “small-scale industries” play an important role in the economy. However, it has quite limited access to financial services, especially in developing countries. In order to improve the skill of workers and technology for production, small-scale industrial enterprises require financial support in the form of preferential loan, credit etc. This indicator shows how widely financial institutions are serving the “small-scale industries”. Together with the indicator SDG 9.3.1, this indicator reflects the main message of the target 9.3 which promotes to increase the access of “small-scale industries” to financial services.  
  
  
  
Concepts:  
  
  
  
International recommendations for industrial statistics 2008 (IRIS 2008) (United Nations, 2011) define an enterprise as the smallest legal unit that constitutes an organizational unit producing goods or services. The enterprise is the basic statistical unit at which all information relating to its production activities and transactions, including financial and balance-sheet accounts, are maintained. It is also used for institutional sector classification in the 2008 System of National Accounts.  
  
  
  
An establishment is defined as an enterprise or part of an enterprise that is situated in a single location and in which only a single productive activity is carried out or in which the principal productive activity accounts for most of the value added. An establishment can be defined ideally as an economic unit that engages, under single ownership or control, that is, under a single legal entity, in one, or predominantly one, kind of economic activity at a single physical location. Mines, factories and workshops are examples. This ideal concept of an establishment is applicable to many of the situations encountered in industrial inquiries, particularly in manufacturing.  
  
  
  
Although the definition of an establishment allows for the possibility that there may be one or more secondary activities carried out in it, their magnitude should be small compared with that of the principal activity. If a secondary activity within an establishment is as important, or nearly as important, as the principal activity, then the unit is more like a local unit. It should be subdivided so that the secondary activity is treated as taking place within an establishment separate from the establishment in which the principal activity takes place.  
  
  
  
In the case of most small-sized businesses, the enterprise and the establishment will be identical. Some enterprises are large and complex with different kinds of economic activities undertaken at different locations. Such enterprises should be broken down into one or more establishments, provided that smaller and more homogeneous production units can be identified for which production data may be meaningfully compiled.   
  
  
  
As introduced in IRIS 2008 (United Nations, 2011), an economic activity is understood as referring to a process, that is to say, to the combination of actions carried out by a certain entity that uses labor, capital, goods and services to produce specific products (goods and services). In general, industrial statistics reflect the characteristics and economic activities of units engaged in a class of industrial activities that are defined in terms of the International Standard Industrial Classification of All Economic Activities, Revision 4 (ISIC Rev.4) (United Nations, 2008) or International Standard Industrial Classification of All Economic Activities, Revision 3.1 (ISIC Rev. 3) (United Nations, 2002).  
  
  
  
Total numbers of persons employed is defined as the total number of persons who work in or for the statistical unit, whether full-time or part-time, including:  
  
Working proprietors  
  
Active business partners  
  
Unpaid family workers  
  
Paid employees (for more details see United Nations, 2011).  
  
  
  
The size of a statistical unit based on employment should be defined primarily in terms of the average number of persons employed in that unit during the reference period. If the average number of persons employed is not available, the total number of persons employed in a single period may be used as the size criterion. The size classification should consist of the following classes of the average number of persons employed: 1-9, 10-19, 20-49, 50-249, 250 and more. This should be considered a minimum division of the overall range; more detailed classifications, where required, should be developed within this framework.  
  
A loan is a financial instrument that is created when a creditor lends funds directly to a debtor and receives a nonnegotiable document as evidence of the asset. This category includes overdrafts, mortgage loans, loans to finance trade credit and advances, repurchase agreements, financial assets and liabilities created by financial leases, and claims on or liabilities to the International Monetary Fund (IMF) in the form of loans. Trade credit and advances and similar accounts payable/receivable are not loans. Loans that have become marketable in secondary markets should be reclassified under debt securities. However, if only traded occasionally, the loan is not reclassified under debt securities (IMF, 2011).  
  
  
  
Lines of credit and loan commitments provide a guarantee that undrawn funds will be available in the future, but no financial liability/asset exists until such funds are actually provided. Undrawn lines of credit and undisbursed loan commitments are contingent liabilities of the issuing institutions— generally, banks (IMF, 2011). A loan or line of credit refers to regulated financial institutions only.  
  
  
  
Comments and limitations:  
  
  
  
The main limitation of existing national data is varying size classes by country indicating that data are obtained from different target populations. Data of one country are not comparable to another.   
  
  
  
The definition of size class in many countries is tied up with the legal and policy framework of the country. It has implications on registration procedure, taxation and different waivers aimed to promote “small-scale industries”. Therefore, countries may agree on a common size class for compilation purposes. In this context, UNIDO proposes that all countries compile the data by a size class of “small-scale industries” as with less than 20 persons employed. From such data, an internationally comparable data on the share of “small-scale industries” in total could be derived.   
  
   
  
Methodology  
  
  
  
Computation Method:  
  
  
  
The proportion of “small-scale industries” with a loan or line of credit is calculated as the number of “small-scale industries” with an active line of credit or a loan from a financial institution in the reference year in percentage to the total number of such enterprises:  
  
  
  
  
  
  
  
The indicator is calculated as a share of small-scale manufacturing enterprises with a loan or line of credit in the total number of small-scale manufacturing enterprises. Calculation of the indicator can be extended for other economic activities.  
  
  
  
Data Sources  
  
  
  
Description:  
  
  
  
Data were collected from the World Bank Enterprise Surveys as a pilot study on this indicator, however the preferable source of data are national statistical offices.  
  
   
  
Collection process:  
  
  
  
One of the main sources of data for this indicator currently available is the Enterprise Survey conducted by the World Bank which covers the formal sector and contains data for small and medium enterprises only (with 5 or more employees). In some countries, additional surveys, including Informal Surveys of unregistered enterprises and/or Micro Surveys for registered firms with less than five employees, are conducted and available at country level.   
  
  
  
The Enterprise Survey is based on a representative sample of enterprises run by the private sector. The surveys cover a broad range of business environment topics including access to finance, corruption, infrastructure, crime, competition, and performance measures. Since 2002, the World Bank has collected these data from face-to-face interviews with top managers and business owners in over 130,000 companies in 135 economies.  
  
  
  
The surveys have been conducted since 2002 by different units within the World Bank. Since 2005-06, most data collection efforts have been centralized within the Enterprise Analysis Unit. Data from 2006 onward is comparable across countries. The raw individual country datasets, aggregated datasets (across countries and years), panel datasets, and all relevant survey documentation are publicly available on the Enterprise Surveys web site.  
  
  
  
The indicator uses a simple weighted percentage formula, where the weights are the sampling weights. The strata for Enterprise Surveys are firm size, business sector, and geographic region within a country. Enterprise Surveys provide indicators covering manufacturing and services activities. Proportion of “small-scale industries” with a loan or line of credit for manufacturing only can be extracted from the micro data.  
  
Enterprises are classified as small, medium or large based on the number of employees as follows:   
  
  
  
Size of enterprise  
  
Number of employees  
  
Small  
  
5 to 19   
  
Medium  
  
20 to 99   
  
Large  
  
more than 99  
  
  
  
The survey also defines an enterprise with female ownership as an enterprise having at least one female owner, and female-managed is measured by whether the top manager is a woman.  
  
  
  
Data Availability  
  
  
  
Description:  
  
Data for around 130 economies were collected.  
  
   
  
Time series:  
  
  
  
Surveys are implemented every year in around 20 countries. Data frequency for each country is around 4 years.  
  
    
  
Data providers  
  
  
  
World Bank Enterprise Surveys  
  
  
  
Data compilers  
  
  
  
United Nations Industrial Development Organization (UNIDO)  
  
   
  
References  
  
  
  
International Monetary Fund. (2011). Public Sector Debt Statistics: Guide for Compilers and Users. Washington, DC: International Monetary Fund. http://www.tffs.org/pdf/method/2013/psds2013.pdf  
  
  
  
United Nations. (2002). International Standard Industrial Classification of All Economic Activities (ISIC Revision 4). New York : United Nations. https://unstats.un.org/unsd/publication/seriesm/seriesm\_4rev4e.pdf  
  
  
  
United Nations. (2008). International Standard Industrial Classification of All Economic Activities (ISIC Revision 3.1). New York : United Nations. https://unstats.un.org/unsd/publication/SeriesM/seriesm\_4rev3\_1e.pdf  
  
  
  
United Nations. (2011). International Recommendations for Industrial Statistics 2008 (IRIS 2008), New York: United Nations. http://dx.doi.org/10.18356/677c08dd-en  
  
  
  
World Bank Enterprise Surveys. 2019. Methodology. http://www.enterprisesurveys.org/methodology

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Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
  
  
Organisation for Economic Co-operation and Development (OECD)  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
  
  
Gross disbursements of total ODA and other official flows from all donors in support of infrastructure.  
  
  
  
Rationale:  
  
  
  
Total ODA and OOF flows to developing countries quantify the public effort (excluding export credits) that donors provide to developing countries for infrastructure.  
  
  
  
Concepts:  
  
  
  
ODA: The DAC defines ODA as “those flows to countries and territories on the DAC List of ODA Recipients and to multilateral institutions which are   
  
provided by official agencies, including state and local governments, or by their executive agencies; and   
  
each transaction is administered with the promotion of the economic development and welfare of developing countries as its main objective; and  
  
is concessional in character and conveys a grant element of at least 25 per cent (calculated at a rate of discount of 10 per cent).   
  
(See http://www.oecd.org/dac/stats/officialdevelopmentassistancedefinitionandcoverage.htm)  
  
  
  
Other official flows (OOF): Other official flows (excluding officially supported export credits) are defined as transactions by the official sector which do not meet the conditions for eligibility as ODA, either because they are not primarily aimed at development, or because they are not sufficiently concessional.  
  
(See http://www.oecd.org/dac/stats/documentupload/DCDDAC(2016)3FINAL.pdf, Para 24).  
  
  
  
Support to infrastructure includes all CRS sector codes in the 200 series (see here: http://www.oecd.org/dac/stats/purposecodessectorclassification.htm)  
  
Comments and limitations:  
  
  
  
Data in the Creditor Reporting System are available from 1973. However, the data coverage is considered complete since 1995 for commitments at an activity level and 2002 for disbursements.  
  
  
  
Methodology  
  
  
  
Computation Method:  
  
  
  
The sum of ODA and OOF flows from all donors to developing countries for infrastructure.  
  
  
  
Disaggregation:  
  
  
  
This indicator can be disaggregated by type of flow (ODA or OOF), by donor, recipient country, type of finance, type of aid, sub-sector, etc.  
  
  
  
Treatment of missing values:  
  
  
  
At country level  
  
  
  
Due to high quality of reporting, no estimates are produced for missing data.  
  
  
  
At regional and global levels  
  
  
  
Not applicable.  
  
  
  
Regional aggregates:  
  
  
  
Global and regional figures are based on the sum of ODA and OOF flows to the agriculture sector.  
  
  
  
Sources of discrepancies:  
  
  
  
DAC statistics are standardized on a calendar year basis for all donors and may differ from fiscal year data available in budget documents for some countries.  
  
  
  
Data Sources  
  
  
  
Description:  
  
  
  
The OECD/DAC has been collecting data on official and private resource flows from 1960 at an aggregate level and 1973 at an activity level through the Creditor Reporting System (CRS data are considered complete from 1995 for commitments at an activity level and 2002 for disbursements).   
  
  
  
The data are reported by donors according to the same standards and methodologies (see here: http://www.oecd.org/dac/stats/methodology.htm).   
  
  
  
Data are reported on an annual calendar year basis by statistical reporters in national administrations (aid agencies, Ministries of Foreign Affairs or Finance, etc.  
  
  
  
Collection process:  
  
  
  
A statistical reporter is responsible for the collection of DAC statistics in each providing country/agency. This reporter is usually located in the national aid agency, Ministry of Foreign Affairs or Finance etc.  
  
  
  
Data Availability  
  
  
  
On a recipient basis for all developing countries eligible for ODA.  
  
  
  
Calendar  
  
  
  
Data collection:  
  
  
  
Data are published on an annual basis in December for flows in the previous year.  
  
  
  
Detailed 2015 flows was published in December 2016.  
  
  
  
Data providers  
  
  
  
Data are reported on an annual calendar year basis by statistical reporters in national administrations (aid agencies, Ministries of Foreign Affairs or Finance, etc.  
  
  
  
Data compilers  
  
  
  
OECD  
  
  
  
References  
  
  
  
URL:  
  
  
  
www.oecd.org/dac/stats  
  
  
  
References:  
  
  
  
See all links here: http://www.oecd.org/dac/stats/methodology.htm

Last updated: 20 December 2018  
  
  
  
Goal: 9 Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
Target: 9.1 Develop quality, reliable, sustainable and resilient infrastructure, including regional and transborder 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  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
World Bank   
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
The indicator (commonly known as the Rural Access Index or RAI) measures the share of a country’s rural population that lives within 2 km of an all-season road.   
  
  
  
Rationale:  
  
Among other factors, transport connectivity is an essential part of the enabling environment for inclusive and sustained growth. In developing countries, particularly in Africa, the vast majority of agricultural production remains smallholder farming with limited access to local, regional, or global markets. Isolated manufacturing and other local businesses (except for those related to mining) often lag behind in the global market. Limited transport connectivity is also a critical constraint to accessing social and administrative services, especially in rural areas where the majority of the poor live.   
  
  
  
Rural access is key to unleashing untapped economic potential and eradicating poverty in many developing countries. In the short term, transport costs and travel time can be reduced by improved road conditions. Over the longer term, agricultural productivity will be increased, and firms will become more profitable with the creation of more jobs, eventually helping to alleviate poverty.   
  
  
  
To make good investments, quality data are required. Since resources are limited, it is essential to understand where the most critical unmet needs exist, and monitor efforts made over time. In the transport sector, there are few global indicators. The quality of roads is often unknown and a matter of concern in developing countries. In Africa, the Road Management Initiative, started by the Africa Transport Policy Program in the late 1990s, developed a road sector database, which includes road network condition data such as the share of roads in good or bad condition. But this database is largely outdated and insufficient.   
  
  
  
The Rural Access Index (RAI), originally developed by the World Bank in 2006, is among the most important global development indicators in the transport sector, providing a strong, clearly understandable and conceptually consistent indicator across countries. It measures the proportion of people living in rural areas who have access to an all-season road within a walking distance of approximately 2 kilometres (km). Although the underlying methodology has been updated to leverage additional sources of data, the RAI remains the most widely accepted metric for tracking access to transport in rural areas.   
  
  
  
The RAI has four primary benefits: sustainability due to its reliance on already existing data, consistency in methodology across countries and time, simplicity in understanding, and operational relevance for the government agencies responsible for generating and aggregating the underlying data.   
  
  
  
Concepts:   
  
The indicator is measured by combining three sets of geospatial data: where people live, the spatial distribution of the road network, and road quality. The use of spatial data has various advantages. It can help ensure consistency across countries. The level of spatial resolution is broadly the same regardless of the size of the country or subnational boundaries. Any given norm of connectivity (for example, 2 km distance from a road) is uniquely and unambiguously applied for all countries.   
  
  
  
Population Distribution - Quality population distribution data are essential for correct measurement of rural access. In some countries, census data is available in a geospatially detailed, reliable format. For other countries, population distribution data sets have been developed by the international research community, interpreting subnational census data through various modelling techniques. For the RAI, the WorldPop has been found to provide the best estimate.   
  
  
  
Rural-Urban Definition – Related to population distribution data, an important challenge facing the index is the need for a consistent and reliable urban and rural definition to exclude urban areas from the calculation. The inclusion of urban areas would create a substantial upward bias in the RAI, because most urban residents have “access to roads,” no matter how it is defined. Ideally, spatial data determining urban-rural boundaries are needed at a similar level of resolution as the population. As such data may rely on different definitions in different countries, globally produced urban extents may be used, such as the Global Urban Rural Mapping Project.  
  
  
  
Road Network Data – Data on road locations may come from a number of sources. Ideally government data are used, as they are consistent with the road network for which road agencies are responsible and are relatively easily merged with other operational databases. In countries where the road location data may not be detailed enough or entirely missing, alternative data sources may be available, such as the open source Open Street Map.   
  
  
  
Road Condition Data – The principle of the “all-season” road network remains central to the original concept of measuring the RAI. An “all-season road” is defined as a road that is motorable all year round by the prevailing means of rural transport (often a pick-up or a truck which does not have four-wheel-drive). Predictable interruptions of short duration during inclement weather (e.g. heavy rainfall) are accepted, particularly on low volume roads. It is important to determine whether access to facilities and services is available all year round, and hence the possibility of the road throughout the year is an essential factor in this aspect of contributing to poverty reduction. Information on the condition of the road network is frequently maintained by road agencies as part of their operational responsibilities.   
  
The traditional road inventory survey can collect data on road condition, including the International Roughness Index (IRI), at a high level of information quality, to determine whether a road is “all-season”. For the purpose of the RAI, the road condition threshold is generally set at an IRI of less than 6 meters/km for paved roads, and an IRI of less than 13 meters/km for unpaved roads. When IRI is not available, other types of condition assessment may be used if comparable. The use of smartphones with GPS are being investigated in order to accurately map local transport services routes, and identify which rural roads are open all year and hence are all-season roads.   
  
  
  
Comments and limitations:  
  
The Indicator relies substantially on data collected by road agencies and national statistics offices for their operational work. As such, its update is dependent on the frequency of update of the road condition surveys and national census. When these data sets are not from the same year, the basic principle to be followed is that a more stable data set should be used with more flexibility. For instance, a national rural roads program could dramatically improve the quality of roads in a certain locality in a relatively short term, while population data are fairly stable over five years. In such a case, the road quality data would be considered as an anchor, with the closest or adjusted population data applied.  
  
  
  
The Indicator depends heavily on the quality of the underlying spatial data. The extent of the road network data, and how well it reflects the reality on the ground, can be a particular issue. More data are always better. Efforts are required to collect detailed road data, including tertiary or feeder roads, which may not be covered in the existing spatial road network data regardless of whether government or open data sources are used. The condition of the missing roads, however, matters; if the missing tertiary and feeder are of poor quality, their exclusion would not impact the overall results.   
  
  
  
For obvious reasons, the 2 km norm of access may not be as applicable in all areas. In Africa, for instance, a 5 km access band may make more sense given the low population density in many regions. However, for global consistency purposes and comparability across countries, the 2 km threshold has been maintained (equivalent to a 20-30 minute walk).  
  
  
  
While the RAI provides an objective benchmark for assessing access to transport in rural areas, “universal” access should not be set as a target. Where individual households are in very remote areas, attempting to reach 100% access would lead to inefficient allocation of resources.   
  
  
  
Methodology  
  
  
  
Computation Method:  
  
The indicator is calculated by overlying three basic geospatial datasets: population distribution, road location, and road condition. The RAI is calculated as the rural population within a 2 km buffer of a good road divided by the total rural population of the country.   
  
  
  
First, the spatial distribution of the rural population needs to be determined. This involves obtaining the population dataset for the country, either from country sources or global datasets such as WorldPop.   
  
  
  
Next, the road network should be merged with road condition assessments, either in terms of IRI if available, or visual assessment. Those roads with a quality not meeting the threshold of the RAI (not providing “all-season” access) should be excluded. In general, the RAI adopts a road condition threshold is generally set at an IRI of less than 6 meters/km for paved roads and an IRI of less than 13 meters/km for unpaved roads. If IRI is unavailable, alternative assessments of road condition may be used, if comparable. A 2 km buffer should be generated around the road network meeting the condition threshold. Urban areas should be removed from both the road data and the population data.   
  
  
  
Finally, the rural population living within the 2 km buffer should be calculated. The final RAI is determined by dividing this portion of the rural population from the total rural population.  
  
  
  
  
  
Disaggregation:  
  
Due to its nature as a geospatially derived indicator, the RAI can be calculated at subnational levels down to the level of granularity of the underlying datasets. While the World Bank will only report country level results for SDG monitoring, subnational results are available for country use.  
  
  
  
Treatment of missing values:  
  
At country level  
  
No gap filling is done to report national numbers.   
  
  
  
At regional and global levels  
  
This is a country specific indicator and no aggregation is currently planned.  
  
  
  
Regional aggregates:  
  
This is a country specific indicator and no aggregation is currently planned. As additional country level data becomes available aggregation may be possible at a supranational level.  
  
  
  
Sources of discrepancies:  
  
Relying heavily on national data, differences in national systems undoubtedly are reflected in the top level indicator (including road quality classification, national census methodologies, etc.). In addition, use of globally derived datasets such as WorldPop may result in somewhat different results from national data. However, an assessment of sample countries indicates that these discrepancies are likely limited in their impact of the overall result.   
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
The World Bank, as custodian agency, has developed and published a full methodological document for the RAI, including detailed descriptions of various data sources, variations on the standard methodology, and a step-by-step guide. In addition, a GIS tool has been developed to calculate the RAI from provided data sets. These resources and others are being collected into an online portal for the Rural Access Index.  
  
  
  
Quality assurance  
  
Within the World Bank, the Transport Global Practice is in charge of the collection and validation of RAI data and results. The Global Practice archives the datasets obtained from NSOs and road agencies and then harmonizes them, applying common methodologies. Where NSOs and road agencies calculate the RAI using their own data and methodologies, the Transport Global Practice is responsible for reviewing the underlying data and assumptions and validating the results for inclusion in the global SDG dataset. The objective is to ensure that the data generated, curated, and disseminated by the World Bank are up to date, meet high-quality standards, and are well documented and consistent across dissemination channels. World Bank country staff works in close collaboration with national statistical authorities on the data collection and dissemination process.   
  
  
  
Data Sources  
  
  
  
Description:  
  
Data on population distribution are typically sourced from WorldPop or national census results, depending on the reliability and spatial granularity of country systems. Road location and quality data are provided by the national road agencies responsible for their upkeep.   
  
  
  
  
  
Collection process:  
  
A partnership between NSOs, national road agencies, and the World Bank as custodian agency is necessary to effectively generate RAI results. In some countries, World Bank transport staff work closely with national agencies, with data generation and calculation of the RAI built into a broader engagement. In other countries, NSOs and Road Agencies provide RAI results directly to the World Bank as custodian.   
  
  
  
  
  
Data Availability  
  
  
  
Description:  
  
As of 2018, data is readily available for 20 countries, with consultations ongoing for a number more. While data is available for some Asian and Latin American countries as well, Africa accounts for the largest share of the available information. Consultations are underway to engage with additional countries.  
  
  
  
Time series:  
  
Due to the long update cycle of national road condition surveys, the RAI is not expected to be updated on an annual basis, but instead aligned with national systems. This implies a likely 3-5 year time frame for update. Current data spans the period from 2009-2018, with 1-2 data points per country.   
  
  
  
Calendar  
  
  
  
Data collection:  
  
 Source collection is ongoing by the Transport Global Practice of the World Bank in coordination with NSOs and national road agencies.   
  
   
  
Data release:  
  
The World Bank Group is committed to releasing available RAI updates on a yearly basis.  
  
  
  
Data providers  
  
  
  
The World Bank typically receives data from national road agencies and NSOs directly. As the underlying calculation relies primarily on road agency data, such agencies are generally the primary counterpart for RAI data.   
  
  
  
Data compilers  
  
  
Within the World Bank, the Transport Global Practice is in charge of the collection and validation of RAI data and results. The Global Practice archives the datasets obtained from NSOs and road agencies and then harmonizes them, applying common methodologies. Where NSOs and road agencies calculate the RAI using their own data and methodologies, the Transport Global Practice is responsible for reviewing the underlying data and assumptions and validating the results for inclusion in the global SDG dataset. The objective is to ensure that the data generated, curated, and disseminated by the World Bank are up to date, meet high-quality standards, and are well documented and consistent across dissemination channels. World Bank country staff works in close collaboration with national statistical authorities on the data collection and dissemination process.   
  
  
  
References  
  
  
  
The guiding methodology for the RAI can be found at:  
  
  
  
World Bank. 2016. Measuring rural access : using new technologies (English). Washington, D.C. : World Bank Group. http://documents.worldbank.org/curated/en/367391472117815229/Measuring-rural-access-using-new-technologies   
  
  
  
  
  
The Sustainable Mobility for All initiative provides input and leverages the RAI in its global tracking framework. More information here: http://sum4all.org/   
  
  
  
Related indicators as of February 2020  
  
  
  
None

Last updated: March 2020   
  
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
International Energy Agency (IEA)  
  
United Nations Industrial Development Organization (UNIDO)  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
Carbon dioxide (here after, CO2) emissions per unit value added is an indicator computed as ratio between CO2 emissions from fuel combustion and the value added of associated economic activities. The indicator can be computed for the whole economy (total CO2 emissions/GDP) or for specific sectors, notably the manufacturing sector (CO2 emissions from manufacturing industries per manufacturing value added (MVA).   
  
  
  
CO2 emissions per unit of GDP are expressed in kilogrammes of CO2 per USD constant 2010 PPP GDP. CO2 emissions from manufacturing industries per unit of MVA are measured in kilogrammes of CO2 equivalent per unit of MVA in constant 2015 USD.  
  
  
  
Rationale:  
  
The indicator CO2 emissions per unit of value added represents the amount of emissions from fuel combustion produced by an economic activity, per unit of economic output. When computed for the whole economy, it combines effects of the average carbon intensity of the energy mix (linked to the shares of the various fossil fuels in the total); of the structure of an economy (linked to the relative weight of more or less energy-intensive sectors); of the average efficiency in the use of energy. When computed for the manufacturing sector (CO2 emissions from fuel combustion per unit of manufacturing value added), it measures the carbon intensity of the manufacturing economic output, and its trends result from changes in the average carbon intensity of the energy mix used, in the structure of the manufacturing sector, in the energy efficiency of production technologies in each sub-sector, and in the economic value of the various output. Manufacturing industries are generally improving their emission intensity as countries move to higher levels of industrialization, but it should be noted that emission intensities can also be reduced through structural changes and product diversification in manufacturing.   
  
  
  
CO2 emission accounts for around 80% of all GHG emission from the manufacturing processes.   
  
  
  
Concepts:  
  
Total CO2 emissions for an economy are estimated based on energy consumption data for all sectors.  
  
CO2 emissions from manufacturing are based on energy data collected across the following subsectors (energy used for transport by industry is not included here but reported under transport):  
  
Iron and steel industry [ISIC Group 241 and Class 2431];  
  
Chemical and petrochemical industry [ISIC Divisions 20 and 21] excluding petrochemical feedstocks;  
  
Non-ferrous metals basic industries [ISIC Group 242 and Class 2432];  
  
Non-metallic minerals such as glass, ceramic, cement, etc. [ISIC Division 23];  
  
Transport equipment [ISIC Divisions 29 and 30];  
  
Machinery comprises fabricated metal products, machinery and equipment other than transport equipment [ISIC Divisions 25 to 28];  
  
Food and tobacco [ISIC Divisions 10 to 12];  
  
Paper, pulp and printing [ISIC Divisions 17 and 18];  
  
Wood and wood products (other than pulp and paper) [ISIC Division 16];  
  
Textile and leather [ISIC Divisions 13 to 15];  
  
Non-specified (any manufacturing industry not included above) [ISIC Divisions 22, 31 and 32].  
  
  
  
Energy data are collected at a country level, based on internationally agreed standards (UN International Recommendations on Energy Statistics). CO2 emissions need to be estimated based on energy data and on internationally agreed methodologies (IPCC Guidelines for GHG inventories).   
  
The IEA collects national energy data, according to internationally agreed energy statistics definitions and estimates CO2 emissions based on the IPCC Guidelines for GHG inventories Tier 1 methodology, producing internationally comparable CO2 emissions data for over 150 countries and regions.  
  
The gross value added measures the contribution to the economy of each individual producer, industry or sector in a country. The gross value added generated by any unit engaged in production activity can be calculated as the residual of the units’ total output less intermediate consumption, goods and services used up in the process of producing the output, or as the sum of the factor incomes generated by the production process (System of National Accounts 2008). Manufacturing refers to industries belonging to the sector C defined by International Standard Industrial Classification of All Economic Activities (ISIC) Revision 4, or D defined by ISIC Revision 3.  
  
  
  
GDP represents the sum of gross value added from all institutional units resident in the economy. For the purpose on comparability over time and across countries, GDP based on purchasing power parity (PPP) is used to calculate the total CO2 emissions intensity of the economy. MVA is estimated in terms of constant prices in USD. The current series are given at constant prices of 2015.  
  
  
  
Comments and limitations:  
  
Estimation of CO2 emission data is not systematized in many countries, although is performed internationally based on harmonised energy data collected at national level. Energy data collection is generally well established, although in some cases national methodologies may differ from internationally agreed methodologies. National data sources include statistical offices, Energy Ministries, Environment agencies, among others. Energy consumption data and value added data are coming from different data sources which may raise some consistency issues.  
  
  
  
Methodology  
  
  
  
Computation Method:  
  
CO2 emissions from fuel combustion are estimated based on energy consumption and on the IPCC Guidelines.  
  
  
  
The total intensity of the economy is defined as the ratio of total CO2 emissions from fuel combustion and GDP.  
  
  
  
The sectoral intensity is defined as CO2 emission from manufacturing (in physical measurement unit such as tonnes) divided by manufacturing value added (MVA) in constant 2015 USD.  
  
  
  
  
  
  
  
Disaggregation:  
  
Data can be presented for national totals, for the manufacturing sector, and by industrial subsector.  
  
  
  
Treatment of missing values:  
  
At country level  
  
Boudt, Todorov, Upadhyaya (2009): Nowcasting manufacturing value added for cross-country comparison; Statistical Journal of IAOS  
  
  
  
At regional and global levels  
  
No imputation is provided if values are missing for the entire country or the region. It can only be projected from the data reported for previous years.  
  
  
  
Regional aggregates:  
  
Regional aggregates are derived from the total number of available countries in a country group.  
  
  
  
Sources of discrepancies:  
  
Difference may arise 1) if the country has not submitted energy consumption data adequately dis-aggregated by sector or by energy sources 2) due to conversion of value data into USD.  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
It is important that energy data collection and emissions calculations are consistent with international standards. CO2 emissions need to be estimated based on energy data and on internationally agreed methodologies. Energy data are collected at a country level, based on internationally agreed standards (UN International Recommendations on Energy Statistics). The IEA collects from countries energy data, according to internationally agreed energy statistics definitions. Then, the IEA estimates CO2 emissions based on country data and on the IPCC Guidelines for GHG inventories, producing internationally comparable CO2 emissions data for over 150 countries and regions. For energy data: the IEA sends standardised energy questionnaires (by fuel) to its Members and more globally to countries willing to provide data (e.g. all EU - jointly with Eurostat- most UNECE countries, and a few others submit these questionnaires). Questionnaires are available at: http://www.iea.org/statistics/resources/questionnaires/annual/. For other countries, national data are processed to a consistent format. Therefore, the IEA is able to provide key energy statistics. More detail on methods and sources is available at: http://wds.iea.org/wds/pdf/WORLDBAL\_Documentation.pdf.  
  
  
  
To estimate CO2 emissions, the internationally agreed reference is the 2006 IPCC Guidelines on GHG Inventories. http://www.ipcc-nggip.iges.or.jp/public/2006gl/. For the underlying energy data, the reference is the UN International Recommendations on Energy Statistics: https://unstats.un.org/unsd/energy/ires/. More information on methodologies from the IEA is available at: http://wds.iea.org/wds/pdf/Worldco2\_Documentation.pdf.   
  
  
  
Quality assurance  
  
The IEA has extensive data quality checks on the energy data submissions (around 30 statisticians working on it), and iterates with countries on data issues and how to address them. http://www.iea.org/statistics/resources/questionnaires/annual/. The IEA also works in cooperation with the IPCC and the UNFCCC to ensure the highest consistency between international methodologies and methodologies adopted at the IEA; the IEA validates energy data submitted to the UNFCCC by countries within their inventories. The IEA convenes international workshops among partner Agencies working on energy data to ensure consistency between energy data at global level is enhanced continuously, and methodologies are harmonised.  
  
  
  
The IEA has an extensive data quality assurance and validation process through exchange with national data providers worldwide. It also convenes its Energy Statistics Development Group meeting to discuss energy statistics developments with its Members, and cooperates with partners worldwide to ensure coherence of data and methods.  
  
  
  
Data Sources  
  
  
  
Description:  
  
Data on total CO2 emissions from fuel combustion, also disaggregated by sector, are taken from the International Energy Agency (IEA) database (IEA CO2 Emissions from Fuel Combustion:https://www.iea.org/reports/co2-emissions-from-fuel-combustion-2019).   
  
  
  
The IEA produces the indicator on total CO2 emissions/GDP, based on secondary sources for GDP (OECD National Accounts and World Bank Development indicators).  
  
  
  
UNIDO maintains MVA database. Figures for updates are obtained from national account estimates produced by UN Statistics Division (UNSD).  
  
  
  
Collection process:  
  
Energy data are collected at the national level according to harmonised international definitions and questionnaires, as described in the UN International Recommendations for Energy Statistics (https://unstats.un.org/unsd/energy/ires/).  
  
The estimates of CO2 emissions from fuel combustion are calculated by the IEA based on the IEA energy data and the default methods and emission factors from the 2006 IPCC Guidelines for National Greenhouse Gas Inventories (http://www.ipcc-nggip.iges.or.jp/public/2006gl/). More information on methodologies from the IEA is available at: http://wds.iea.org/wds/pdf/Worldco2\_Documentation.pdf  
  
The MVA and GDP country data are collected through a national accounts questionnaire (NAQ) sent by UNSD. More information on the methodology is available on  
  
https://unstats.un.org/unsd/snaama/methodology.pdf.  
  
  
  
Data Availability  
  
  
  
Description:  
  
Data are available for more than 130 countries.  
  
  
  
Time series:  
  
Data for this indicator are available as of 2000 in the UN Global SDG Database, but longer time series are available in the IEA database (IEA CO2 Emissions from Fuel Combustion) and the UNIDO MVA database.  
  
  
  
Calendar  
  
  
  
Data collection:  
  
Data collection is carried out by receiving data electronically throughout the year.  
  
  
  
Data release:  
  
The IEA releases its World CO2 emissions from fuel combustion statistics in Fall each year.  
  
UNIDO MVA database is updated between March and April every year.  
  
  
  
Data providers  
  
  
  
Name:  
  
UNSD, IEA  
  
  
  
Description:  
  
NSOs and national energy data collecting agencies provide the data to UNSD and IEA.  
  
  
  
Data compilers  
  
  
  
Name:  
  
UNIDO, IEA  
  
  
  
Description:  
  
IEA provides data on total CO2 emissions, CO2 emissions/GDP, manufacturing CO2 emissions.  
  
UNIDO compiles the data using its source for MVA data and IEA for data on CO2 emissions.  
  
  
  
References  
  
  
  
URL:  
  
https://www.iea.org/statistics   
  
http://wds.iea.org/wds/pdf/Worldco2\_Documentation.pdf  
  
  
  
www.unido.org/statistics  
  
https://unstats.un.org/unsd/snaama/methodology.pdf  
  
  
  
References:  
  
International Yearbook of Industrial Statistics; UNIDO  
  
IEA (2019), CO2 Emissions from Fuel Combustion  
  
System of National Accounts, 2008  
  
IEA, Key world energy statistics  
  
International Standard Industrial Classification of All Economic Activities 2008

Last updated: March 2020  
  
  
  
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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 9.2.2: Manufacturing employment as a proportion of total employment  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
  
  
United Nations Industrial Development Organization (UNIDO)  
  
(with the collaboration of the International Labour Organization – ILO)  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
  
  
This indicator presents the share of manufacturing employment in total employment.  
  
  
  
Rationale:  
  
  
  
This indicator conveys the contribution of manufacturing in total employment. It measures the ability of the manufacturing sector to absorb surplus labour from agricultural and other traditional sectors. However, in developed countries an opposite trend is expected where emphasis has shifted to reduction in labor in manufacturing as part of cost-cutting measures, to promote more capital-intensive industries.   
  
  
  
Concepts:  
  
  
  
Employment comprises all persons of working age who during a short reference period (one week), were engaged in any activity to produce goods or provide services for pay or profit.   
  
The working-age population is usually defined as all persons aged 15 and above.   
  
For further clarification, see: Resolution concerning statistics of work, employment and labour underutilization (2013), available from http://ilo.org/global/statistics-and-databases/standards-and-guidelines/resolutions-adopted-by-international-conferences-of-labour-statisticians/WCMS\_230304/lang--en/index.htm.   
  
No distinction is made between persons employed full time and those working less than full time.  
  
  
  
The manufacturing sector is defined according to the International Standard Industrial Classification of all Economic Activities (ISIC) revision 4 (2008, the latest) or revision 3 (1990). It refers to industries belonging to sector C in revision 4 or sector D in revision 3.  
  
  
  
Comments and limitations:  
  
  
  
The characteristics of the data source impact the international comparability of the data, especially in cases where the coverage of the source is less than comprehensive (either in terms of country territory or economic activities). In the absence of a labour force survey (the preferred source of data for this indicator), some countries may use an establishment survey to derive this indicator, but these usually have a minimum establishement size cut-off point and small units which are not officially registered (whether in manufacturing or not) would thus not be included in the survey. Consequently, employment data may be underestimated. Discrepancies can also be caused by differences in the definition of employment or the working–age population.   
  
  
  
Methodology  
  
  
  
Computation Method:  
  
  
  
  
  
  
  
Disaggregation:  
  
  
  
This indicator can be disaggregated by sex, occupation, age, region and others.   
  
  
  
Treatment of missing values:  
  
  
  
At country level  
  
  
  
Multivariate regression and cross-validation techniques are used to impute missing values at the country level. The additional variables used for the imputation include a range of indicators, including labour market and economic data. However, the imputed missing country values are only used to calculate the global and regional estimates; they are not used for international reporting on the SDG indicators by the ILO. For further information on the estimates, please refer to the the ILO modelled estimates methodological overview, available at https://www.ilo.org/ilostat-files/Documents/TEM.pdf.  
  
  
  
At regional and global levels  
  
  
  
The aggregates are derived from the ILO modelled estimates that are used to produce global and regional estimates of, amongst others, employment by economic activity. These models use multivariate regression and cross-validation techniques to impute missing values at the country level, which are then aggregated to produce regional and global estimates. The regional and global shares of employment in manufacturing are obtained by first adding up, across countries, the numerator and denominator of the formula that defines the manufacturing employment as a proportion of total employment - outlined above. Once both magnitudes are produced at the desired level of aggregation, the ratio between the two is used to compute the share for each regional grouping and the global level. Notice that this direct aggregation method can be used due to the imputation of missing observations. For further information on the estimates, please refer to the the ILO modelled estimates methodological overview, available at https://www.ilo.org/ilostat-files/Documents/TEM.pdf.  
  
  
  
Regional aggregates:  
  
  
  
The global and regional aggregates are calculated after direct summation of country values within country groups.  
  
  
  
Sources of discrepancies:  
  
  
  
The difference may arise due to: a) discrepancies in data sources; b) ISIC Revision used by a country; c) informal employment; d) coverage of data source (geographical coverage, economic activities covered, types of establishments covered, etc.); e) working-age population definition..  
  
  
  
Data Sources  
  
  
  
Description:  
  
The preferred official national data source for this indicator is a household-based labour force survey.   
  
In the absence of a labour force survey, a population census and/or other type of household survey with an appropriate employment module may also be used to obtain the required data.   
  
Where no household survey exists, establishment surveys or some types of administrative records may be used to derive the required data, keeping into account the limitations of these sources in their coverage. Specifically, these sources may exclude some types of establishments, establishments of certain sizes, some economic activities or some geographical areas.  
  
  
  
  
  
Collection process:  
  
  
  
  
  
The ILO Department of Statistics sends out its annual ILOSTAT questionnaire to all relevant agencies within each country (national statistical office, labour ministry, etc.) requesting the latest annual data and any revisions on numerous labour market topics and indicators, including many SDG indicators. Indicator 9.2.2 is calculated from statistics submitted to the ILO via this questionnaire as well as through special agreements with regional and national statistical offices or through ILO processing of microdatasets of national labour force surveys.  
  
  
  
UNIDO employment data are collected using General Industrial Statistics Questionnaire which is filled by NSOs and submitted to UNIDO annually.   
  
  
  
Data Availability  
  
  
  
Description:  
  
  
  
Data is available in ILOSTAT for around 170 countries and territories.  
  
  
  
Time series:  
  
  
  
Data for this indicator is available as of 2000 in the UN Global SDG Database, but longer time series are available in ILOSTAT.  
  
  
  
Calendar  
  
  
  
Data collection:  
  
 The ILO Department of Statistics sends out its annual ILOSTAT questionnaire, usually in the 2nd quarter, with a view to receiving the requested statistics by the 3rd quarter or the end of the year at the latest. Data received in batch from regional and national statistical offices and data obtained through the processing of microdata sets of national household surveys by the ILO Department of Statistics are continuously updated in ILOSTAT (as they become available).  
  
  
  
  
  
Data release:  
  
The ILO’s online database ILOSTAT is continuously updated to reflect statistics compiled and processed every week. In general, statistics for EUROSTAT and OECD countries are available around the 2nd or 3rd quarter of the year following the year of reference, whereas they are usually available around the 3rd or 4th quarter of the year following the year of reference for the other countries.  
  
  
  
Data providers  
  
  
  
Mainly national statistical offices, and in some cases labour ministries or other related agencies, at the country-level. In some cases, regional or international statistical offices can also act as data providers.  
  
  
  
  
  
Data compilers  
  
  
  
United Nations Industrial Development Organization (UNIDO) and International Labour Organization (ILO)  
  
  
  
References  
  
  
  
URL:  
  
  
  
https://ilostat.ilo.org/  
  
https://ilostat.ilo.org/resources/methods/description-employment-by-economic-activity/  
  
www.unido.org/statistics  
  
https://stat.unido.org/  
  
  
  
References:  
  
  
  
ILO Guidebook - Decent Work and the Sustainable Development Goals: A Guidebook on SDG Labour Market Indicators (https://www.ilo.org/stat/Publications/WCMS\_647109/lang--en/index.htm )  
  
Decent Work Indicators Manual: http://www.ilo.org/wcmsp5/groups/public/---dgreports/---stat/documents/publication/wcms\_223121.pdf   
  
Resolution concerning statistics of work, employment and labour underutilization, adopted by the 19th ICLS in 2013: http://www.ilo.org/global/statistics-and-databases/standards-and-guidelines/resolutions-adoptedby-international-conferences-of-labour-statisticians/WCMS\_230304/lang--en/index.htm   
  
ILOSTAT database: https://ilostat.ilo.org  
  
ILOSTAT Metadata – Indicator Descriptions (https://ilostat.ilo.org/resources/methods/description-employment-by-economic-activity/)  
  
International Standard Industrial Classification of All Economic Activities 2008 (https://unstats.un.org/unsd/publication/seriesm/seriesm\_4rev4e.pdf)

Last updated: 19 July 2016  
  
  
  
  
  
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
  
  
International Telecommunication Union (ITU)  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
  
  
Proportion of population covered by a mobile network, broken down by technology, refers to the percentage of inhabitants living within range of a mobile-cellular signal, irrespective of whether or not they are mobile phone subscribers or users. This is calculated by dividing the number of inhabitants within range of a mobile-cellular signal by the total population and multiplying by 100.  
  
  
  
Rationale:  
  
  
  
The percentage of the population covered by a mobile cellular network can be considered as a minimum indicator for ICT access since it provides people with the possibility to subscribe to and use mobile-cellular services to communicate. Over the last decade, mobile-cellular networks have expanded rapidly and helped overcome very basic infrastructure barriers that existed when fixed-telephone networks – often limited to urban and highly populated areas - were the dominant telecommunication infrastructure.  
  
  
  
While 2G (narrowband) mobile-cellular networks offer limited (and mainly voice-based) services, higher-speed networks (3G and LTE) provide increasingly high-speed, reliable and high-quality access to the Internet and its increasing amount of information, content, services, and applications. Mobile networks are therefore essential to overcoming infrastructure barriers, helping people join the information society and benefit from the potential of ICTs, in particular in least developed countries.  
  
  
  
The indicator highlights the importance of mobile networks in providing basic, as well as advanced communication services and will help design targeted policies to overcome remaining infrastructure barriers, and address the digital divide. Many governments track this indicator and have set specific targets in terms of the mobile population coverage (by technology) that operators must achieve.  
  
  
  
Concepts:  
  
  
  
"The indicator is based on where the population lives, and not where they work or go to school, etc. When there are multiple operators offering the service, the maximum population number covered should be reported. Coverage should refer to LTE, broadband (3G) and narrowband (2G) mobile-cellular technologies and include:  
  
  
  
- 2G mobile population coverage: Mobile networks with access to data communications (e.g. Internet) at downstream speeds below 256 Kbit/s. This includes mobile-cellular technologies such as GPRS, CDMA2000 1x and most EDGE implementations. The indicator refers to the theoretical ability of subscribers to use non-broadband speed mobile data services, rather than the number of active users of such services.  
  
  
  
- 3G population coverage: refers to the percentage of inhabitants that are within range of at least a 3G mobile-cellular signal, irrespective of whether or not they are subscribers. This is calculated by dividing the number of inhabitants that are covered by at least a 3G mobile-cellular signal by the total population and multiplying by 100. It excludes people covered only by GPRS, EDGE or CDMA 1xRTT.  
  
  
  
- LTE population coverage: Refers to the percentage of inhabitants that live within range of LTE/LTE-Advanced, mobile WiMAX/WirelessMAN or other more advanced mobile-cellular networks, irrespective of whether or not they are subscribers. This is calculated by dividing the number of inhabitants that are covered by the previously mentioned mobile-cellular technologies by the total population and multiplying by 100. It excludes people covered only by HSPA, UMTS, EV-DO and previous 3G technologies, and also excludes fixed WiMAX coverage.  
  
  
  
As technologies evolve and as more and more countries will deploy and commercialize more advanced mobile-broadband networks (5G etc.), the indicator will include further breakdowns."  
  
  
  
Comments and limitations:  
  
  
  
Some countries have difficulty calculating overall mobile-cellular population coverage. In some cases, data refer only to the operator with the largest coverage, and this may understate the true coverage.  
  
  
  
Methodology  
  
  
  
Computation Method:  
  
  
  
The indicator percentage of the population covered by a mobile network, broken down by technology, refers to the percentage of inhabitants living within range of a mobile-cellular signal, irrespective of whether or not they are mobile phone subscribers or users. This is calculated by dividing the number of inhabitants within range of a mobile-cellular signal by the total population and multiplying by 100.  
  
  
  
Disaggregation:  
  
  
  
Based on the data for the percentage of the population covered by a mobile network, broken down by technology, and on rural population figures, countries can produce estimates on rural and urban population coverage. ITU produces global estimates for the rural population coverage, by technology.  
  
  
  
Treatment of missing values:  
  
  
  
At country level  
  
  
  
Missing values are estimated using data published by mobile cellular operators that have the largest market share.  
  
  
  
At regional and global levels  
  
  
  
Missing values are estimated using data published by mobile cellular operators that have the largest market share.  
  
  
  
Regional aggregates:  
  
  
  
Global and regional estimates are produced using weighted country-level data. First, the missing country-level data are estimated using data of the dominant mobile operator. Once all the country-level percentages are available, the number of people covered by the mobile signal is calculated by multiplying the percentage of population covered by the signal to the population of the country. The regional and world total population covered by a signal were calculated by summing the country-level data. The aggregate percentages were calculated by dividing the regional totals by the population of respective groups.  
  
  
  
Sources of discrepancies:  
  
  
  
None. ITU uses the data provided by countries, including the in-scope population that is used to calculate the percentages.  
  
  
  
Data Sources  
  
  
  
Description:  
  
  
  
This indicator is based on an internationally agreed definition and methodology, which have been developed under the coordination of ITU, through its Expert Groups and following an extensive consultation process with countries. It is also a core indicator of the Partnership on Measuring ICT for Development's Core List of Indicators, which has been endorsed by the UN Statistical Commission (last time in 2014).  
  
  
  
ITU collects data for this indicator through an annual questionnaire from national regulatory authorities or Information and Communication Technology Ministries, who collect the data from Internet service providers.  
  
  
  
Collection process:  
  
  
  
ITU collects data for this indicator through an annual questionnaire from national regulatory authorities or Information and Communication Technology Ministries, who collect the data from Internet service providers.  
  
  
  
Data Availability  
  
  
  
By 2015, data on 2G mobile population coverage were available for about 147 countries, from developed and developing regions, and covering all key global regions. Data on 3G mobile population coverage were available for 152 countries and data on LTE mobile population coverage were available for 124 countries. ITU publishes data on this indicator yearly.  
  
  
  
Calendar  
  
  
  
Data collection:  
  
  
  
Data are collected through the short ITU World Telecommunication/ICT Indicators Questionnaire in April of each year and published in June of each year.  
  
  
  
Data release:  
  
  
  
June 2016.  
  
  
  
Data providers  
  
  
  
Telecommunication/ICT regulatory authority, or Ministry of ICTs.  
  
  
  
Data compilers  
  
  
  
ITU  
  
  
  
References  
  
  
  
URL:  
  
  
  
http://www.itu.int/en/ITU-D/Statistics/Pages/default.aspx  
  
  
  
References:  
  
  
  
ITU Handbook for the collection of Administrative Data on Telecommunications/ICT, 2011 (and revisions and new indicators), see:  
  
  
  
http://www.itu.int/en/ITU-D/Statistics/Pages/publications/handbook.aspx  
  
  
  
Related indicators as of February 2020  
  
  
  
1.4, 2.3, 2.c, 9.1, 11.b, 13.1

Last updated: 11 July 2017  
  
  
  
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
  
  
United Nations Educational, Scientific and Cultural Organization (UNESCO)  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
  
  
Research and development (R&D) expenditure as a proportion of Gross Domestic Product (GDP) is the amount of R&D expenditure divided by the total output of the economy.  
  
  
  
Rationale:  
  
  
  
The indicator is a direct measure of Research and development (R&D) spending referred to in the target.  
  
  
  
Concepts:  
  
  
  
The OECD Frascati Manual (OECD, 2015) provides the relevant definitions for research and experimental development, gross domestic expenditure on R&D and researchers. Although an OECD manual, the application is global. During the 6th revision of the Frascati Manual, developing country issues were mainstreamed in the core of the Manual. The 7th edition was released in October 2015.  
  
  
  
The following definitions, taken from the 2015 edition of the Frascati Manual are relevant for computing the indicator.   
  
  
  
Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge.  
  
  
  
Expenditures on intramural R&D represent the amount of money spent on R&D that is performed within a reporting unit.  
  
  
  
Comments and limitations:  
  
  
  
Research and development (R&D) data need to be collected through surveys, which are expensive, and are not done on a regular basis in many developing countries. Furthermore, (developing) countries do not always cover all sectors of performance. In particular the business sector is not always covered.  
  
  
  
Methodology  
  
  
  
Computation Method:  
  
  
  
Computation of the indicator Research and development (R&D) expenditure as a proportion of Gross Domestic Product (GDP) is self-explanatory, using readily available GDP data as denominator.  
  
  
  
Disaggregation:  
  
  
  
R&D expenditure can be broken down by sector of performance, source of funds, field of science, type of research and type of cost.  
  
  
  
Treatment of missing values:  
  
  
  
At country level  
  
  
  
Missing data are not estimated by the UIS.  
  
  
  
At regional and global levels  
  
  
  
Imputations are based on interpolations or extrapolations of data for other reference years. In case no data are available at all, the unweighted regional average is used as an estimate.  
  
  
  
Regional aggregates:  
  
  
  
Data are converted using purchasing power parities. Missing data are imputed using the methodology described above. R&D expenditure data are then added up by region and divided by GDP in PPP for that region. Similar for the global total.  
  
  
  
Sources of discrepancies:  
  
  
  
There are no differences in the underlying data. Difference may occur due to the use of difference data for the denominator used to calculate indicators.  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
  
  
Countries are responsible themselves for the collection of R&D data at the national level, compile national totals and submit them to international organisations. All countries follow the guidelines of the Frascati Manual: http://www.oecd-ilibrary.org/science-and-technology/frascati-manual-2015\_9789264239012-en.  
  
  
  
All countries follow the international guidelines of the OECD Frascati Manual: http://www.oecd-ilibrary.org/science-and-technology/frascati-manual-2015\_9789264239012-en. Countries starting to measure R&D can use UIS Technical Paper 11 for assistance, which can be downloaded here: uis.unesco.org/sites/default/files/documents/guide-to-conducting-an-rd-survey-for-countries-starting-to-measure-research-and-experimental-development-2014-en.pdf.  
  
  
  
Quality assurance:  
  
  
  
The UNESCO Institute of Statistics (UIS) sends out a questionnaire every year to collect R&D data from all countries (around 125 countries), which are not covered by the data collections of the other partner organizations such as the Organisation for Economic Co-operation and Development (OECD), Eurostat (Statistical Office of the European Union) and the Network on Science and Technology Indicators – Ibero-American and Inter-American (RICYT). In agreement with these three organisations, their data (which were collected from their member states/associated member states – around 65 countries-) are directly obtained from the respective databases (in the case of the OECD and Eurostat) or received from the partner (in the case of RICYT). There is also collaboration in Africa with the African STI Indicators Initiative (ASTII) of AU/NEPAD. For the data UIS sends a questionnaire to, the quality assurance process is the following:   
  
A questionnaire is sent to focal points in countries, generally within the Ministry of Science and Technology or the national statistical office.   
  
UIS processes the questionnaires, communicating with the countries in case of questions, calculates indicators and releases the data and indicators on its website.   
  
Countries are requested to complete the questionnaire using the standard international classifications, therefore adjustments are generally not needed. The other agencies have similar procedures.  
  
  
  
After processing the data, but before submitting the data for inclusion in the SDG database, UIS sends the calculated indicators for target 9.5 to all countries that do not submit their data to Eurostat or the OECD. This provides the countries with the opportunity to review the data and provide any modifications or additions before UIS submits the data to UNSD.  
  
  
  
  
  
Data Sources  
  
  
  
Description:  
  
  
  
Data are collected through national Research and development (R&D) surveys, either by the national statistical office or a line ministry (such as the Ministry for Science and Technology).  
  
  
  
Collection process:  
  
  
  
The UNESCO Institute of Statistics (UIS) sends out a questionnaire every year to collect R&D data from all countries (around 125 countries), which are not covered by the data collections of the other partner organizations such as the Organisation for Economic Co-operation and Development (OECD), Eurostat (Statistical Office of the European Union) and the Network on Science and Technology Indicators – Ibero-American and Inter-American (RICYT). In agreement with these three organisations, their data (which were collected from their member states/associated member states – around 65 countries-) are directly obtained from the respective databases (in the case of the OECD and Eurostat) or received from the partner (in the case of RICYT). There is also collaboration in Africa with the African STI Indicators Initiative (ASTII) of AU/NEPAD, which may lead to a joint data collection in the future.   
  
  
  
For the data UIS sends a questionnaire to, the process is the following:  
  
  
  
A questionnaire is sent to focal points in countries, generally within the Ministry of Science and Technology or the national statistical office.  
  
UIS processes the questionnaires, communicating with the countries in case of questions, calculates indicators and releases the data and indicators on its website.   
  
Countries are requested to complete the questionnaire using the standard international classifications, therefore adjustments are generally not needed.  
  
  
  
Data Availability  
  
  
  
Description:  
  
  
  
Data available for over 130 countries for R&D expenditure as % of GDP  
  
  
  
Time series:  
  
  
  
Data available in the UIS database since reference year 1996, but historical data available back to 1981   
  
  
  
Calendar  
  
  
  
Data collection:  
  
  
  
UIS sends out the questionnaire in September every year. The OECD and Eurostat collect data twice per year.  
  
  
  
Data release:  
  
  
  
July every year  
  
  
  
Data providers  
  
  
  
Data are collected through national R&D surveys, either by the national statistical office or a line ministry (such as the Ministry for Science and Technology).  
  
  
  
Data compilers  
  
  
  
Name:  
  
  
  
The UNESCO Institute of Statistics (UIS), Organisation for Economic Co-operation and Development (OECD), Eurostat (Statistical Office of the European Union) and the Network on Science and Technology Indicators – Ibero-American and Inter-American (RICYT), African STI Indicators Initiative (ASTII) of AU/NEPAD  
  
  
  
References  
  
  
  
URL:  
  
  
  
www.uis.unesco.org  
  
  
  
References:  
  
  
  
OECD (2015), Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris. DOI:  
  
http://dx.doi.org/10.1787/9789264239012-en  
  
  
  
UIS Data centre:  
  
http://data.uis.unesco.org/Index.aspx?DataSetCode=SCN\_DS&popupcustomise=true&lang=en  
  
  
  
Related indicators as of February 2020  
  
  
  
2a, 3b, 12a, 14a, 17.6, 17.7

Last updated: 13 February 2019  
  
  
  
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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 9.1.2: Passenger and freight volumes, by mode of transport  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
  
  
International Civil Aviation Organization (ICAO); International Transport Forum (ITF); United Nations Economic Commission for Europe (UNECE); United Nations Conference on Trade and Development (UNCTAD).  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
  
  
Passenger and freight volumes are respectively measured in passenger-km and tonne-km, and broken down by mode of transport. For the purposes of monitoring this indicator, passenger-km data are split between aviation, road (broken down between passenger cars, buses and motorcycles) and rail, and tonne-km are split between aviation, road, rail and inland waterways.   
  
As maritime data are not widely available, only tonnes (rather than tonne-km) data at the regional level have been shared.  
  
  
  
  
  
Rationale:  
  
  
  
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. Trans-border infrastructure development is best captured by passenger and freight volumes moved by Member States and Regions. A growth in passenger and freight volumes shows a robust infrastructure development happening in States and Regions along with the resultant socio-economic benefit. Air Transport is particularly important not only for the economic and job benefits but also because it is one of the only mode of transport that can be relied on during emergencies and disease outbreaks to reach food, medicines, medical personnel, vaccines and other supplies speedily to the affected persons in the affected areas. In addition, tracking how the non-road share of freight volumes, and the public transport share of passenger volumes, changes over time allows insights into the overall sustainability of the global transport system.  
  
  
  
Concepts:  
  
  
  
Aviation:  
  
The International Civil Aviation Organization (ICAO) through its Statistics Division have established standard methodologies and definitions to collect and report traffic (passenger and freight volume) data related to air transport. These standards and methodologies have been adopted by the 191 Member States of ICAO and also by the Industry stakeholders i.e. air carriers and airports. The data of ICAO is used by States and also the World Bank for its development indicators. ICAO uses Air Transport Reporting Forms A, AS, B and C to arrive at the passenger and freight volumes for air transport.  
  
  
  
Precise definition of all different concepts and metadata related to Air Transport Reporting Forms A, AS, B and C to arrive at the passenger and freight volumes for air transport. approved by the ICAO Statistics Division and Member States can be found at the ICAO website given below -  
  
http://www.icao.int/sustainability/pages/eap-sta-excel.aspx/.  
  
  
  
Road, Rail, Inland waterways, Pipelines  
  
  
  
The ITF and UNECE, in collaboration with Eurostat, collect data on rail and road, inland waterway and pipeline statistics on an annual basis from all their collective Member countries. Data are collected from Transport Ministries, statistical offices and other institution designated as official data source. Although there are clear definitions for all the terms used in this survey, countries might have different methodologies to calculate tonne-kilometres and passenger-kilometres. Methods could be based on traffic or mobility surveys, use very different sampling methods and estimating techniques which could affect the comparability of their statistics.   
  
  
  
Official statistics for road, rail, inland waterways and pipeline transport are only available for UNECE or ITF member States. Data for these modes for other countries come from the ITF’s global transport model.  
  
For definitions of all relevant terms, the UNECE/ITF/Eurostat Glossary for Transport Statistics can be consulted. The 5th edition of this publication should be released in 2019. The fourth edition from 2009 is available at https://www.unece.org/fileadmin/DAM/trans/main/wp6/pdfdocs/glossen4.pdf.   
  
  
  
  
  
Comments and limitations:  
  
  
  
Coverage for aviation is for all ICAO 191 Member States.  
  
Coverage for road, rail, inland waterways and pipelines is for all U.N. member States, but these are sourced from official statistics only for UNECE member States and ITF member States (and only when available).   
  
  
  
Methodology  
  
  
  
Computation Method:  
  
  
  
Aviation  
  
The aviation passenger and freight volumes are reported for the air carriers through ICAO Air Transport Reporting Forms and grouped by Member States of ICAO.  
  
Road/Rail/Inland waterways/Pipelines  
  
Data for each inland mode are reported to UNECE/ITF/Eurostat by member States, through an annual data collection using the transport statistics web common questionnaire.  
  
  
  
Disaggregation:  
  
  
  
Aviation  
  
The indicator can be dis-aggregated by -Country, Country pair, City Pair, Region, Segment (International and domestic)  
  
Road/Rail/Inland waterways/Pipelines  
  
The indicator can be disaggregated by country and mode of transport.  
  
  
  
Treatment of missing values:  
  
  
  
At country level  
  
  
  
Aviation data are broadly complete.  
  
  
  
For inland transport statistics: In case of missing data for a country for which at least one data point is available since 2000, we calculate estimates based on the expected growth rate for the country. The growth rates are computed from other socio-economic variables, such as Gross Domestic Product (GDP), population or urbanization.  
  
  
  
For non-ITF/UNECE countries, data points are estimated using the ITF model, which uses several covariates such as GDP, population, transport network coverage… A description of the model can be found in the ITF Transport Outlook 2017.  
  
ITF (2017) ITF Transport Outlook 2017, OECD Publishing   
  
  
  
This model also uses several other data sources to make the calibration more robust in regions where ITF data does not have a good coverage.  
  
International Union of Railways (2015) Railway Statistics – 2015 synopsis, UIC  
  
International Road Federation (2011) ITF World Road Statistics, IRF  
  
De Bod, A., & Havenga, J. (2010). Sub-Saharan Africa’s rail freight transport system: Potential impact of densification on cost. Journal of Transport and Supply Chain Management, Vol. 4, pp. 89-101  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
  
  
Aviation  
  
  
  
Road/Rail/Inland waterways/Pipelines  
  
Metadata (explanations of coverage, breaks in series etc.) for the ITF and UNECE inland transport data are available through their respective online databases. The aforementioned Glossary for Transport Statistics provides definitions for passenger-km and tonne-km, but also for related terms such as what constitutes a passenger, the definitions and exclusions within each transport mode etc.  
  
  
  
  
  
  
  
Quality assurance  
  
  
  
Road/Rail/Inland waterways/Pipelines  
  
  
  
The ITF and UNECE conduct annual checks of their jointly collected data, comparing the data for internal consistency, against previous years, and on a per capita basis across countries, to determine if the data appear reasonable. Significant correspondence is undertaken with the countries over potential errors, and common issues and challenges are discussed at both the ITF annual statistics meeting and the UNECE’s annual Working Party on Transport Statistics.  
  
  
  
A common problem for many countries is that passenger-km are only collected for public transport. Given that private passenger cars form the majority of passenger trips in most countries, this would clearly significantly underestimate road passenger-km, which is why the breakdown where available between passenger cars, buses and motorcycles is given.   
  
  
  
  
  
Data Sources  
  
  
  
Aviation  
  
ICAO Air Transport Reporting Forms approved by the Statistics Division of ICAO and its Member States has been used to define standards, methodologies and to collect aviation data since the 1950's. ICAO definitions and metadata is also used by the Aviation Industry as the basis of collecting data and conducting analysis.  
  
  
  
Data Availability  
  
  
  
Description:  
  
  
  
Aviation  
  
Data already provided for all 191 Member States that have air transport activities  
  
  
  
Road/Rail/Inland waterways/Pipelines  
  
For UNECE and ITF member States data are typically available, although some data gaps appear for some modes due to intermittent collection.  
  
  
  
  
  
Time series:  
  
Aviation  
  
From 1970's  
  
Road/Rail/Inland waterways/Pipelines  
  
UNECE/ITF member States typically have data available since 1993, or earlier. For non-UNECE/ITF countries,   
  
  
  
Calendar  
  
  
  
Aviation  
  
Every year by June 10th data for the previous year is available to ICAO Member States at a country level.   
  
  
  
Road/Rail/Inland waterways/Pipelines  
  
Data are collected for the reference year starting in September of the following year, and are typically published by the following January. So 2017 data were published in January 2019.  
  
  
  
Data providers  
  
  
  
Name:  
  
  
  
ICAO, ITF, UNECE, UNCTAD  
  
  
  
Description:  
  
  
  
International Civil Aviation organisation (ICAO). Data provided to ICAO by ICAO Member States from its Ministry of Transport, Infrastructure or Aviation  
  
  
  
Data compilers  
  
  
  
  
  
International Civil Aviation organisation (ICAO)  
  
  
  
  
  
References  
  
  
  
URL:  
  
  
  
www.icao.int  
  
https://data.oecd.org/transport/passenger-transport.htm  
  
https://w3.unece.org/PXWeb/en  
  
https://unctadstat.unctad.org/EN/

Last updated: 11 July 2017  
  
  
  
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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 9.5.2: Researchers (in full-time equivalent) per million inhabitants  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
  
  
United Nations Educational, Scientific and Cultural Organization (UNESCO)  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
  
  
The researchers (in full-time equivalent) per million inhabitants is a direct measure of the number of research and development workers per 1 million people.  
  
  
  
Rationale:  
  
  
  
The indicator is a direct measure of the number of research and development workers per 1 million people referred to in the target.  
  
  
  
Concepts:  
  
  
  
The OECD Frascati Manual (OECD, 2015) provides the relevant definitions for research and experimental development, gross domestic expenditure on R&D and researchers. Although an OECD manual, the application is global. During the 6th revision of the Frascati Manual, developing country issues were mainstreamed in the core of the Manual. The 7th edition was released in October 2015.  
  
  
  
The following definitions, taken from the 2015 edition of the Frascati Manual are relevant for computing the indicator.   
  
  
  
Research and experimental development (R&D) comprise creative and systematic work undertaken in order to increase the stock of knowledge – including knowledge of humankind, culture and society – and to devise new applications of available knowledge.  
  
  
  
Researchers are professionals engaged in the conception or creation of new knowledge. They conduct research and improve or develop concepts, theories, models, techniques instrumentation, software or operational methods.  
  
  
  
The Full-time equivalent (FTE) of R&D personnel is defined as the ratio of working hours actually spent on R&D during a specific reference period (usually a calendar year) divided by the total number of hours conventionally worked in the same period by an individual or by a group.  
  
  
  
Comments and limitations:  
  
  
  
R&D data need to be collected through surveys, which are expensive, and are not done on a regular basis in many developing countries. Furthermore, (developing) countries do not always cover all sectors of performance. In particular the business sector is not always covered.  
  
  
  
Methodology  
  
  
  
Computation Method:  
  
  
  
Computation of the indicator Researchers (in full-time equivalent) per million inhabitants uses available population data as denominator.  
  
  
  
Disaggregation:  
  
  
  
Researchers can be broken down by sector of employment, field of science, sex and age.  
  
  
  
Treatment of missing values:  
  
  
  
At country level  
  
  
  
Missing data are not estimated by the UIS.  
  
  
  
At regional and global levels  
  
  
  
Imputations are based on interpolations or extrapolations of data for other reference years. Second option is to make an estimate for FTE based on available headcount data. In case no data are available at all, the unweighted regional average is used as an estimate.  
  
  
  
Regional aggregates:  
  
  
  
Missing data are imputed using the methodology described above. The data for researchers in FTE are then added up by region and divided by the population data for that region. Similar for the global total.  
  
  
  
Sources of discrepancies:  
  
  
  
There are no differences in the underlying data. Difference may occur due to the use of difference data for the denominator used to calculate indicators.  
  
  
  
Methods and guidance available to countries for the compilation of the data at the national level:  
  
  
  
Countries are responsible themselves for the collection of R&D data at the national level, compile national totals and submit them to international organisations. All countries follow the guidelines of the Frascati Manual: http://www.oecd-ilibrary.org/science-and-technology/frascati-manual-2015\_9789264239012-en.  
  
  
  
All countries follow the international guidelines of the OECD Frascati Manual: http://www.oecd-ilibrary.org/science-and-technology/frascati-manual-2015\_9789264239012-en. Countries starting to measure R&D can use UIS Technical Paper 11 for assistance, which can be downloaded here: uis.unesco.org/sites/default/files/documents/guide-to-conducting-an-rd-survey-for-countries-starting-to-measure-research-and-experimental-development-2014-en.pdf.  
  
  
  
Quality assurance:  
  
  
  
The UNESCO Institute of Statistics (UIS) sends out a questionnaire every year to collect R&D data from all countries (around 125 countries), which are not covered by the data collections of the other partner organizations such as the Organisation for Economic Co-operation and Development (OECD), Eurostat (Statistical Office of the European Union) and the Network on Science and Technology Indicators – Ibero-American and Inter-American (RICYT). In agreement with these three organisations, their data (which were collected from their member states/associated member states – around 65 countries-) are directly obtained from the respective databases (in the case of the OECD and Eurostat) or received from the partner (in the case of RICYT). There is also collaboration in Africa with the African STI Indicators Initiative (ASTII) of AU/NEPAD. For the data UIS sends a questionnaire to, the quality assurance process is the following:   
  
A questionnaire is sent to focal points in countries, generally within the Ministry of Science and Technology or the national statistical office.   
  
UIS processes the questionnaires, communicating with the countries in case of questions, calculates indicators and releases the data and indicators on its website.   
  
Countries are requested to complete the questionnaire using the standard international classifications, therefore adjustments are generally not needed. The other agencies have similar procedures.  
  
  
  
After processing the data, but before submitting the data for inclusion in the SDG database, UIS sends the calculated indicators for target 9.5 to all countries that do not submit their data to Eurostat or the OECD. This provides the countries with the opportunity to review the data and provide any modifications or additions before UIS submits the data to UNSD.  
  
  
  
Data Sources  
  
  
  
Description:  
  
  
  
Data are collected through national R&D surveys, either by the national statistical office or a line ministry (such as the Ministry for Science and Technology).  
  
  
  
Collection process:  
  
  
  
The UIS sends out a questionnaire every year to collect R&D data from all countries (around 125 countries), which are not covered by the data collections of the other partner organizations such as the Organisation for Economic Co-operation and Development (OECD), Eurostat (Statistical Office of the European Union) and the Network on Science and Technology Indicators – Ibero-American and Inter-American (RICYT). In agreement with these three organisations, their data (which were collected from their member states/associated member states – around 65 countries-) are directly obtained from the respective databases (in the case of the OECD and Eurostat) or received from the partner (in the case of RICYT). There is also collaboration in Africa with the African STI Indicators Initiative (ASTII) of AU/NEPAD, which may lead to a joint data collection in the future.   
  
  
  
For the data UIS sends a questionnaire to, the process is the following:  
  
  
  
A questionnaire is sent to focal points in countries, generally within the Ministry of Science and Technology or the national statistical office.  
  
UIS processes the questionnaires, communicating with the countries in case of questions, calculates indicators and releases the data and indicators on its website.   
  
Countries are requested to complete the questionnaire using the standard international classifications, therefore adjustments are generally not needed.  
  
  
  
Data Availability  
  
  
  
Description:  
  
  
  
Data available for over 120 countries for Researchers (in FTE) per million inhabitants  
  
  
  
Time series:  
  
  
  
Data available in the UIS database since reference year 1996, but historical data available back to 1981   
  
  
  
Calendar  
  
  
  
Data collection:  
  
  
  
UIS sends out the questionnaire in September every year. The OECD and Eurostat collect data twice per year.  
  
  
  
Data release:  
  
  
  
July every year  
  
  
  
Data providers  
  
  
  
Name:  
  
  
  
national R&D surveys, either by the national statistical office or a line ministry (such as the Ministry for Science and Technology).  
  
  
  
Description:  
  
  
  
Data are collected through national R&D surveys, either by the national statistical office or a line ministry (such as the Ministry for Science and Technology).  
  
  
  
Data compilers  
  
  
  
The UIS, Organisation for Economic Co-operation and Development (OECD), Eurostat (Statistical Office of the European Union) and the Network on Science and Technology Indicators – Ibero-American and Inter-American (RICYT), African STI Indicators Initiative (ASTII) of AU/NEPAD  
  
  
  
References  
  
  
  
URL:  
  
  
  
www.uis.unesco.org  
  
  
  
References:  
  
  
  
OECD (2015), Frascati Manual 2015: Guidelines for Collecting and Reporting Data on Research and Experimental Development, The Measurement of Scientific, Technological and Innovation Activities, OECD Publishing, Paris. DOI:  
  
http://dx.doi.org/10.1787/9789264239012-en.   
  
  
  
UIS Data centre:   
  
http://data.uis.unesco.org/Index.aspx?DataSetCode=SCN\_DS&popupcustomise=true&lang=en.  
  
  
  
Related indicators as of February 2020  
  
  
  
9.b, 12.a, 17.6, 17.7, 17.8

Last updated: March 2020  
  
  
  
Goal 9: Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation  
  
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  
  
  
  
Institutional information  
  
  
  
Organization(s):  
  
  
  
United Nations Industrial Development Organization (UNIDO)  
  
  
  
Concepts and definitions  
  
  
  
Definition:  
  
  
  
The proportion of medium-high and high-tech industry (MHT hereafter) value added in total value added of manufacturing (MVA hereafter) is a ratio value between the value added of MHT industry and MVA.  
  
  
  
Rationale:  
  
  
  
Industrial development generally entails a structural transition from resource-based and low technology activities to MHT activities. A modern, highly complex production structure offers better opportunities for skills development and technological innovation. MHT activities are also the high value addition industries of manufacturing with higher technological intensity and labour productivity. Increasing the share of MHT sectors also reflects the impact of innovation.  
  
  
  
Concepts:  
  
  
  
The value added of an industry (industry value added) is a survey concept that refers to the given industry’s net output derived from the difference of gross output and intermediate consumption. Manufacturing sector is defined according to the International Standard Industrial Classification of all Economic Activities (ISIC) Revision 3 (1990) or Revision 4 (2008). It refers to industries belonging to sector D in revision 3 or sector C in Revision 4.  
  
  
  
Technology classification is based on research and development (R&D) expenditure relative to value added otherwise referred as R&D intensity. Data for R&D intensity are presented in a report (Galindo-Rueda and Verger, 2016) published by the OECD in 2016, which also proposes a taxonomy for industry groups with different ranges of R&D expenditure relative to their gross value added. MHT industries have traditionally been defined exclusively to manufacturing industries. However, there have been recent efforts (Galindo-Rueda and Verger, 2016) to extend the definition to non-manufacturing industries as well. Nevertheless, medium-high and high technology sectors also in new paper are primarily represented by manufacturing industries.  
  
  
  
ISIC Rev.4  
  
Description  
  
ISIC Rev.3   
  
Description  
  
20  
  
Manufacture of chemicals and chemical products  
  
24  
  
Manufacture of chemicals and chemical products  
  
21  
  
Manufacture of basic pharmaceutical products and pharmaceutical preparations  
  
29  
  
Manufacture of machinery and equipment n.e.c.  
  
252  
  
Manufacture of weapons and ammunition  
  
30  
  
Manufacture of office, accounting and computing machinery  
  
26  
  
Manufacture of computer, electronic and optical products  
  
31  
  
Manufacture of electrical machinery and apparatus n.e.c.  
  
27  
  
Manufacture of electrical equipment  
  
32  
  
Manufacture of radio, television and communication equipment and apparatus  
  
28  
  
Manufacture of machinery and equipment n.e.c.  
  
33  
  
Manufacture of medical, precision and optical instruments, watches and clocks  
  
29  
  
Manufacture of motor vehicles, trailers and semi-trailers  
  
34  
  
Manufacture of motor vehicles, trailers and semi-trailers  
  
30\*  
  
Manufacture of other transport equipment   
  
35\*\*  
  
Manufacture of other transport equipment  
  
325  
  
Manufacture of medical and dental instruments and supplies  
  
  
  
  
  
\* Excluding 301 (Building of ships and boats)  
  
\*\* Excluding 351 (Building and repairing of ships and boats)  
  
  
  
MVA is the value added of manufacturing industry, which is Section C of ISIC Rev.4, and Section D of ISIC Rev.3.   
  
  
  
Comments and limitations:  
  
  
  
Value added by economic activity should be reported at least at 3-digit ISIC for compiling MHT values.  
  
  
  
Methodology  
  
  
  
Computation Method:  
  
  
  
The indicator is calculated as the share of the sum of the value added from MHT economic activities to MVA.  
  
  
  
  
  
  
  
Disaggregation:  
  
  
  
No disaggregation available.  
  
  
  
Treatment of missing values:  
  
  
  
At country level  
  
  
  
Missing values are imputed based on the methodology from Competitive Industrial Performance Report (UNIDO, 2016).  
  
  
  
At regional and global levels  
  
  
  
Imputation applied at country level.  
  
  
  
Regional aggregates:  
  
  
  
Regional and global aggregates are calculated as a weighted average of countries’ MHT shares in a group. Weights are taken based on the MVA share in a group (UNIDO MVA Database).  
  
  
  
Sources of discrepancies:  
  
  
  
Conversion to USD or difference in ISIC combinations may cause discrepancy between national and international figures.  
  
  
  
Data Sources  
  
  
  
Description:  
  
  
  
Data can be found in UNIDO INDSTAT4 Database by ISIC Revision 3 and ISIC Revision 4 respectively.  
  
  
  
Collection process:  
  
  
  
Data are collected using General Industrial Statistics Questionnaire which is filled by NSOs and submitted to UNIDO annually. Data for OECD countries are obtained directly from OECD. Country data are also collected from official publications and official web-sites.  
  
  
  
Data Availability  
  
  
  
Description:  
  
  
  
More than 140 economies  
  
  
  
Time series:  
  
  
  
Data for this indicator are available as of 2000 in the UN Global SDG Database, but longer time series are available in the CIP database.  
  
  
  
Calendar  
  
  
  
Data collection:  
  
  
  
Data are collected annually from NSOs and OECD  
  
  
  
Data release:  
  
  
  
UNIDO INDSTAT database is updated between March and April every year.  
  
  
  
Data providers  
  
  
  
National statistical offices (NSOs) in non-OECD countries, and OECD countries by OECD  
  
  
  
Data compilers  
  
  
  
Name:  
  
  
  
United Nations Industrial Development Organization (UNIDO)  
  
  
  
References  
  
  
  
URL:  
  
  
  
www.unido.org/statistics  
  
https://stat.unido.org/  
  
  
  
References:  
  
  
  
UNIDO Publication - The Industrial Competitiveness of Nations 2013  
  
Competitive Industrial Performance (CIP) report 2018  
  
International Standard Industrial Classification of All Economic Activities 2008  
  
Galindo-Rueda, F. and F. Verger (2016). OECD Taxonomy of Economic Activities Based on R&D Intensity, OECD Science, Technology and Industry Working Papers, 2016/04, OECD Publishing, Paris. Available at:  
  
http://dx.doi.org/10.1787/5jlv73sqqp8r-en

**Industry**

An **industry** is a sector that [produces](https://en.wikipedia.org/wiki/Production_(economics)) [goods](https://en.wikipedia.org/wiki/Good_(economics)) or related [services](https://en.wikipedia.org/wiki/Service_(economics)) within an [economy.](https://en.wikipedia.org/wiki/Economy)[[1]](#page3) The major source of revenue of a group or



company is an indicator of what industry it should be classified in.[[2]](#page3) When a large corporate group has multiple sources of revenue generation, it is considered to be working in different industries. The manufacturing industry became a key sector of production and labour in [European](https://en.wikipedia.org/wiki/Europe) and [North American](https://en.wikipedia.org/wiki/North_America) countries during the [Industrial Revolution,](https://en.wikipedia.org/wiki/Industrial_Revolution) upsetting previous [mercantile](https://en.wikipedia.org/wiki/Mercantilism) and [feudal](https://en.wikipedia.org/wiki/Feudalism) economies. This came through many successive rapid advances in technology, such as the development of [steam power](https://en.wikipedia.org/wiki/Steam_power) and the production of [steel](https://en.wikipedia.org/wiki/Steel) and [coal.](https://en.wikipedia.org/wiki/Coal)



[Following the Industrial Revolution, possibly a third of the economic output came from manufacturing industries. Many developed](https://en.wikipedia.org/wiki/Developed_country) [countries and many developing/semi-developed countries (China, India etc.) depend significantly on manufacturing industry.](https://en.wikipedia.org/wiki/Developed_country)



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Cement factories are part of the manufacturing industry. This factory is in Malmö, Sweden.



**History**



**Slavery**

Slavery, the practice of utilizing forced labor to produce goods[[3]](#page3) and services, has occurred since antiquity throughout the world as a means of low-cost production. It typically produces goods for which profit depends on [economies of scale,](https://en.wikipedia.org/wiki/Economies_of_scale) especially those for which labor was simple and easy to supervise.[[4]](#page3) [International law](https://en.wikipedia.org/wiki/Slavery_in_international_law) has declared slavery illegal.[[5]](#page3)



**Guilds**

Guilds, associations of [artisans](https://en.wikipedia.org/wiki/Artisan) and [merchants,](https://en.wikipedia.org/wiki/Merchant) oversee the production and distribution of a particular good. Guilds have their roots in the [Roman Empire](https://en.wikipedia.org/wiki/Roman_Empire) as *collegia* (singular: *collegium*)



Membership in these early guilds was voluntary. The Roman *collegia* did not survive the fall of Rome.[[6]](#page3) In the [early middle ages,](https://en.wikipedia.org/wiki/Early_Middle_Ages) guilds once again began to emerge in Europe, reaching a degree of maturity by the beginning of the 14th century.[[7]](#page3) While few guilds remain today, some modern labor structures resemble those of traditional guilds.[[8]](#page4) Other guilds, such as the [SAG-AFTRA](https://en.wikipedia.org/wiki/SAG-AFTRA) act as [trade unions](https://en.wikipedia.org/wiki/Trade_union) rather than as classical guilds. Professor [Sheilagh Ogilvie](https://en.wikipedia.org/wiki/Sheilagh_Ogilvie) claims that guilds negatively affected quality, skills, and innovation in areas that they were present.[[9]](#page4)



**Industrial Revolution**

The industrial revolution (from the mid-18th century to the mid-19th century) saw the development and popularization of mechanized means of production as a replacement for hand production.[[10]](#page4) The industrial revolution played a role in the [abolition of slavery](https://en.wikipedia.org/wiki/Abolition_of_slavery) in Europe and in North America.[[11]](#page4)



**Since the Industrial Revolution**

**Industrial development**



The [Industrial Revolution](https://en.wikipedia.org/wiki/Industrial_Revolution) led to the development of factories for large-scale production with consequent changes in society.[[12]](#page4) Originally the factories were steam-powered, but later transitioned to [electricity](https://en.wikipedia.org/wiki/Electricity) once an [electrical grid](https://en.wikipedia.org/wiki/Electrical_grid) was developed. The mechanized [assembly line](https://en.wikipedia.org/wiki/Assembly_line) was introduced to assemble parts in a repeatable fashion, with individual workers performing specific steps during the process. This led to significant increases in efficiency, lowering the cost of the end process. Later [automation](https://en.wikipedia.org/wiki/Automation) was increasingly used to replace human operators. This process has accelerated with the development of the [computer](https://en.wikipedia.org/wiki/Computer) and the [robot.](https://en.wikipedia.org/wiki/Robot)



**Deindustrialisation**



Historically certain manufacturing industries have gone into a decline due to various economic factors, including the development of replacement technology or the loss of competitive advantage.

An example of the former is the decline in [carriage](https://en.wikipedia.org/wiki/Carriage) manufacturing when the [automobile](https://en.wikipedia.org/wiki/Automobile) was mass-produced.



A recent trend has been the migration of prosperous, industrialized nations towards a [post-industrial society.](https://en.wikipedia.org/wiki/Post-industrial_society) This is manifested by an increase in the [service sector](https://en.wikipedia.org/wiki/Service_sector) at the expense of manufacturing, and the development of an information-based economy, the so-called [informational revolution.](https://en.wikipedia.org/wiki/Informational_revolution) In a post-industrial society, manufacturers relocate to more profitable locations through a process of [off-shoring.](https://en.wikipedia.org/wiki/Off-shoring)



Measurements of manufacturing industries outputs and economic effect are not historically stable. Traditionally, success has been measured in the number of jobs created. The reduced number of employees in the manufacturing sector has been assumed to result from a decline in the competitiveness of the sector, or the introduction of the [lean manufacturing](https://en.wikipedia.org/wiki/Lean_manufacturing) process.



Related to this change is the upgrading of the [quality](https://en.wikipedia.org/wiki/Quality_(business)) of the product being manufactured. While it is possible to produce a low-technology product with low-skill labour, the ability to manufacture high-technology products well is dependent on a highly skilled staff.



**Society**



An [industrial society](https://en.wikipedia.org/wiki/Industrial_society) is a society driven by the use of [technology](https://en.wikipedia.org/wiki/Technology) to enable [mass production,](https://en.wikipedia.org/wiki/Mass_production) supporting a [large population](https://en.wikipedia.org/wiki/Population_growth) with a high capacity for



[division of labour.](https://en.wikipedia.org/wiki/Division_of_labour) Today, industry is an important part of most societies and nations. A government must have some kind of [industrial policy,](https://en.wikipedia.org/wiki/Industrial_policy)



regulating industrial placement, [industrial pollution,](https://en.wikipedia.org/wiki/Pollution) [financing](https://en.wikipedia.org/wiki/Financing) and [industrial labour.](https://en.wikipedia.org/wiki/Industrial_labour)



**Industrial labour**



In an industrial society, industry employs a major part of the population. This occurs typically in the manufacturing sector. A labour union is an organization of workers who have banded together to achieve common goals in key areas such as wages, hours, and other working conditions. The trade union, through its leadership, bargains with the employer on behalf of union members [(rank and file](https://en.wiktionary.org/wiki/rank_and_file) members) and negotiates labour contracts with employers. This [movement](https://en.wikipedia.org/wiki/Labour_movement) first rose among industrial workers.



**War**



[The Industrial Revolution changed warfare, with mass-produced weaponry and supplies, machine-powered transportation, mobilization, the total](https://en.wikipedia.org/wiki/Total_war) [war concept and](https://en.wikipedia.org/wiki/Total_war) [weapons of mass destruction.](https://en.wikipedia.org/wiki/Weapons_of_mass_destruction) [Early instances of](https://en.wikipedia.org/wiki/Total_war) [industrial warfare](https://en.wikipedia.org/wiki/Industrial_warfare) [were the](https://en.wikipedia.org/wiki/Total_war) [Crimean War](https://en.wikipedia.org/wiki/Crimean_War) [and the](https://en.wikipedia.org/wiki/Total_war) [American Civil War,](https://en.wikipedia.org/wiki/American_Civil_War) [but its full](https://en.wikipedia.org/wiki/Total_war) [potential showed during the world wars. See also military-industrial complex, arms industries, military](https://en.wikipedia.org/wiki/Military_industry) [industry and](https://en.wikipedia.org/wiki/Military_industry) [modern warfare.](https://en.wikipedia.org/wiki/Modern_warfare)