

9 INDUSTRY, INNOVATION
AND INFRASTRUCTURE



Goal 9: Industries, Innovation, and Infrastructure



Overview

Industrialization

Value

Infrastructure

Connection and
Knowledge



Facts

Industrialization's job multiplication effect has a positive impact on society. Every job in manufacturing creates 2.2 jobs in other sectors.

Small and medium-sized enterprises that engage in industrial processing and manufacturing are the most critical for the early stages of industrialization and are typically the largest job creators. They make up over 90 percent of business worldwide and account for between 50-60 percent of employment.

Least developed countries have immense potential for industrialization in food and beverages (agro-industry), and textiles and garments, with good prospects for sustained employment generation and higher productivity

Middle-income countries can benefit from entering the basic and fabricated metals industries, which offer a range of products facing rapidly growing international demand

In developing countries, barely 30 per cent of agricultural production undergoes industrial processing. In high-income countries, 98 per cent is processed. This suggests that there are great opportunities for developing countries in agribusiness.

<https://www.un.org/sustainabledevelopment/infrastructure-industrialization/>



9.1

Target

- 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

Indicators

- Proportion of the **rural population** who live within **2 km of an all-season road**
- **Passenger and freight volumes**, by mode of transport

<https://sustainabledevelopment.un.org/sdg9>

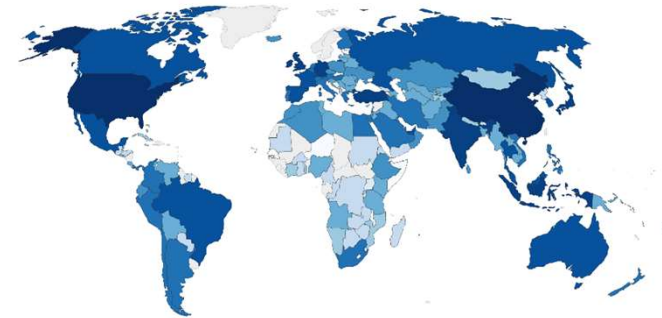
Africa-70 percent of the continent's rural population, or about 450 million people, lacked road accessibility in rural areas
<https://www.worldbank.org/en/topic/transport/brief/connections-note-23>

Cargo Ships



Number of air transport passengers carried, 2017

Total number of air passengers carried per year, including both domestic and international aircraft passengers of air carriers registered in the country. This denotes the number of passengers carried by airliners registered in a given country, rather than the nationality of individual passengers.

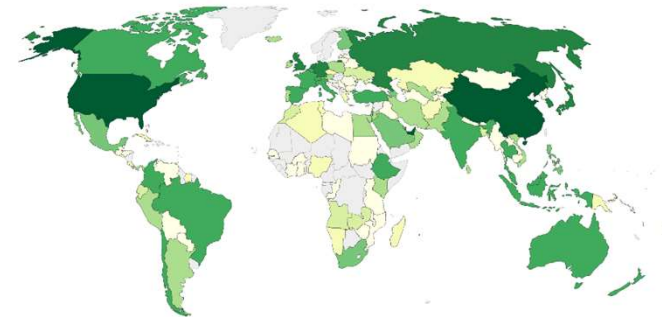


Source: World Bank

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Air transport, freight (ton-km), 2017

Air freight is the volume of freight, express, and diplomatic bags carried on each flight stage (operation of an aircraft from takeoff to its next landing), measured in metric tons times kilometers traveled.



Source: World Bank

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9.2

Target

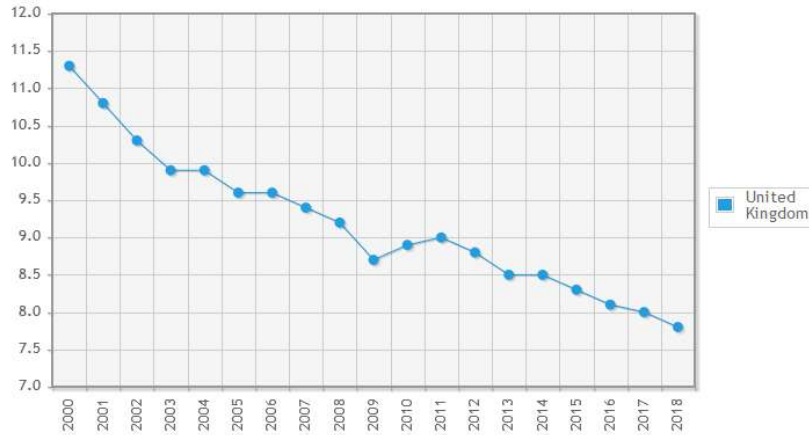
- Promote inclusive and sustainable industrialization and, by 2030, significantly **raise industry's share of employment** and gross domestic product, in line with national circumstances, and **double its share in least developed countries**

Indicators

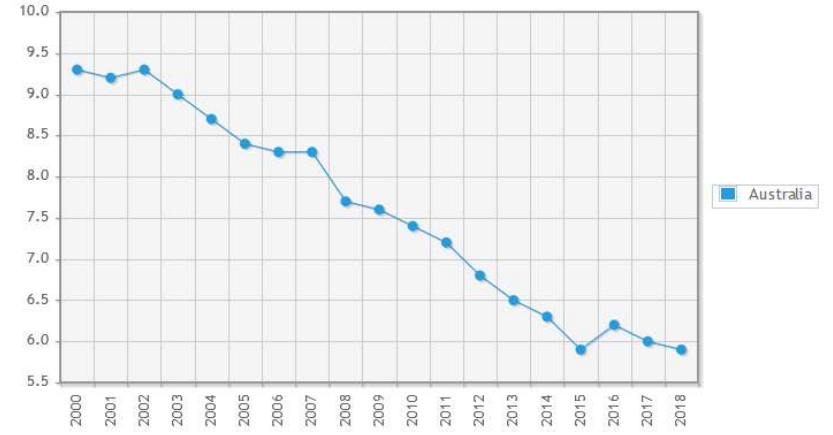
- **Manufacturing value added** as a proportion of GDP and per capita
- **Manufacturing employment** as a proportion of total employment

Developed
Manufacturing has not been adding value because they are past that and in knowledge and service based industries primarily

Manufacturing value added as a proportion of GDP (%)

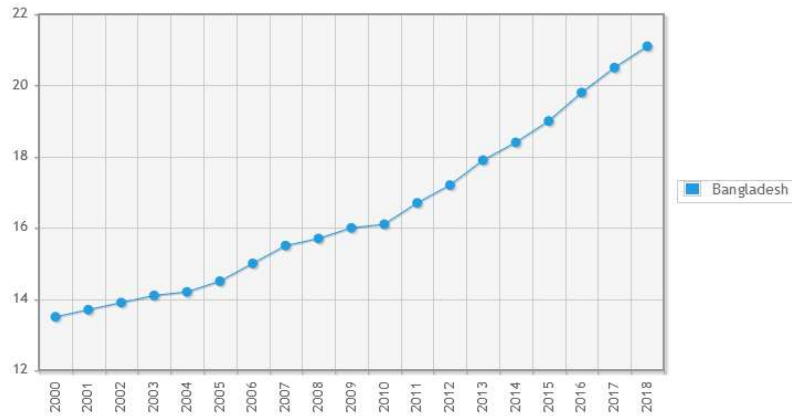


Manufacturing value added as a proportion of GDP (%)

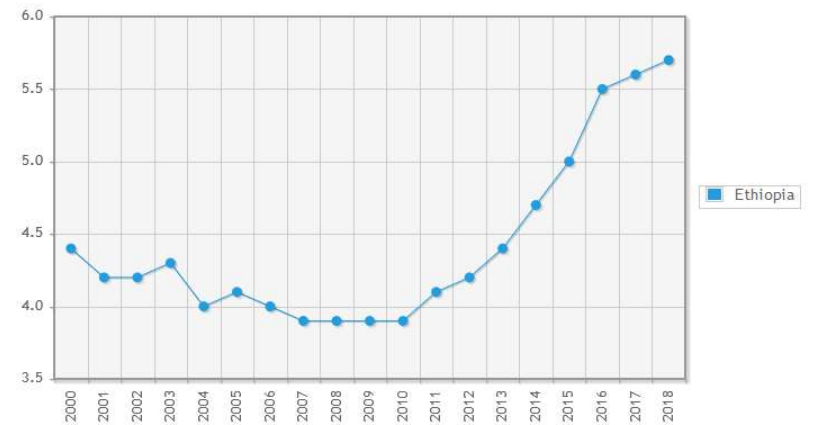


Developing
The addition of manufacturing does add value to the GDP

Manufacturing value added as a proportion of GDP (%)



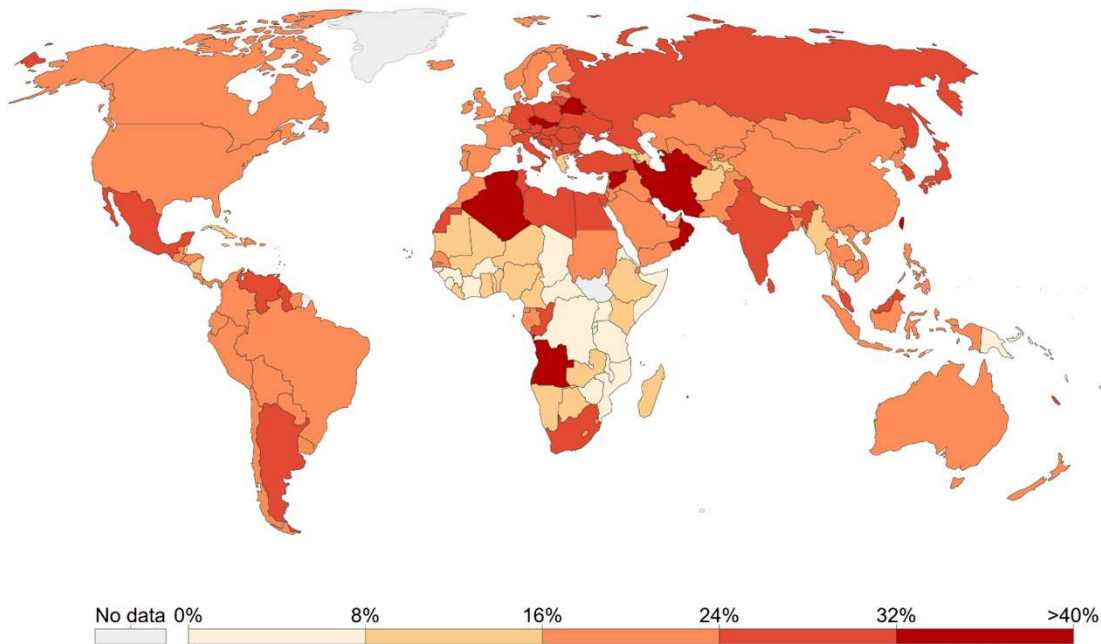
Manufacturing value added as a proportion of GDP (%)



Industry employment (% of total employment), 2017

Employment refers to all persons of working age who, during a specified brief period, were in paid employment (whether at work or with a job but not at work) or in self-employment (whether at work or with an enterprise but not at work).

Our World
in Data



Source: ILOSTAT

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Countries who have recently developed or in process like Eastern Europe, some of middle East are in industry.

Less developed countries are lacking substantial means to make money and more developed countries have gone towards service and knowledge based industries or replaced jobs with automation



9.3

Target

- 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

Indicators

- Proportion of **small-scale industries in total industry value added**
- Proportion of **small-scale industries with a loan or line of credit**

<https://sustainabledevelopment.un.org/sdg9>

Benefits of Small Scale Industries

Partner in nation building

- Brings job opportunities which provides for families and their needs

Customized Products

- Less generic and more specific items

Employs local people

- Build within a community instead of all around the world



9.4

Target

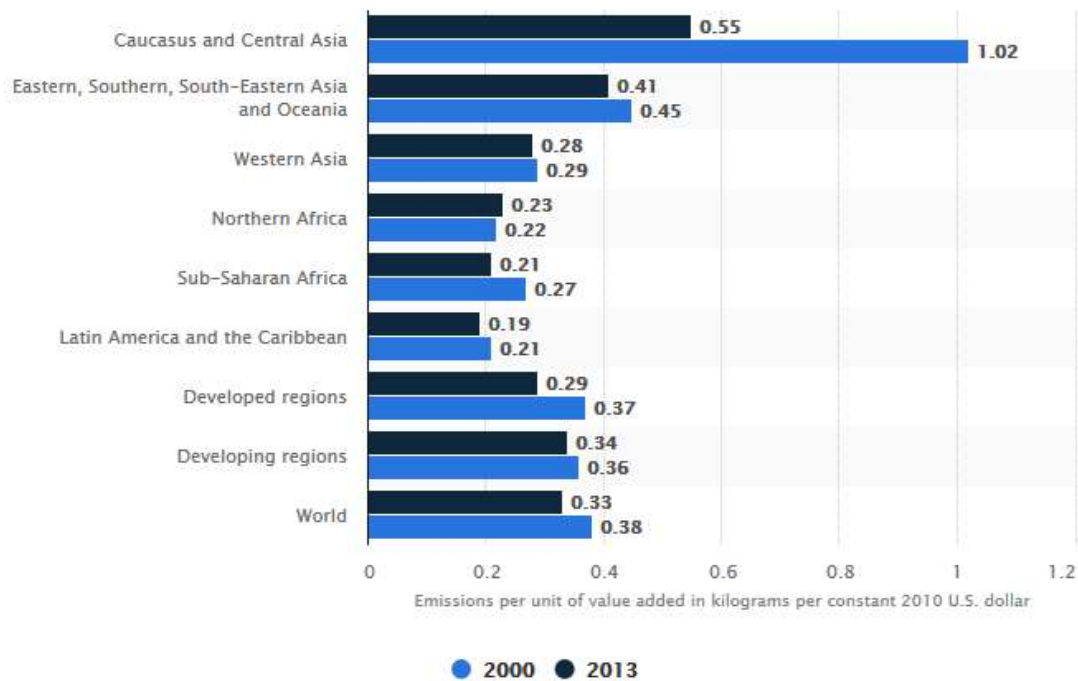
- By 2030, **upgrade infrastructure and retrofit industries** to make them sustainable, with **increased resource-use efficiency** and greater adoption of **clean and environmentally sound technologies** and industrial processes, with all countries taking action in accordance with their respective capabilities

Indicators

- **CO2 emission** per unit of value added

<https://sustainabledevelopment.un.org/sdg9>

Carbon Dioxide Emissions Per Unit of Value Added in 2000 and 2013



Caucasus and Central Asia reduced emissions by .55 kg (per 2010 US dollar)

Overall, all areas reduced emissions per dollar added



9.5

Target

- 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

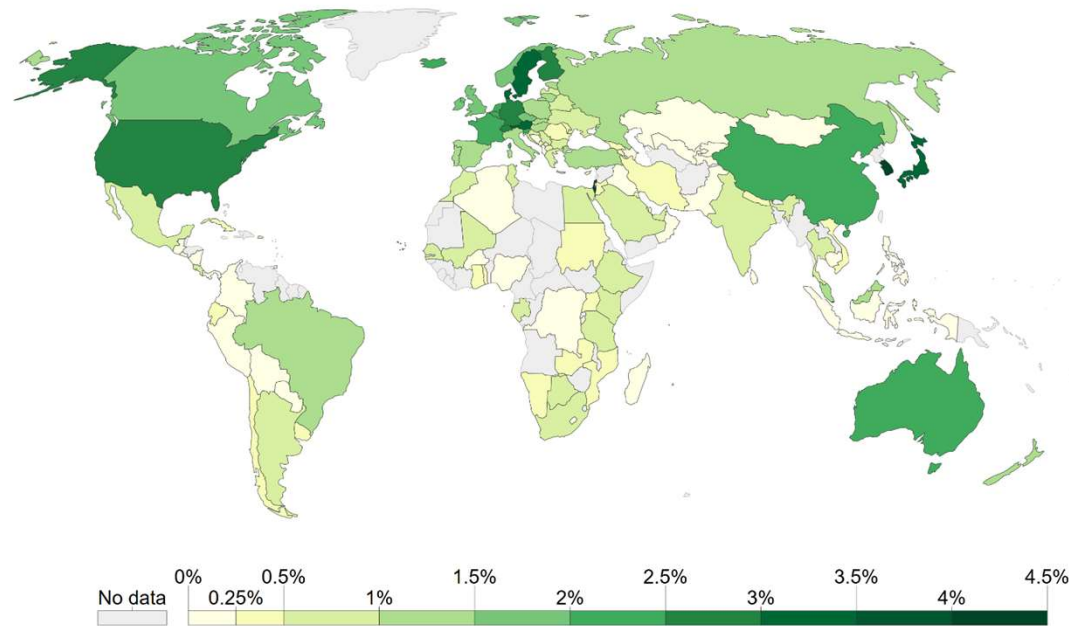
Indicators

- **Research and development expenditure** as a proportion of GDP
- **Researchers** (in full-time equivalent) per million inhabitants

<https://sustainabledevelopment.un.org/sdg9>

Spending on research and development as share of GDP, 2015

Expenditures for research and development are current and capital expenditures (both public and private) on creative work undertaken systematically to increase knowledge, including knowledge of humanity, culture, and society, and the use of knowledge for new applications. R&D covers basic research, applied research, and experimental development.



Most developed nations have highest expenditure percentages

Source: World Bank

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9.A

Target

- 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**

Indicators

- Total **official international support** (official development assistance plus other official flows) to infrastructure

<https://sustainabledevelopment.un.org/sdg9>

Global forecasts

Investment estimates

\$79 Trillion

Investment current trends

\$94 Trillion

Investment needed

\$15 Trillion

Investment gap

View data in

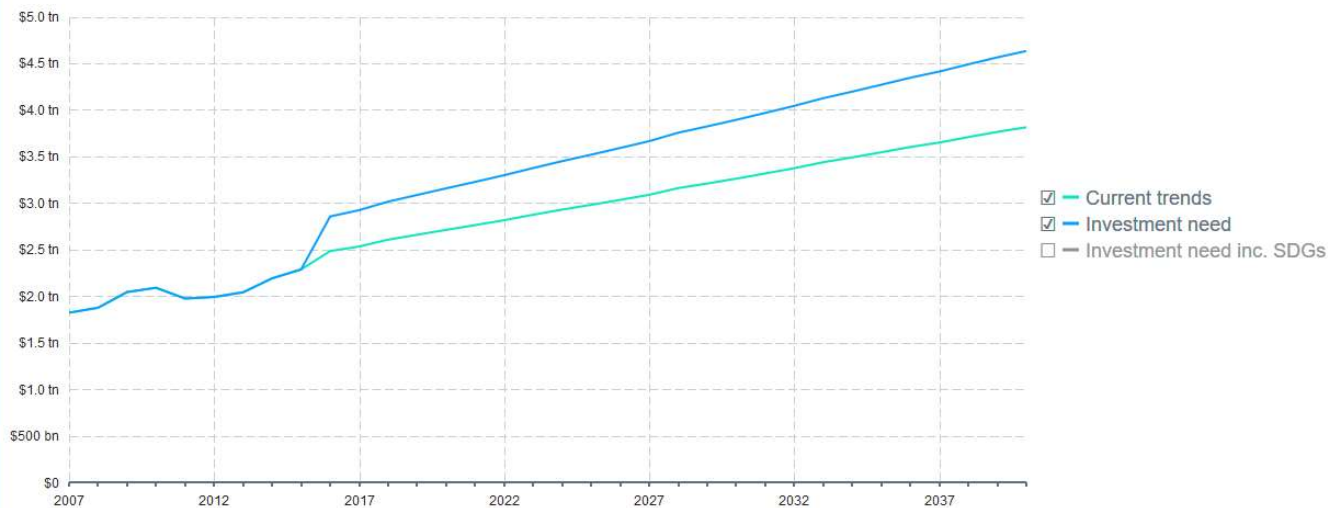
View by Estimate | Sector

Download data

\$ USD | % of GDP

Export Chart

Infrastructure investment at current trends and need



Described as to meet SDG goals

This focuses primarily on developed countries.

It is recommended for the US alone to invest \$12 trillion instead of \$8.5 trillion, a \$3.8 trillion gap

Meanwhile Cambodia has \$59 billion investment, but predicts \$87 billion, a \$28 billion gap



9.B

Target

- 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

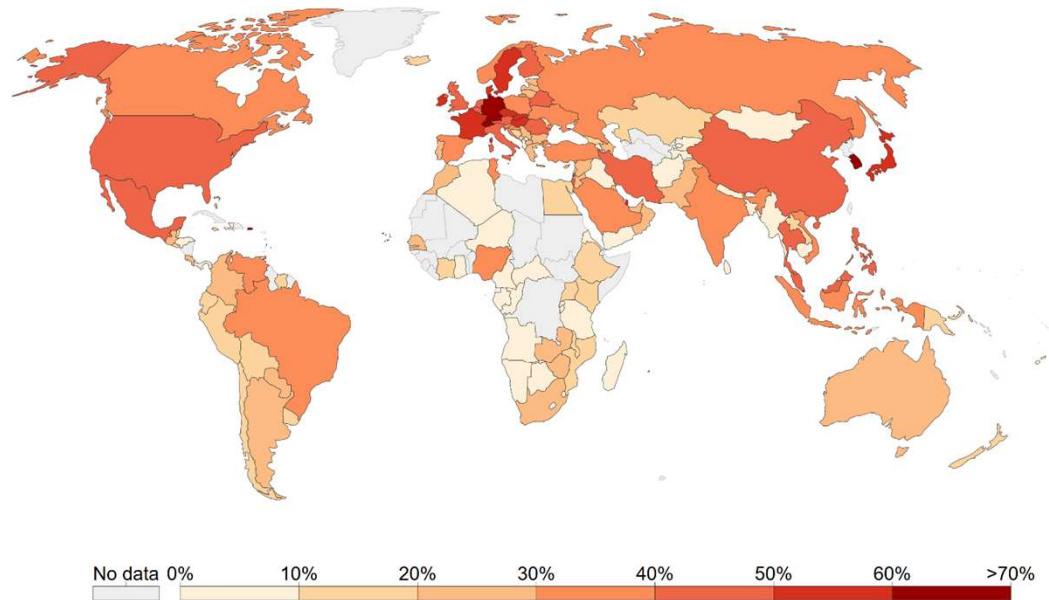
Indicators

- Proportion of **medium and high-tech industry value added** in total value added

Proportion of total manufacturing value added from medium and high-tech industry, 2016

Our World
in Data

The proportion of medium and high-tech industry (MHT) value added as a percentage of total manufacturing value. Higher values indicate a country's industry sector is focused on high-tech manufacturing.



Source: UN Statistics Division

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High tech is where more developed countries have been booming, but the goal is to increase in developing countries



9.C

Target

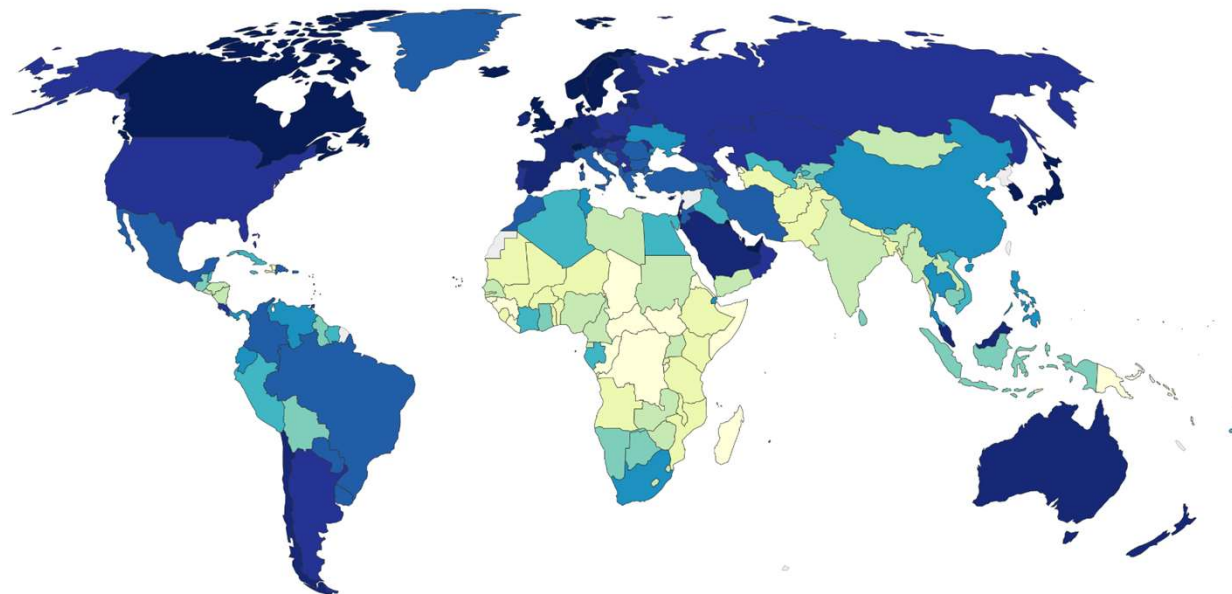
- Significantly increase access to information and communications technology and strive to provide **universal and affordable access to the Internet in least developed countries by 2020**

Indicators

- Proportion of **population covered by a mobile network**, by technology

Share of the population using the Internet, 2017

All individuals who have used the Internet in the last 3 months are counted as Internet users. The Internet can be used via a computer, mobile phone, personal digital assistant, games machine, digital TV etc.



Unequal access for service and financial reasons. Widens the information access gap



Source: World Bank

OurWorldInData.org/technology-adoption/ • CC BY

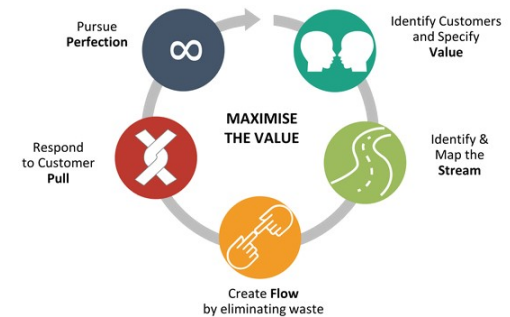
Lean Manufacturing

Eliminating non-value added activities (waste)

Shift in thinking from “batch and queue” to “one-piece flow” production

LEAN MANUFACTURING

Lean Thinking



Kaizen	5S	Cellular Manufacturing	Just-in-time/Kanban	Total Productive Maintenance	Six Sigma
<ul style="list-style-type: none"> • Continual improvement • Small, periodic changes 	<ul style="list-style-type: none"> • Maintain orderly workplace • Sort (Seiri), Set in Order (Seiton), Shine (Seiso), Standardize (Seiketsu), and Sustain (Shitsuke) 	<ul style="list-style-type: none"> • Arranged in a sequence with minimal transport and delay • Minimize time 	<ul style="list-style-type: none"> • Move items through process in accordance to demand • Reduce storing and waste 	<ul style="list-style-type: none"> • Reduce mistakes and accidents • Engage all levels of organization • People who work on a component can fix that component 	<ul style="list-style-type: none"> • Use statistics and data to analyze processes • Find areas for improvement

Roads

Importance for rural areas

Link

- Producers to markets
- Workers to jobs
- Students to schools
- Sick to hospitals

Lack of data has hindered planning

In high density areas public transport should be a larger focus

Can also lead to more deforestation and pollution

Materials in roads could generate electricity from passing traffic.

Engineers at Lancaster University are working to take energy from normal traffic volumes in an hour to power between 2000 and 4000 street lamps.

Estimates the cost to install the technology is 20 percent of the cost currently for powering the lights.

Ted Talks

African manufacturing development from universities to makerspaces:

https://www.ted.com/talks/kamau_gachigi_success_stories_from_kenya_s_first_makerspace

Trading and manufacturing:

https://www.ted.com/talks/augie_picado_the_real_reason_manufacturing_jobs_are_disappearing