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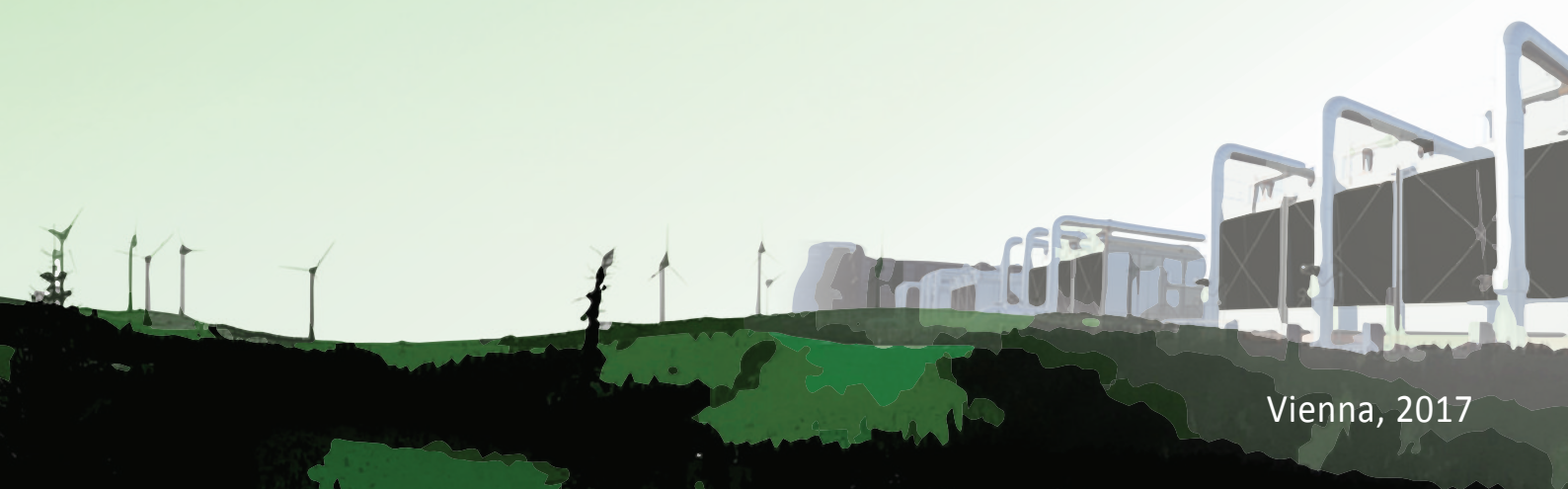
UNITED NATIONS  
INDUSTRIAL DEVELOPMENT ORGANIZATION

9 INDUSTRY, INNOVATION  
AND INFRASTRUCTURE



# STATISTICAL INDICATORS OF INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION

Baseline scenario



Vienna, 2017





Policy Research and Statistics Department

# **STATISTICAL INDICATORS OF INCLUSIVE AND SUSTAINABLE INDUSTRIALIZATION**

Baseline scenario

Statistics Division  
UNIDO



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# LIST OF ABBREVIATIONS

CO <sub>2</sub>	Carbon dioxide
DEIE	Developing and Emerging Industrial Economies
DESA	Department of Economic and Social Affairs (UN)
EIE	Emerging Industrial Economies
EC	European Commission
EUI	European Union (Industrialized countries only)
GDP	Gross Domestic Product
GHG	Greenhouse Gas
IAEG-SDGs	Inter-Agency Expert Group on SDG Indicators
IEA	International Energy Agency
IFC	International Finance Corporation
ILO	International Labour Organization
IND	Industrialized Countries
LDC	Least Developed Country
MHT	Medium and High-Technology
MVA	Manufacturing Value Added
ODC	Other Developing Countries
OECD	Organization of Economic Cooperation and Development
R&D	Research and Development
SME	Small- and Medium-sized Enterprise
SSIs	Small-Scale Industrial and other enterprises
UNSD	United Nations Statistics Division

# INTRODUCTION

At the UN Conference on Sustainable Development, also referred to as Rio + 20, in June 2012, Member States decided to launch a process to develop a set of Sustainable Development Goals (SDGs) to build upon the Millennium Development Goals and converge with the post 2015 development agenda. From the outset, UNIDO strongly advocated for industrialization to be one of the prime objectives given that manufacturing encompasses economic, social, and environmental dimensions of sustainable development.

Industrialization is a universal goal of economic growth applicable to both developing and developed countries. For developing economies, industrial growth implies structural transformation of the economy from a traditional agrarian to a modern industry-based model. Expansion of the manufacturing sector creates jobs, develops and introduces new technologies, and produces essential goods and services for the market.

For those industrialized countries which have undergone a shift from industry towards the services -

and particularly financial services - sector in recent years, a return to manufacturing reduces the imbalance between the production sector and financial intermediation and helps to restore economic stability. Industrialization offers extensive opportunities for the employment of women and, in view of advances in technology, creates increased demand for skilled workers which, in turn, stimulates the development of education and training facilities. In the most advanced countries, there are growing signs of industry's growing awareness and commitment to environmental protection, with a decrease in CO<sub>2</sub> emissions and the development of new technologies to increase resource and energy efficiency in the production process.

Although substantial progress has been made in reducing extreme poverty (the MDG target of a 50 per cent reduction was reached five years early), hundreds of millions of people, especially in the Least Developed Countries (LDCs), continue to struggle for a better life. Since the establishment of the category in 1971, when 25 countries were designated as LDCs, the list has grown steadily to 48 in 2016. Throughout this period of almost

half a century, only four countries have graduated from the list.

Today, one of the main challenges for sustainable development is the widening inequality which exists between both rich and poor and also between high and low income nations. Not only do the richest 1 per cent own more than the combined wealth of the remaining 99 per cent of the world population, the 25 highest income countries, with around 10 per cent of global population, account for more than half of global GDP. The gap between the level of wealth in industrialized and least developed economies has widened to the extent that it will take more than 100 years for the LDCs to achieve the current level of MVA per capita in industrialized economies and around 50 years if the LDCs' MVA per capita grows at a hypothetical rate of 10 per cent per annum.

UNIDO's statistical analyses have presented sound evidence of the relationship between industrialization and the well-being of society. As a country industrializes, it acquires the resources necessary to improve the population's living conditions. With an average annual 1

per cent increase in MVA per capita, the poverty head count decreases by nearly 2 per cent. Industrialization is not only the solution to problems of social and economic development but also to improving peace and the security situation in many conflict-affected countries. This same growth of 1 per cent per capita in MVA results in the number of deaths related to armed conflicts falling by 4.5 per cent.<sup>1</sup> Whilst industrial production has some negative impact on the environment, the lack of industrialization causes even more damage as a result of the increasing burden of population growth on natural resources, resulting in deforestation, over-use of soil and landslides.

In September 2015, the UN General Assembly adopted Agenda 2030 putting the issue of industrialization at the forefront of global development strategy as Sustainable Development Goal 9. It underscored the relevance and necessity of industrialization and set an ambitious target of doubling the share of industry in GDP in LDCs by 2030. Following the General Assembly resolution, the UN Statistical Commission approved a list of more than 230 statistical

indicators put forward by the Inter-Agency and Expert Group on SDG Indicators (IAEG-SDGs).

These indicators are to be used for global monitoring while individual countries and regions may add more indicators for national and thematic purposes. IAEG-SDG also designated custodian agencies for data collection, compilation and contributing to the global report of the Secretary General on the SDGs. UNIDO has responsibility to report on a number of indicators on SDG 9. The first report<sup>2</sup> on the SDGs, with the input of a large number of custodian agencies including UNIDO, was released in July 2016 and followed by the launching of a global SDG database.

This paper sets out to provide a baseline scenario for the level of global industrialization at the outset of the SDGs. It highlights the level and growth patterns of the manufacturing sector in 2015 to be used as a reference point in global monitoring. It also indicates that data are not yet available for all selected indicators for global monitoring and thus emphasizes the need for additional efforts by UNIDO in building national capacity in industrial statistics.

Most of the statistical tables and diagrams included have been compiled from the databases maintained by UNIDO. The country grouping used refers to that used by UNIDO in its major statistical products, including the International Yearbook of Industrial Statistics<sup>3</sup>. This classification is based on the stage of industrial development and differs from the one used in the Sustainable Development Report 2016.

<sup>1</sup> UNIDO: How industrial development matters to the well-being of the population – Some statistical evidence [http://www.unido.org/fileadmin/user\\_media/Services/PSD/WPA\\_2014\\_Industrialization\\_and\\_social\\_well-being.pdf](http://www.unido.org/fileadmin/user_media/Services/PSD/WPA_2014_Industrialization_and_social_well-being.pdf)

<sup>2</sup> UN, The Sustainable Development Report 2016 <http://unstats.un.org/sdgs/report/2016/The%20Sustainable%20Development%20Goals%20Report%202016.pdf>

<sup>3</sup> International Yearbook of Industrial Statistics, 2016, UNIDO, Vienna

# TARGETS AND INDICATORS FOR SUSTAINABLE DEVELOPMENT GOAL 9

Targets	Indicators
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	<p>9.1.1 Share of the rural population who live within 2 km of an all-season road</p> <p>9.1.2 Passenger and freight volumes, by mode of transport</p>
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	<p>9.2.1 Manufacturing value added as a percentage of GDP and per capita</p> <p>9.2.2 Manufacturing employment as a percentage of total employment</p>
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	<p>9.3.1 Percentage share of small-scale industries in total industry value added</p> <p>9.3.2 Percentage of small-scale industries with a loan or line of credit</p>
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	<p>9.4.1 CO2 emission per unit of value added</p>
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	<p>9.5.1 Research and development expenditure as a percentage of GDP</p> <p>9.5.2 Researchers (in full-time equivalent) per million inhabitants</p>

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	9.a.1 Total official international support (official development assistance plus other official flows) to infrastructure
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	9.b.1 Percentage of medium and high-tech manufacturing value added in total value added
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	9.c.1 Percentage of population covered by a mobile network, by technology

The highlighted sections refer to the targets and indicators directly related to industrialization and which are expanded upon below. UNIDO is recognized as a custodian agency responsible for data reporting on these indicators.

## TARGET 9.2 MANUFACTURING PRODUCTION AND EMPLOYMENT

Target 9.2 acknowledges the role of manufacturing production and employment in sustainable economic growth, with an emphasis on the least developed countries (LDCs), and as a means of helping those countries to catch up with more advanced economies. This target will be measured by manufacturing value added (MVA) as a proportion of GDP, by MVA per capita, and by manufacturing employment as a proportion of total employment.

Manufacturing is viewed as the engine of economic growth of a country. Rapid industrial growth has generated new jobs in many regions, providing better wages for workers and lifting a significant proportion of the population out of poverty. Similarly, in many countries, industrial development has generated essential resources which were then directed towards poverty reduction and the improvement of health and education facilities for the wider population.

## 9.2.1 MANUFACTURING PRODUCTION

Manufacturing value added (MVA) as a proportion of GDP and MVA per capita are widely recognized indicators for measuring progress on inclusive and sustainable industrialization. MVA is an important indicator for measuring the contribution of the manufacturing sector to total economic output.

The share of MVA in GDP reflects the role of manufacturing in the economy and in national development in general.

Manufacturing satisfies increasing demand for goods and related services worldwide and its output is on an upward trend in all groups of countries. However, the share of MVA in GDP in industrialized economies has fallen as a result of the increasing importance of services and was estimated at around 14 per cent in 2015. In contrast, in many developing and emerging industrial economies (DEIE) in the early stage of development, the share of manufacturing in GDP increases. In emerging industrial (EIE) economies, the share of MVA in GDP has increased from around 15 per cent in 1990 to more than 20 per cent in 2015.

Currently, it is LDCs which pose the greatest challenge for industrialization. With around 13 per cent of the world's population, LDCs contribute less than 1 per cent of global MVA. The share of MVA in GDP in the LDCs reached 12 per cent in 2015 but this is still much lower than the overall share of manufacturing in the world economy, which is around 16 per cent.

The share of manufacturing in GDP in EIEs has grown rapidly since 2000, increasing by almost 20 per cent. The trend in MVA as a share of GDP in industrialized countries was deeply influenced by the financial crisis in 2008/2009, which also put a brake on world manufacturing growth although developing and emerging industrial economies managed to increase their share of MVA in GDP by almost 5 per cent between 2010 and 2015 (UNIDO, 2016).

From a global perspective, industrialization faces many essential challenges arising out of the concentration of industrial production capacity in just a few industrialized countries such as the USA, China, and Japan. This has resulted in a marked inequality with other countries, as can be seen in the disparities in MVA per capita, reflecting large variations in industrial productivity among nations. In the LDCs, MVA per capita had not even reached USD 100 (constant 2010) in 2015 whereas in industrialized economies it stood at USD 5400 with an average USD 1630 per capita for the world (UNIDO, 2013).

In contrast to the general perception of the declining role of manufacturing in industrialized economies, the absolute value of manufacturing production is rising in all country groups and can be seen in increasing MVA and MVA per capita. In industrialized economies, between 2010 and 2015, MVA rose by 10.8 per cent while MVA per capita rose by only 4.6 per cent over the same period.



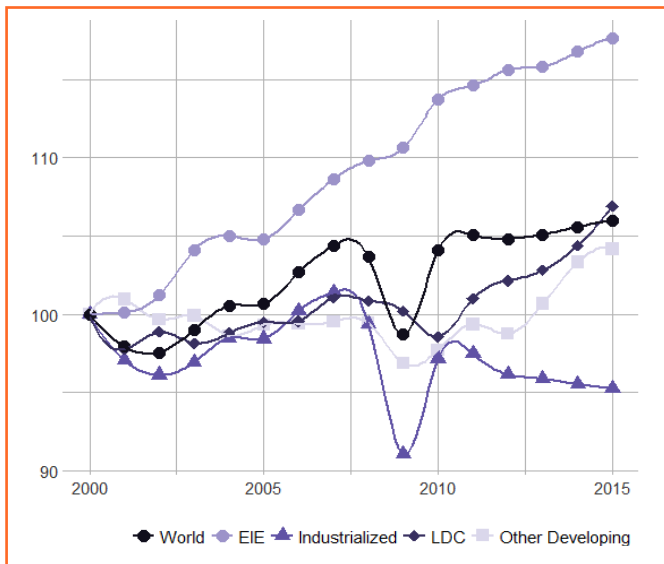


Figure 1 Growth of share of MVA in GDP, index 2000=100 (per cent)  
Source: UNIDO (2016)

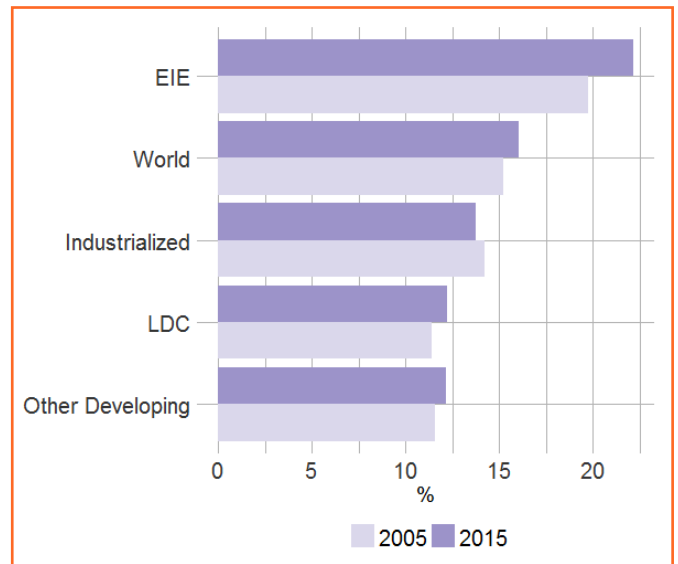


Figure 2 Share of MVA in GDP (per cent)  
Source: UNIDO (2016)

Negative growth was observed only during the financial crisis of 2008/2009 which severely hit output in industrialized economies. The fastest growth in MVA per capita was seen in EIEs which doubled their MVA per capita in a relatively short period of 15 years. In the LDCs, although MVA per

capita has not grown nearly as fast as in the EIEs, nevertheless it has increased by 80 per cent over the 15 years to 2015 whilst in other developing economies it grew at almost 60 per cent between 2000 and 2015. These figures suggest that although developing countries and particularly LDCs

have been growing rapidly, they still have to develop considerable capacity for manufacturing growth and technological progress in the coming decades (UNIDO, 2016).

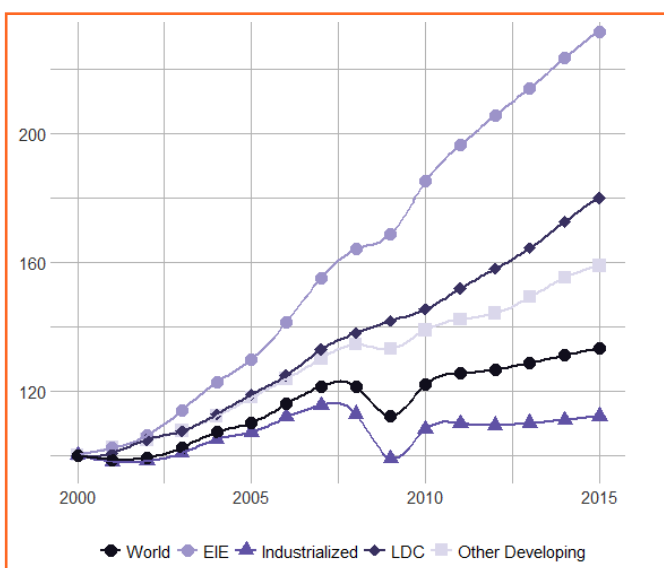


Figure 3 Growth of MVA per capita, index 2000=100  
Source: UNIDO (2016)

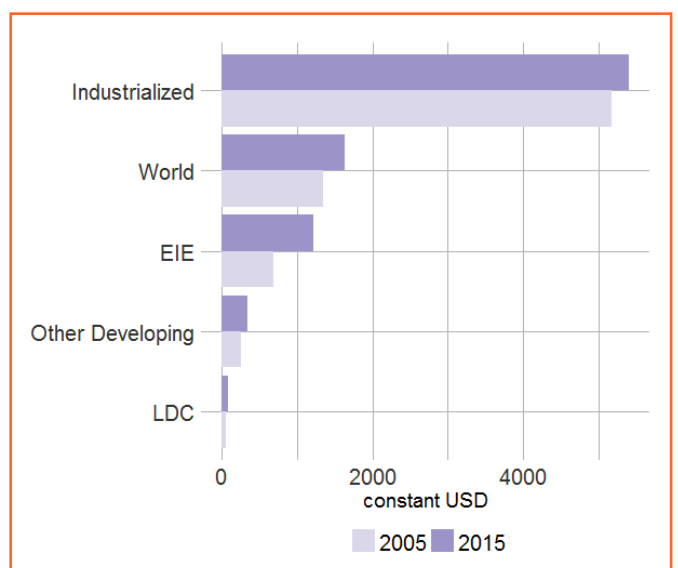


Figure 4 Manufacturing value added per capita, in constant USD  
Source: UNIDO (2016)

### Box 1: Size and distribution of global manufacturing

Global MVA reached an all-time high of 11.9 trillion international dollars (at 2010 constant prices) in 2015 and is expected to exceed 12 trillion in 2016. Whereas industrialized economies still contribute the larger share (56.4 per cent in 2015), global manufacturing has steadily shifted from industrialized to developing economies and it is China that has made the largest gain in this process. In 2005, it contributed 11.7 per cent to world MVA but this share then increased considerably, with China overtaking Japan in 2011 to become the second largest contributor and then overtaking the USA in 2015 to become the largest manufacturer in the world with a share of 23.8 per cent of global MVA.

#### Percentage distribution of world MVA in 2015 by country group at constant 2010 prices

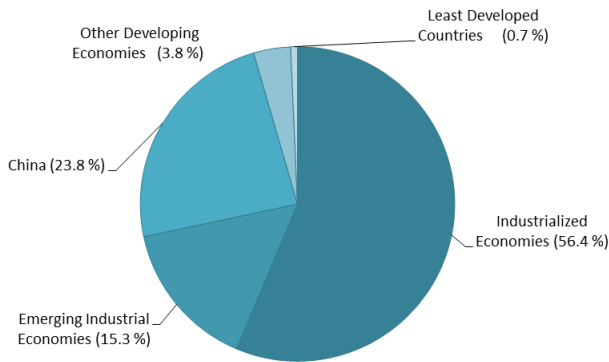


Figure 5 Share of world MVA in 2015, at constant 2010 prices (per cent)  
Source: UNIDO (2016)



Figure 6 Leading 15 manufacturers in the world, at constant 2010 prices  
Source: UNIDO (2016)

Remarkable progress in industrialization was made by other emerging industrial economies. India jumped furthest in the ranking of the world's largest manufacturers in absolute terms, moving from 14th position in 2005 to 6th in 2015. In 2015, Indonesia climbed to 10th place among the top manufacturers in the world and five economies, namely China, India, Brazil, Indonesia and Mexico, were listed among the 15 largest manufacturers in the world.

The number of European economies among the top 15 producers in the world has been falling constantly and now numbers only six, namely France, Germany, Italy, the Russian Federation, Spain, and the United Kingdom. These changes have resulted in a further redistribution of global MVA across countries and continents. It has also increased competition among producers in world markets and resulted in lower prices of manufactured goods. Although the total value of manufacturing production has been impacted by falling prices, nonetheless, the supply of goods continues to increase.

## 9.2.2 MANUFACTURING EMPLOYMENT

The second indicator under target 9.2 is manufacturing employment as a proportion of total employment. Theoretically, employment intensity (manufacturing employment per unit of value added) increases at an early stage of industrialization and

then steadily declines as countries move towards high productivity sectors as a result of structural changes. This dynamic reflects a combination of changes in the structure of demand arising out of increases in income and the impact of global industrial competitiveness

which pushes economies to further specialize in medium- and high-tech activities. Whereas innovation and technology were until recently the main drivers behind product sophistication, especially in manufacturing, in recent years the emphasis has shifted to reduction

in labour as part of cost-cutting measures.

Such changes promote capital-intensive industry and consequently the share of manufacturing in total employment may decrease. As pointed out in UNIDO's Industrial Development Report 2013, under these changed circumstances, manufacturing promotes innovation, productivity and trade more than growth and employment. However, intensive growth in industrial production occurs mainly in industrialized or emerging industrial economies. SDG 9 is more focused on developing economies, especially LDCs, where structural changes take place relatively slowly and the share of Medium and High-Technology (MHT) sectors in total manufacturing is fairly small.

In many African countries, industrialization has not yet been triggered through the production of basic consumer goods or by processing other local materials in which they have an obvious comparative advantage. Such industries are relatively labour intensive and suited to absorbing the surplus labour force arising out of rural exodus. A significant part of these economic changes takes

place in the informal sector where a critical gap exists in national and international data sources.

Moreover, employment data for the organized part of manufacturing activity is not readily available from a single source. The data presented in this paper are compiled from UNIDO and ILO databases and cover the proportion of persons employed in the manufacturing sector in total employment in all activities. Employment in manufacturing is reported in annual industrial surveys conducted by UNIDO, whereas total employment data are obtained from various sources including population censuses, labour force surveys, household surveys, population registers and official estimates. Industrial surveys in some countries use a cut-off point with the result that small manufacturing units that are not on the register are not included in the survey and consequently employment data are probably underestimated.

Discrepancies can also be caused by differences in the definition of employment; for example, in countries where informal employment is included in the figure for total employment. Because of the lack of data, only

109 countries produce an indicator of the proportion of manufacturing employment in total employment. In assessing these data, special attention should be paid to LDCs since this group is not well represented.

It has been estimated that manufacturing employs more than 500 million people around the world. The sector has often played a key role in job creation by absorbing surplus labour from agriculture and other traditional sectors and directing it into production activities with higher rates of pay. This structural change has lifted many countries out of a low-income to a middle-income and eventually a high-income group, thus clearly underlining the importance of manufacturing in economic development. In common with MVA, employment trends vary between industrialized and developing economies. While manufacturing job numbers have fallen in industrialized economies, they have increased steadily in developing countries. The outlook for employment growth is particularly encouraging in LDCs as a large segment of total employment is currently still accounted for by agriculture and traditional sectors.

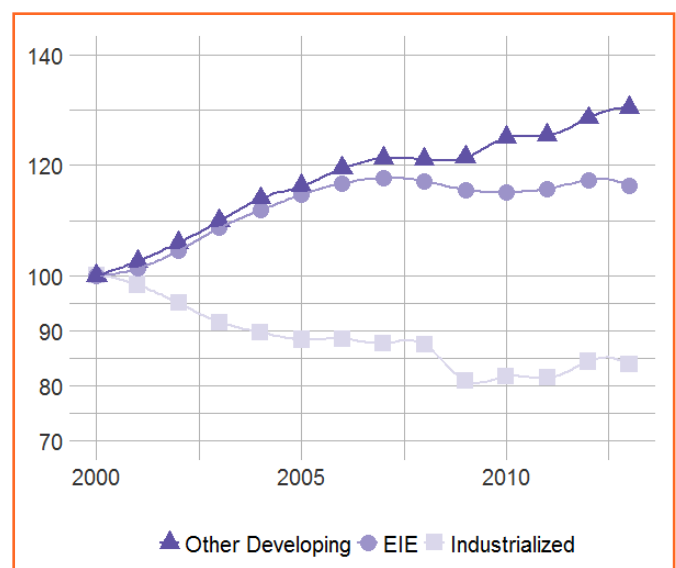


Figure 7 Growth of manufacturing employment by country group, 2000 = 100  
Source: ILO, UNIDO (2016)

## GENDER-DISAGGREGATED EMPLOYMENT DATA

It is recognized that gender-disaggregated data should be used in SDG reporting wherever applicable. Gender-disaggregated employment data enable monitoring of the major aspects of inclusive industrialization. The wide participation of women in productive activities not only results in a narrowing of the gender gap but also contributes to reducing income poverty. However, in many countries, and in LDCs in particular, employment data by sex are not readily available. UNIDO collects and compiles data on employment by sex but coverage is fairly limited. An analysis of those countries for which data are available in the INDSTAT database supports the supposition that most women working in manufacturing are engaged in low-tech industries such as production of food and beverages, textiles and wearing apparel.

The number of women working in manufacturing has fallen in industrialized countries in recent years, especially following the financial crisis. The contraction is also attributable to the shift of female employees from production to service sectors, which can be explained by several factors. Firstly, a manufacturing job requires some kind of professional and technical training. In times of economic crisis, employers are forced to minimize labour costs and women seem to be affected more than men by such measures. Secondly, working mothers often prefer a part-time job for a number of years for family reasons and part-time employment appears to be more readily available in service sectors than in manufacturing. Again, there is lack of sufficient data to positively substantiate this argument.

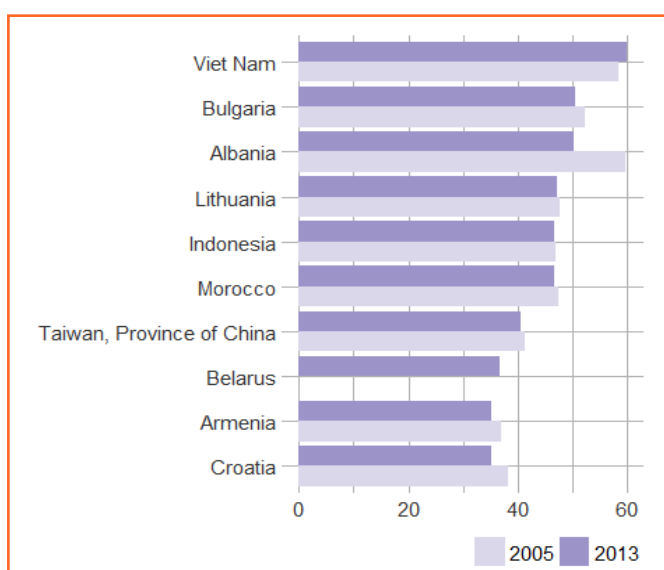


Figure 8 Share of women in employment in manufacturing for selected economies (per cent)  
Source: UNIDO (2016)

## TARGET 9.3 SMALL-SCALE MANUFACTURING INDUSTRIES

Small-scale industries, which operate on a small amount of capital using local resources, play a crucial role in the economy by generating employment and self-employment which helps to reduce poverty. Some estimates suggest that small industries in developing countries account for some 15 to 20 per cent of total value added and between 25 and 30 per cent of total employment in industry.

One of the main problems currently faced by small scale industries is lack of adequate access to financial services which are essential to upgrade technology and develop skills. In many developing economies, most small enterprises do not have even a bank account while only some 30 to 35 per cent of enterprises have ever applied for a loan or had a credit line. Such lack of access to financial services severely limits the possibility of integrating small manufacturing enterprises into the domestic market.

Target 9.3 comprises two indicators: the share of small scale manufacturing enterprises in total manufacturing value added; and the percentage of small scale industries with loans or lines of credit. The first indicator demonstrates the contribution of small industries to total manufacturing value added and the second serves to compare access to financial services with market share. Given the lack of data and methodology, both indicators are currently placed in the group of Tier 3 indicators<sup>5</sup>.

<sup>5</sup> Indicator for which there are no established methodology and standards or methodology/standards are being developed/tested [http://unstats.un.org/sdgs/files/meetings/iaeg-sdgs-meeting-04/Tier%20Classification%20of%20SDG%20Indicators\\_21%20Dec%20for%20website.pdf](http://unstats.un.org/sdgs/files/meetings/iaeg-sdgs-meeting-04/Tier%20Classification%20of%20SDG%20Indicators_21%20Dec%20for%20website.pdf)

## 9.3.1 SHARE OF SMALL-SCALE MANUFACTURING ENTERPRISES IN TOTAL MVA

One of the essential methodological problems for the global compilation of data is the lack of a uniform definition of ‘small scale industry’. In most countries, ‘small-scale industry’ defined by government in the application of policy-related measures such as subsidies, tax waivers and discounts on import duties. In view of this, the definition varies from country to country as it is based essentially on national legislation and not on statistical data. As a result, if international comparisons are to be attained, agreement must be reached on a uniform definition of the category of employment size designated as small scale-industry, at least for the purposes of SDG monitoring.

International Recommendations for Industrial Statistics <sup>6</sup> suggests that the principal indicators of industrial statistics should be compiled by employment-size classes such as 1-9, 10-19, 20-49, 50-249 and 250 and more. There is no specific taxonomy recommended for any size. Current practice at national level is to conduct a separate survey for establishments of 10 and more persons engaged. Using this method, disaggregated data for the size class data exist only for establishments which employ 10 or more persons.

The lack of an international definition of small-scale industry is the biggest problem in collecting data related to Target 9.3. The European Commission (EC) has distinguished three categories of size for small and medium

enterprises (SME): micro, small, and medium. However, some countries do not use all three categories, preferring to merge some. The definitions vary according to the number of employees, business revenue, sectors or other factors. The EC definition combines the number of persons employed and the turnover, as illustrated below:

Using this EC classification, the following table shows those countries which combine small and micro enterprises under the single heading of ‘small-scale industry’.

Data from Eurostat on manufacturing value added according to employment size are available only up to the year 2007. Based on these data, the countries with the largest proportion of small-scale enterprises in total MVA are Cyprus (58.2%), Greece (42.5%), and Italy (42.4%). In contrast, the countries with the lowest share of small-scale enterprises are Luxembourg (4.3%), Ireland (8.7%), and Germany (13.7%).

Size class	Number of persons employed	Turnover in million Euro (€)
Large	500 and more	50 and more
Medium	50 to 249	Less than 50
Small	10 to 49	Less than 10
Micro	Less than 10	Less than 2

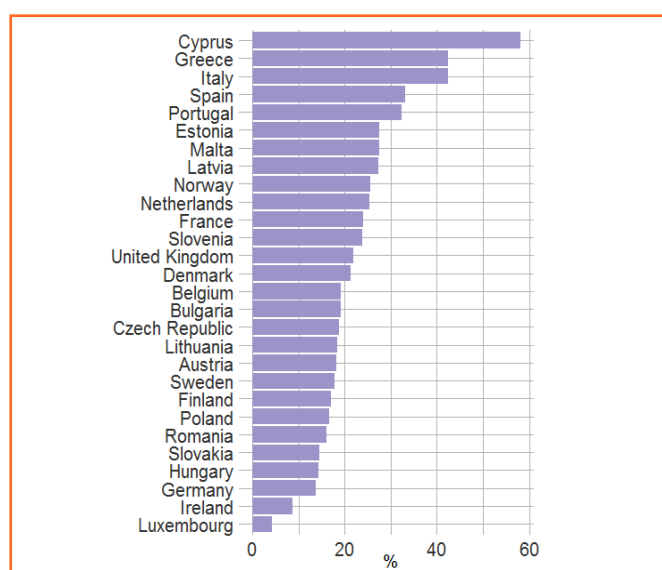


Figure 9 Share of small-scale manufacturing industry in total MVA (per cent), 2007  
Source: EUROSTAT (2016)

<sup>6</sup> United Nations, 2011; International Recommendations for Industrial Statistics 2008

## 9.3.2 PROPORTION OF SMALL-SCALE INDUSTRIES WITH A LOAN OR LINE OF CREDIT

Small-scale industries are the backbone of industrial development but access to financial services is one of the biggest challenges they face in day-to-day operations. Due to the small size of their own capital base, they cannot invest in acquiring new skills and technology without external financial support. If they are to grow, it is vital that these industries should be able to raise finance for expansion, investment in new equipment and capacity building. One of the major data sources for this indicator is the World Bank Enterprise Survey although its coverage and frequency is limited. The survey has its own classification for size classes and this is different to those of the UN or the EC. In the World Bank Enterprise Survey, data on group sizes are disaggregated as follows:

Size category	Number of persons employed
Large	100 and more
Medium	20 to 99
Small	5 to 19
No taxonomy (informal)	Less than 5

Data on the proportion of small-scale industries with loans should be interpreted with caution. These enterprises might meet their financial needs from other sources, such as listing on the stock market or raising loans from other enterprises along the companies' value chains. Whereas the stock market option is often used in some industrialized economies, raising loans elsewhere is common practice in developing countries. This, however, does not necessarily mean that small enterprises in developing countries would not prefer a bank loan if access could be provided. It is also important to note that large firms are generally less dependent on bank finance than medium or small sized firms since they can raise finance directly through the market, for example, by

launching public offerings for debt and equity. Small-scale industries usually have far fewer options and this makes them more vulnerable to the changing conditions in credit markets.

The European Commission has analysed loan patterns for small and medium size enterprises (SME) but, in this instance, it merges both class sizes into a single one under the heading of SMEs. This research indicates that changes in the proportion of SMEs with loans could be for several quite different reasons. Rising shares might imply that SME loans were increasing at a faster rate than business loans in general; that SME

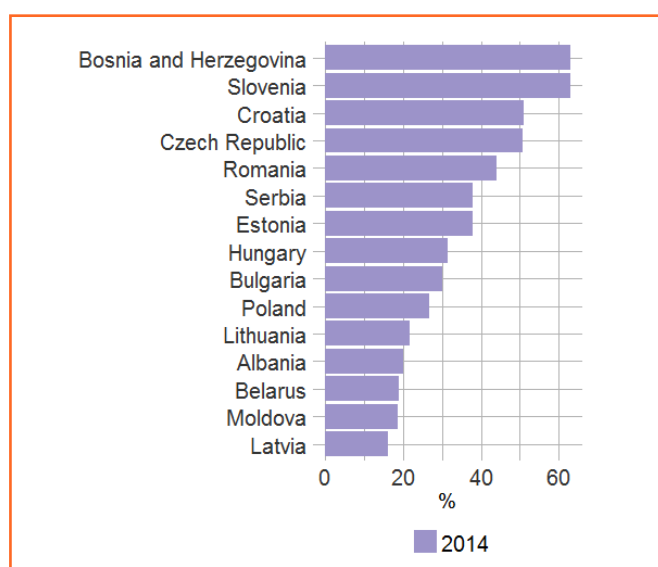


Figure 10 Proportion of small-scale manufacturing industries with a loan or line of credit, selected countries (per cent)  
Source: WB Enterprise Surveys (2016)

## TARGET 9.4

# ENVIRONMENTALLY SUSTAINABLE INDUSTRIAL DEVELOPMENT

loans were stable or on the rise while business loans in general shrank; or that SME loans are contracting less sharply than overall business loans.

Hence, an increasing SME loan share could be attributed, for example, to SMEs being given access (probably for policy reasons) to more favourable credit conditions than large firms or it could be attributable to better access for large firms to non-bank financing instruments. Thus, an increase in the proportion of loans to SMEs might reflect trends in financing opportunities and strategies in large firms rather than increased access to loans for SMEs. This is especially the case at times of a general contraction in lending as, for example, seen in many industrialized economies after the onset of the global financial crisis.

The UN General Assembly has defined sustainable development as development that meets present needs without compromising the ability of future generations to meet their own needs. It refers to human progress with a clear recognition of the long-term value of the environment. Environmentally sustainable industrial development depends on the efficient use of natural resources and the reduction of the impact on the environment of production activities.

A large part of resources used in manufacturing as raw materials and energy goods are inputs from Nature. An increase in production leads to an increase in consumption of these resources and, eventually, the depletion of environmental assets. However, the amount of resources used can be reduced significantly through the application of efficient technology and better organization of the production process.

The impact of industrial development on the environment also depends on the pace of structural change in the economy. For example, there is a large variation among industrial sectors in intensity of energy use and rates of emission. Moreover, economies can shift production from high-energy intensive sectors to low energy-intensive ones<sup>7</sup>. Industries which use low- and medium-low technology tend to be 'dirtier' in terms of emission inefficiency

per unit of output and many manufacturing units improve their emission performance only as countries advance to a higher stage of industrialization.

<sup>7</sup> Shyam Upadhyaya; Compilation of Energy Statistics for Economic Analysis; UNIDO 2010  
[http://www.unido.org/fileadmin/user\\_media/Publications/Research\\_and\\_statistics/Branch\\_publications/Research\\_and\\_Policy/Files/Working\\_Papers/2010/WP%2001%20Compilation%20of%20Energy%20Statistics%20for%20Economic%20Analysis.pdf](http://www.unido.org/fileadmin/user_media/Publications/Research_and_statistics/Branch_publications/Research_and_Policy/Files/Working_Papers/2010/WP%2001%20Compilation%20of%20Energy%20Statistics%20for%20Economic%20Analysis.pdf)

## 9.4.1 CO2 EMISSION PER UNIT OF VALUE ADDED

This indicator captures the environmental aspects of industrialization and touches upon the efficiency of energy use in industrial production. CO2 emissions are highly relevant for manufacturing as they account for around 80 per cent of Greenhouse Gas (GHG) emission occurring in this sector. Most CO2 emissions are caused by burning fossil fuels (emission from combustion) and fossil fuels are non-renewable energy resources with only limited reserves in the Earth. Consequently, CO2 emission per unit of manufacturing value added is considered as a very suitable indicator that captures both these dimensions of the environmental sustainability of industrial production. On the one hand, it reflects the amount of emission relative to the volume of production and, on the other; it helps to monitor the type and efficiency of energy used. A higher level of emission would suggest

to policy makers that a switch to using renewable types of energy is advisable as well as the introduction of energy-efficient technology in manufacturing.

Manufacturing accounts for around one fifth of total CO2 emissions and other sources are electricity generation, heat production and transportation. The total amount of CO2 emissions grew rapidly from 2000 to 2010 but has remained constant in recent years. In 2000, the total amount of CO2 emissions from manufacturing was estimated at 3886 million tonnes and it reached its highest level in 2013 since when no further growth has been observed.

Although the growth in the total volume of CO2 emissions from manufacturing activities has almost halted, the impact of these emissions on the environment cannot be seen immediately as the emitted carbon remains in the environment for a relatively

long period of time. In view of this, countries in general should strive to reduce the relative value of emission or rate of emission per unit of manufacturing output. Therefore, it is important to monitor CO2 emission per unit of manufacturing value added.

Major fast growing industrial economies have made remarkable progress in reducing CO2 emission per unit of manufacturing value added. China, which has the highest absolute amount of CO2 emissions, has reduced the relative value from 1.5 kg/USD per unit of MVA to 1.1 kg/USD. Among other emerging industrial economies, CO2 emission per unit of MVA has dropped in Brazil and Indonesia but not in India.

The value of CO2 emission per unit of manufacturing value added is presented below for the leading manufacturing countries of the world.

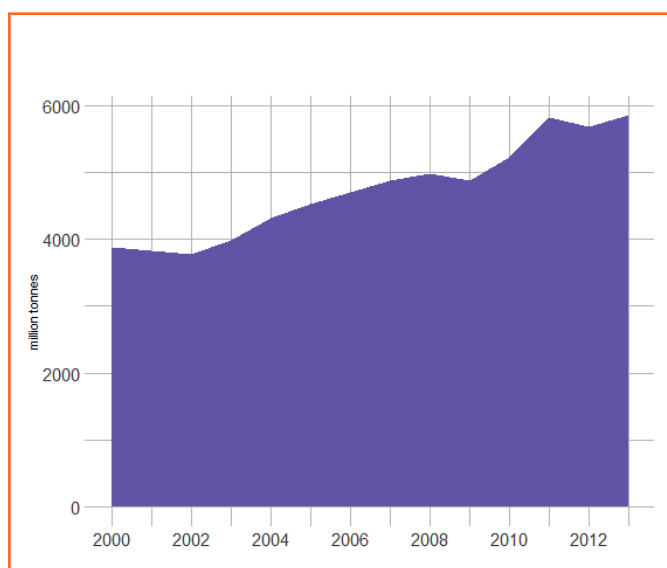


Figure 11 CO2 emissions from the world manufacturing sector (in million tonnes)

Source: International Energy Agency (IEA), 2016

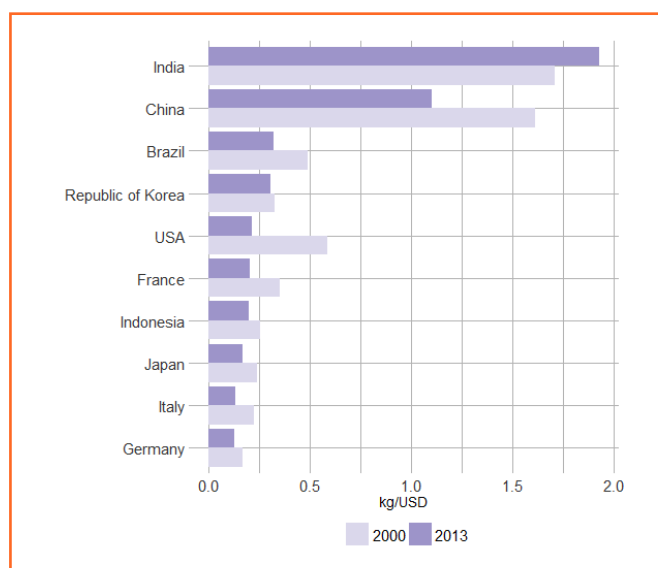


Figure 12 CO2 emission per unit of MVA in selected economies, at 2010 constant prices, kg/USD

Source: IEA, UNIDO (2016)



## TARGET 9.B INDUSTRIAL DIVERSIFICATION THROUGH TECHNOLOGY

Manufacturing industries are consistently improving their emission performance as countries move to higher levels of industrialization. At subsector level, a high volume of emissions is generally observed in the chemical industry, basic metals and non-metallic mineral products. In this respect, the emission level can also be reduced by structural changes and product diversification in manufacturing. Currently, a relatively low rate of emission per unit of MVA is found in either LDCs because of their lower volume of manufacturing production or in industrialized economies with more efficient technology for burning fuel. The highest amount of CO<sub>2</sub> is emitted by emerging industrial economies. However, reduction of emissions through structural change, especially from the relocation of industries outside the national economy, may only have local impact as the amount of emission at global level will not

change. As indicated in Figure 13, the higher the MVA per capita (level of industrialization) the lower the CO<sub>2</sub> emission per unit of manufacturing value added. In the diagram, industrialized economies are clustered at the left-hand side, indicating lower CO<sub>2</sub> emission rate per unit of MVA. Most of the emerging industrial economies (EIE) have higher CO<sub>2</sub> emissions (right-hand side of the diagram). LDCs are scattered, with no particular trend in emission rate, in view of their lower volume of manufacturing production (low MVA per capita).

Industrial development generally entails a structural transition from resource-based and low technology activities to medium and high technology (MHT) activities. Determination of MHT sectors for statistical classification is based on the share of Research and Development (R&D) expenditures in value added. Consequently, industries with higher R&D expenditures fall into the group of MHT sectors.

High-technology sectors are those which regularly carry out R&D activities aimed at product sophistication, efficient use of resources, and better organization of the production process. A modern, highly complex production structure offers better opportunities for skills development and technological innovation. MHT activities are also the high value addition sectors of manufacturing with higher technological intensity and labour productivity. MHT sectors contribute up to 80 per cent of manufacturing value added in industrialized economies.

Target 9.b is covered by an indicator which reflects the relative importance of MHT sectors in the manufacturing industry of an economy. An increase in the share of MHT sectors in total manufacturing value added not only indicates the technological intensity of manufacturing in a country but also reflects its capacity to introduce new technology in other sectors. MHT sectors produce the machinery and equipment required not only by manufacturing industry itself but also by agriculture,

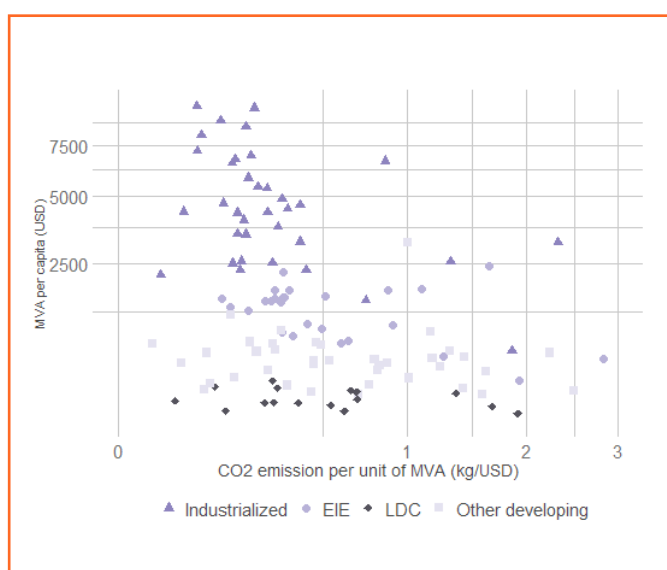


Figure 13 Scatter diagram of economies by MVA per capita and CO<sub>2</sub> emission per unit of MVA

Source: IEA, UNIDO (2016)

livestock farming, mining, and the construction industry. MHT sectors produce a large variety of consumer goods, such as personal computers and appliances, radio, television and communication equipment including cellular smart phones and a variety of household equipment. The demand for such commodities rises in proportion to the level of income of a population.

The change in manufacturing structure is best evidenced in the shift of industries towards more technologically complex products. Medium and high technology products continue to dominate manufacturing production in industrialized economies. The share of the MHT sector in total manufacturing value added is given below for selected countries.

In general, there is a trend towards gradual growth of MHT sectors in manufacturing across the globe. However, growth in LDCs has been painfully slow. Despite some increase in recent years, LDCs' share of global MHT activities has barely reached 10 per cent. The fastest growth in the MHT share in manufacturing production has occurred in industrialized economies, where a country like Slovakia jumped from 34 per cent in 2000 to 47 per cent in 2014. Industrialized countries continuously dominate the world ranking of countries by MHT shares, with Singapore in first place with a share of more than 80 per cent.

Whilst emerging industrial economies have recorded similar average growth rates in MHT activities to those of industrialized countries, in terms of absolute

shares they are still far behind. The group of EIEs shows a very heterogeneous structure with regard to both individual growth rates and absolute shares. The average share of medium and high technology manufacturing in total manufacturing production in EIEs is 30 per cent.

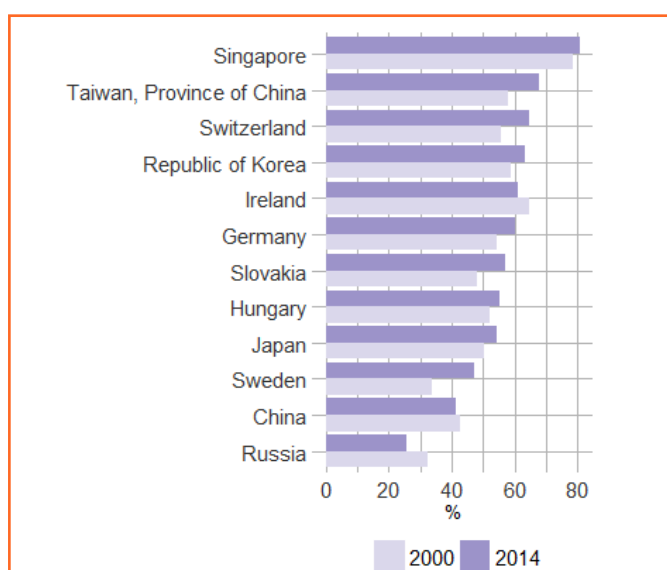


Figure 14 Share of MHT in MVA in selected countries (per cent)

Source: UNIDO (2016)

# CONCLUSION

This paper presents an initial and preliminary overview of targets and indicators related to industrialization in the context of global monitoring of the UN Sustainable Development Goals, and particularly SDG 9. The data outlined looks at two aspects of monitoring – firstly, the status of world manufacturing at the time of launching the SDGs and, secondly, the availability of data for use in continuous global monitoring.

World manufacturing is expanding but the pace varies according to country groups. In emerging industrial economies, MVA is growing in absolute and relative terms with respect to GDP. In industrialized economies, the share of manufacturing is declining in terms of both volume and employment. The biggest challenge is industrialization of LDCs which are faced with the challenge of doubling their industries' share in GDP and employment if they are to meet Target 9.2. LDCs currently produce MVA equivalent to less than 100 USD per capita whereas some industrialized economies produce MVA of more than 10000 USD per capita, illustrating the very large degree of variation. This represents inequality amongst the world's nations. The attainment of global sustainable development should significantly narrow this gap. SDG 9 underlines the vital economic and social role of small-scale industries, which

could be the key to extending industrialization on a wider level in developing countries. However, these industries lack access to financial services to maintain and promote their activities. The environment is another major dimension of industrialization. Trends here are encouraging overall as CO2 emission per unit of manufacturing value added is decreasing. Nonetheless, it should be borne in mind that although CO2 emissions in many developing economies are currently negligible, the expansion of manufacturing production in these countries may lead to an increase in the absolute volume of CO2 emissions. This will only be overcome by the adoption of innovation and technology on a wide scale.

Working towards the SDGs is a global agenda which requires global monitoring. UNIDO offers a wide range of statistics to monitor

the progress made by the world's nations in achieving the SDGs. The main problem with this monitoring is the critical data gap in a large number of developing countries. The extent of the problem varies. Basic manufacturing production data at highly aggregated macro-economic levels are available for many countries. But the main requirement set by Agenda 2030<sup>8</sup> is to monitor based on "...data disaggregated by income, gender, age, race, ethnicity, migratory status, disability, geographic location and other characteristics relevant in national contexts". Relevant data in an industrial context should be disaggregated by industry, geographical region, gender (employment data), size of firms (small industry) and other characteristics. However, the data are not available in such detail. This strongly underlines the need for national statistics capacity building programmes.

<sup>8</sup> United Nations; Transforming Our World: The 2030 Agenda for Sustainable Development; p 23. [http://www.un.org/pga/wp-content/uploads/sites/3/2015/08/120815\\_outcome-document-of-Summit-for-adoption-of-the-post-2015-development-agenda.pdf](http://www.un.org/pga/wp-content/uploads/sites/3/2015/08/120815_outcome-document-of-Summit-for-adoption-of-the-post-2015-development-agenda.pdf)



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# APPENDIX I – LIST OF COUNTRIES AND AREAS INCLUDED IN SELECTED GROUPINGS

## Industrialized Economies

### EU <sup>9</sup>

Austria  
Belgium  
Czech Republic  
Denmark  
Estonia  
Finland  
France  
Germany  
Hungary  
Ireland  
Italy  
Lithuania  
Luxembourg  
Malta  
Netherlands  
Portugal  
Slovakia  
Slovenia  
Spain  
Sweden  
United Kingdom

### Other Europe

Andorra  
Iceland  
Liechtenstein  
Monaco  
Norway  
Russian Federation  
San Marino  
Switzerland

### East Asia

China, Hong Kong SAR  
China, Macao SAR  
China, Taiwan Province  
Japan  
Malaysia

Republic of Korea  
Singapore

### West Asia

Bahrain  
Kuwait  
Qatar  
United Arab Emirates

### North America

Canada  
United States of America

### Others

Australia  
Israel  
New Zealand

## Emerging Industrial Economies

Argentina  
Belarus  
Brazil  
Brunei Darussalam  
Bulgaria  
Chile  
China  
Columbia  
Costa Rica  
Croatia  
Cyprus  
Greece  
India  
Indonesia  
Kazakhstan  
Latvia  
Mauritius  
Mexico  
Oman  
Poland

Romania  
Saudi Arabia  
Serbia  
South Africa  
Suriname  
Thailand  
TFYR Macedonia  
Tunisia  
Turkey  
Ukraine  
Uruguay  
Venezuela (Bolivarian Republic of)

## Other Developing Economies

Albania  
Algeria  
Angola  
Antigua and Barbuda  
Armenia  
Azerbaijan  
Bahamas  
Barbados  
Belize  
Bolivia (Plurinational State of)  
Bosnia and Herzegovina  
Botswana  
Cameroon  
Cape Verde  
Congo  
Côte d'Ivoire  
Cuba  
Democratic People's Republic of Korea  
Dominican Republic  
Ecuador  
Egypt  
El Salvador  
Equatorial Guinea  
Fiji

Gabon  
Georgia  
Ghana  
Grenada  
Guatemala  
Guyana  
Honduras  
Iran (Islamic Republic of)  
Iraq  
Jamaica  
Jordan  
Kenya  
Kyrgyzstan  
Lebanon  
Libya  
Maldives  
Marshall Islands  
Micronesia (Federated States of)  
Mongolia  
Montenegro  
Morocco  
Namibia  
Nicaragua  
Nigeria  
Pakistan  
Palau  
Panama  
Papua New Guinea  
Paraguay  
Peru  
Philippines  
Republic of Moldova  
Saint Kitts and Nevis  
Saint Lucia  
Saint Vincent and the Grenadines  
Seychelles  
Sri Lanka  
State of Palestine  
Swaziland  
Syrian Arab Republic  
Tajikistan

Tonga  
Trinidad and Tobago  
Turkmenistan  
Uzbekistan  
Viet Nam  
Zimbabwe

### **Least Developed Countries**

Afghanistan  
Bangladesh  
Benin  
Bhutan  
Burkina Faso  
Burundi  
Cambodia  
Central African Republic  
Chad  
Comoros  
Democratic Republic of the Congo  
Djibouti  
Eritrea  
Ethiopia  
Gambia  
Guinea  
Guinea-Bissau  
Haiti  
Kiribati  
Lao People's Democratic Republic  
Lesotho  
Liberia  
Madagascar  
Malawi  
Mali  
Mauritania  
Mozambique  
Myanmar  
Nepal  
Niger  
Rwanda

Samoa  
Sao Tome and Principe  
Senegal  
Sierra Leone  
Solomon Islands  
Somalia  
Sudan  
Timor-Leste  
Togo  
Tuvalu  
Uganda  
United Republic of Tanzania  
Vanuatu  
Yemen  
Zambia

## APPENDIX II – SUMMARY OF THE SHARE OF MVA IN GDP (PER CENT) AND MVA PER CAPITA FOR SELECTED COUNTRIES AND COUNTRY GROUPINGS (CONSTANT USD 2010)

World/Country/Country Groupings	2000 (%)	2015 (%)	Growth rate (%) (2000 – 2015)
World	15.2	16.1	6.0
Industrialized economies	14.5	13.8	-4.8
Emerging industrial economies	18.9	22.2	17.7
China	28.7	32.8	14.8
European Union (28 countries)	14.6	14.1	-3.7
Other developing countries	11.7	12.2	4.2
Least developed countries	11.5	12.3	6.9
European Union (industrialized countries)	14.8	14	-5.2
OECD countries	14.4	13.9	-4.0

MVA per capita	2000 (USD)	2015 (USD)	Growth rate (2000 – 2015) (%)
World	1223.3	1630	33.2
Industrialized economies	4821.5	5406.1	12.1
Emerging industrial economies	524.8	1216.7	131.8
China	490.6	2025.3	312.9
European Union (28 countries)	4414.8	4873.3	10.4
Other developing countries	214.3	340.5	58.9
Least developed countries	51.3	92.5	80.1
European Union (industrialized countries)	5144.5	5448.7	5.9
OECD countries	4735.7	5209.4	10



## APPENDIX III – CO2 EMISSIONS FROM MANUFACTURING, PER UNIT OF MVA KG/USD AT 2010 CONSTANT PRICES

	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009	2010	2011	2012	2013
<b>Brazil</b>	0.33	0.31	0.32	0.31	0.29	0.28	0.27	0.29	0.28	0.28	0.30	0.33	0.32	0.30
<b>China</b>	1.61	1.48	1.35	1.37	1.55	1.64	1.53	1.37	1.30	1.22	1.12	1.13	1.14	1.10
<b>Germany</b>	0.17	0.15	0.16	0.16	0.15	0.15	0.14	0.13	0.14	0.15	0.14	0.13	0.13	0.13
<b>India</b>	1.71	1.66	1.71	1.49	1.46	1.51	1.47	1.50	1.50	1.59	1.61	1.68	1.69	1.93
<b>Iran</b>	2.59	2.34	2.17	2.09	1.99	1.95	1.87	2.09	2.17	2.04	1.99	1.94	2.18	2.24
<b>Italy</b>	0.25	0.25	0.26	0.24	0.24	0.23	0.23	0.21	0.19	0.22	0.19	0.20	0.20	0.20
<b>Japan</b>	0.25	0.25	0.26	0.24	0.24	0.23	0.23	0.16	0.21	0.19	0.22	0.20	0.20	0.20
<b>Republic of Korea</b>	0.58	0.56	0.46	0.42	0.36	0.32	0.32	0.28	0.28	0.25	0.25	0.24	0.22	0.21
<b>Mexico</b>	0.29	0.27	0.29	0.27	0.23	0.29	0.28	0.28	0.29	0.27	0.26	0.26	0.26	0.33
<b>Russian Federation</b>	1.15	1.05	1.02	0.89	0.83	0.77	0.70	0.74	0.75	0.86	0.86	0.85	0.74	0.74
<b>South Africa</b>	0.97	0.75	0.81	0.88	1.00	0.99	0.86	0.69	0.69	1.15	1.04	0.81	0.80	0.91
<b>United Arab Emirates</b>	2.02	1.78	1.95	1.82	1.54	1.34	1.31	1.60	1.74	2.43	2.46	2.46	2.65	2.32
<b>Egypt</b>	1.16	1.44	1.30	1.19	0.94	1.27	1.25	1.34	1.15	0.96	0.91	0.93	0.80	0.79
<b>United Kingdom</b>	0.28	0.27	0.25	0.26	0.25	0.23	0.22	0.22	0.21	0.19	0.19	0.17	0.17	0.17
<b>United States of America</b>	0.35	0.35	0.30	0.28	0.28	0.25	0.24	0.23	0.23	0.21	0.24	0.24	0.20	0.20

Source: UNIDO elaboration based on IEA CO2 emissions from fuel combustion statistics 2015



**THE GLOBAL GOALS**  
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