

Annex to chapter 9

1. Data for SDG 9

SDG 9 comprises eight targets and a total of 12 indicators (four of which contain multiple subindicators). Of these indicators, nine are tier I, two are tier II and one is tier III for which data are not available, as the indicator is still in the process of methodological definition.

The United Nations Statistic Division provides data sets for a total of 11 indicators: 9.1.2 - Passenger and freight volumes, by mode of transport; 9.2.1 - Manufacturing value added as a proportion of GDP and per capita; 9.2.2 - Manufacturing employment as a proportion of total employment; 9.3.1 - Proportion of small-scale industries in total industry value added; 9.3.2 - Proportion of small-scale industries with a loan or line of credit; 9.4.1 - Carbon dioxide emission per unit of value added; 9.5.1 - Research and development expenditure as a proportion of GDP; 9.5.2 - Researchers (in full-time equivalent) per million inhabitants; 9.a.1 - Total official international support (official development assistance plus other official flows) to infrastructure; 9.b.1 - Proportion of medium and high-tech industry value added in total value added; and 9.c.1 - Proportion of population covered by a mobile network, by technology. None of the provided data sets includes sex disaggregated data.

The data used in the analysis of SDG 9 was downloaded on 2 August 2018. After a country level data check following a major update of the Global SDG Indicators Database of the United Nations Statistics Division on 8 July 2019, the data series of 9.1.2 (Passenger and freight volumes, by mode of transport), 9.2.1 (Manufacturing value added as a proportion of GDP and per capita), 9.a.1 (Total official international support (Official development assistance plus other official flows) to infrastructure), and 9.b.1 (Proportion of medium and high-tech industry value added in total value added), as well as the third data series of 9.c.1 (Proportion of population covered by at least a 4G mobile network (percentage)) are replaced with amended data.

We examine data availability in the Arab region and implement data substitution, when needed, based on the criteria of having to cover half or more of the total population of the Arab region and at least one third of the Arab countries for an indicator/subindicator to be kept in the analysis. When there are many subindicators that mean the same but are expressed differently (as in the case of the two series under indicator 9.2.1 and the three series under indicator 9.4.1), we choose the one among these subindicators that is more representative, is easier to interpret and has more data availability. This leads us to omit one of the two series of 9.2.1, keeping the manufacturing value added as a proportion of GDP (percentage); and one of the three series of 9.4.1, keeping the carbon dioxide emissions per unit of manufacturing value added (kilograms of carbon dioxide per constant 2010 United States dollars). On account of insufficient data availability, especially for Arab countries, we also omit two series of 9.1.2 [passenger volume by air transport (in passenger kilometres) and freight volume by air transport (in tonne-kilometres)], which only cover regions, subregions or groups of countries but not individual countries, and indicator 9.3.1 (Proportion of small-scale industries in total industry value added).

The rest of the indicators or subindicators are subject to our data substitution scheme for the year 2017, considering the data spanning 2009–2017. Table 9.1 shows the number of substituted data points for each year, including those from Arab countries.

Table 9.1 Data substitution scheme for selected indicators and subindicators

Indicator or subindicator	Number of substituted data points (Arab)	Year
	32 (5)	2016
	12 (1)	2015
	15 (2)	2014
9.2.2 (Manufacturing employment as a proportion of total employment)	5 (0)	2013
	6 (1)	2012
	7 (1)	2011

	7 (2)	2010
	2 (0)	2009
	18 (1)	2016
	8 (0)	2015
	10 (1)	2014
	45 (6)	2013
9.3.2 (Proportion of small-scale industries with a loan or line of credit)	2 (0)	2012
	4 (1)	2011
	24 (0)	2010
	11 (0)	2009
9.4.1 (Carbon dioxide emissions per unit of manufacturing value added (kilograms of carbon dioxide per constant 2010 United States dollars))	137 (17)	2015
	25 (4)	2016
	65 (3)	2015
	11 (1)	2014
	13 (3)	2013
9.5.1 (Research and development expenditure as a proportion of GDP)	2 (0)	2012
	3 (0)	2011
	5 (1)	2010
	2 (0)	2009
	18 (5)	2016
	57 (3)	2015
	12 (1)	2014
	11 (1)	2013
9.5.2 (Researchers (in full-time equivalent) per million inhabitants)	5 (1)	2012
	3 (0)	2011
	7 (0)	2010
	2 (0)	2009

	2 (0)	2013
9.a.1 (Total official flows for infrastructure, by recipient countries)	5 (1)	2010
9.b.1 (Proportion of medium and high-tech industry value added in total value added)	147 (16)	2016
	163 (16)	2016
	24 (2)	2015
	5 (1)	2014
9.c.1 (Proportion of population covered by at least a 2G mobile network)	4 (1)	2013
	3 (1)	2012
	1 (0)	2011
9.c.1 (Proportion of population covered by at least a 3G mobile network)	204 (21)	2016
	9 (0)	2015
	14 (1)	2016
9.c.1 (Proportion of population covered by at least a 4G mobile network)	3 (0)	2015
	1 (0)	2014

No substitution was made for the chosen series of 9.2.1 (Manufacturing value added as a proportion of GDP) over the considered time interval since the corresponding data are complete for our base year (2017). As for the four remaining series of 9.1.2, data are only provided for 2017 and are complete or nearly complete for this year. Therefore, no substitution was possible or needed.

For indicator 9.a.1 (Total official flows for infrastructure, by recipient country), the main data set provided by the United Nations Statistics Division only includes recipient countries/territories and omits the donor countries/territories that then take missing values which are considered as zeros when the series' regional and global aggregates are calculated using a total sum. Hence, we consider that 22 instead of 17 Arab countries are covered by data for this indicator, knowing that the members of the Gulf Cooperation Council are donor countries whose missing data values in the original data set are equivalent to zeros (apart from Oman, the only member of the Gulf Cooperation Council that originally has a value in the data set and whose value is kept).

We visualize and analyse the Arab, regional and subregional aggregates of two of the remaining series of 9.1.2, which are related to freight volume (by road and rail transport (tonne-kilometres)), separately but in the same chart; knowing that they are on the same range, scale and unit. We use another graph to also visualize and analyse the aggregates of the two other remaining series of 9.1.2, which are related to passenger volume (by road and rail transport (passenger kilometres)), separately but in the same chart; knowing that they are on the same range, scale and unit as well. Similarly, we visualize and analyse the three series of 9.c.1 separately but in the same bar chart since they are on the same scale, range and unit, and since they measure different levels of the mobile network coverage dimension.

This leaves us with 13 integral indicators/subindicators with which we can assess the position of the region, as noted in box 9.1.

Box 9.1	Summary list of preserved and examined indicators/subindicators
<ul style="list-style-type: none"> • Indicator 9.1.2 – 4 series out of 6 – Passenger and freight volumes, by mode of transport • Indicator 9.2.1 – 1 series out of 2 – Manufacturing value added as a proportion of GDP and per capita • Indicator 9.2.2 – Manufacturing employment as a proportion of total employment • Indicator 9.3.2 – Proportion of small-scale industries with a loan or line of credit • Indicator 9.4.1 – 1 series out of 3 – Carbon dioxide emission per unit of value added • Indicator 9.5.1 – Research and development expenditure as a proportion of GDP • Indicator 9.5.2 – Researchers (in full-time equivalent) per million inhabitants • Indicator 9.a.1 – Total official international support (official development assistance plus other official flows) to infrastructure • Indicator 9.b.1 – Proportion of medium and high-tech industry value added in total value added • Indicator 9.c.1 – Proportion of population covered by a mobile network, by technology 	

All targets are evaluated, if not fully then partially.

Accordingly, all targets are evaluated; if not fully, then partially through some of their indicators/subindicators. The non-featured indicators/subindicators, whether due to insufficient data or to other reasons, can be determined from table 9.2 on targets, indicators, tiers and data availability for Arab countries for SDG 9.

Annex 9.2 for a graph for each of the evaluated series/indicators, showing the country level data values of the series/indicator for the years whose data points were used for every included country.

The global, regional and subregional aggregates of 9.a.1 and the preserved series of 9.1.2 are calculated using a total sum. The aggregates of all the other series and indicators are calculated using a weighted average. The method of aggregation, in general, as well as the weighting variables to be used for the weighted averages and the weighting variables' properties are all chosen based on what is advised by the corresponding SDG Indicators Metadata Repository of the United Nations Statistics Division or by the original source of the corresponding data that is referred to by this metadata. If none of these two references advise on the aggregation methods or weights, the decisions are made based on the most common scientific logic fitting the case and its feasibility (e.g. the availability of the needed data for the weighting variables). The year of the weighting variable data is the most commonly used year for the data of the respective series/indicator. The following weights were actually used for the series/indicators whose global, regional and subregional aggregates are weighted averages: Total population in 2015 (from the World Population Prospects); Total GDP (constant 2010 United States dollars) for the year 2017 (from the World Development Indicators Database); Total GDP (constant 2011 PPP) for the year 2015 (from the World Development Indicators Database); Total employment (in thousands) in 2016 (from the International Labor Organization); Total GDP (constant 2010 United States dollars) for the year 2013 (from the World Development Indicators Database); Total manufacturing value added (constant 2010 United States dollars) in 2015 (from the World Development Indicators Database); and Total manufacturing value added (constant 2010 United States dollars) in 2016 (from the World Development Indicators Database). The chapter includes more details about the weighting variables, including which weight was used for which series or indicator.

We note that, when a certain series or indicator (namely SDGs 9.5.2 and 9.c.1) need a population-related weighting variable in 2016 or 2017, we use the latest available data for this variable, i.e. data for 2015, provided by the World Population Prospects. For 9.3.2, we are obliged to compromise the weighting variable itself with a proxy one because we ideally need to weight by the "total number of small-scale industries" (according to the metadata and the official definition of the indicator) in 2013 but the data that we found for this variable (including data from the IFC and the World Bank Enterprise Survey) is of insufficient coverage for the world's countries, in general, and especially the Arab countries, for all the available years that we can consider. Therefore, we decide to weight by total GDP for the year 2013 (the most commonly used year for the data of the indicator in question) instead, since a country's GDP has a considerable impact on the number of small-scale industries in it and thus can serve as a proxy for the latter.

Finally, we note that the weighting variables sometimes prevent us from evaluating the series/indicator using the full data that are available or provided to us. As such, our final data coverage for the series/indicators is sometimes slightly undermined by the data availability of the weighting variable. This applies for the preserved series of 9.2.1 where 19 Arab countries out of a potential of 22 are covered after weighting, for 9.3.2 where eight Arab countries out of a potential of nine are covered after weighting, for the preserved series of 9.4.1 where 14 Arab countries out of a potential of 17 are covered after weighting, and for 9.b.1 where 15 Arab countries out of a potential of 16 are covered after weighting. While this affects the global, regional and/or subregional aggregates, the country-year graphs include all the Arab countries that have data for the evaluated series/indicator, regardless of the data availability of the weighting variable.

We calculate the world, regional and subregional aggregates for each indicator and include the target value – when available – to facilitate comparability. For indicator 9.c.1, to “Significantly increase access to information and communications technology and strive to provide universal and affordable access to the Internet in least developed countries by 2020”, we consider the target values for each of the three series as 100 per cent of the population covered by at least a 2G mobile network, 100 per cent of the population covered by at least a 3G mobile network, and 100 per cent of the population covered by at least a 4G mobile network, respectively; noting that a country, region, or subregion would be considered to have achieved the target if at least one of these three target values are met (i.e. if it provides, for 100 per cent of its population, 2G or 3G or 4G mobile network) and ultimately the last one which is related to the 4G mobile network coverage. However, it is not possible to infer the official desired target values for any of the other evaluated indicators and thus they are not shown.

Table 9.2 Targets, indicators, tiers and data availability for Arab countries – SDG 9 (Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation)

Target	Indicator	Number of subindicators	Tier	Data availability*
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	9.1.1 Proportion of the rural population who live within 2 km of an all-season road	(No data)	Tier III	x
	9.1.2 Passenger and freight volumes, by mode of transport	4 chosen out of 6	Tier I	22
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	9.2.1 Manufacturing value added as a proportion of GDP and per capita	1 chosen out of 2	Tier I	22
	9.2.2 Manufacturing employment as a proportion of total employment	1 chosen out of 1	Tier I	12
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	9.3.1 Proportion of small-scale industries in total industry value added	(Dropped) 1	Tier II	x
	9.3.2 Proportion of small-scale industries with a loan or line of credit	1 chosen out of 1	Tier II	9

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	9.4.1 Carbon dioxide emission per unit of value added	1 chosen out of 3	Tier I	17
	<hr/>			
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	9.5.1 Research and development expenditure as a proportion of GDP	1 chosen out of 1	Tier I	12
	9.5.2 Researchers (in full-time equivalent) per million inhabitants	1 chosen out of 1	Tier I	11
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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	1 chosen out of 1	Tier I	22
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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 Proportion of medium and high-tech industry value added in total value added	1 chosen out of 1	Tier I	16
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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 Proportion of population covered by a mobile network, by technology	3 chosen out of 3	Tier I	21, 21, 22
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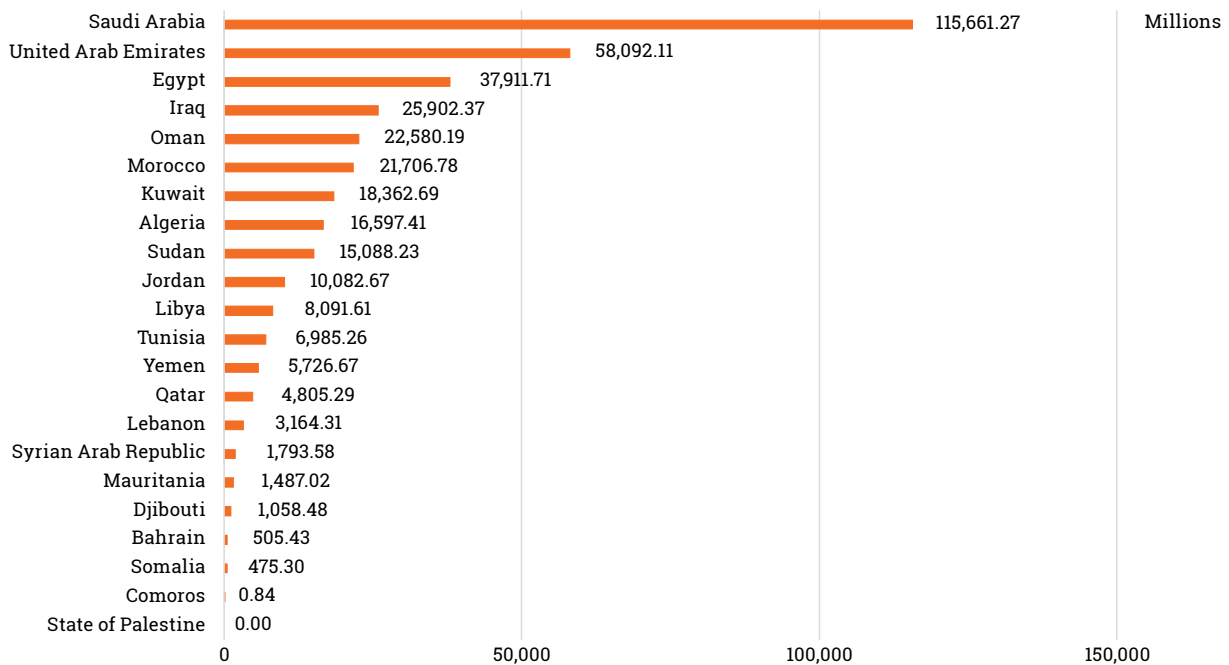
Note: We note that the weighting variables sometimes prevent us from evaluating the series/indicator using its full data that is available/provided to us. As such, our final data coverage for the series/indicators is sometimes slightly undermined by the data availability of the weighting variable. While this affects the global, regional and/or subregional aggregates, the country-year graphs include all the Arab countries for the evaluated series/indicator that have data, regardless of the weighting variable's data availability.

Source: <https://unstats.un.org/sdgs/indicators/indicators-list/> and author's calculations.

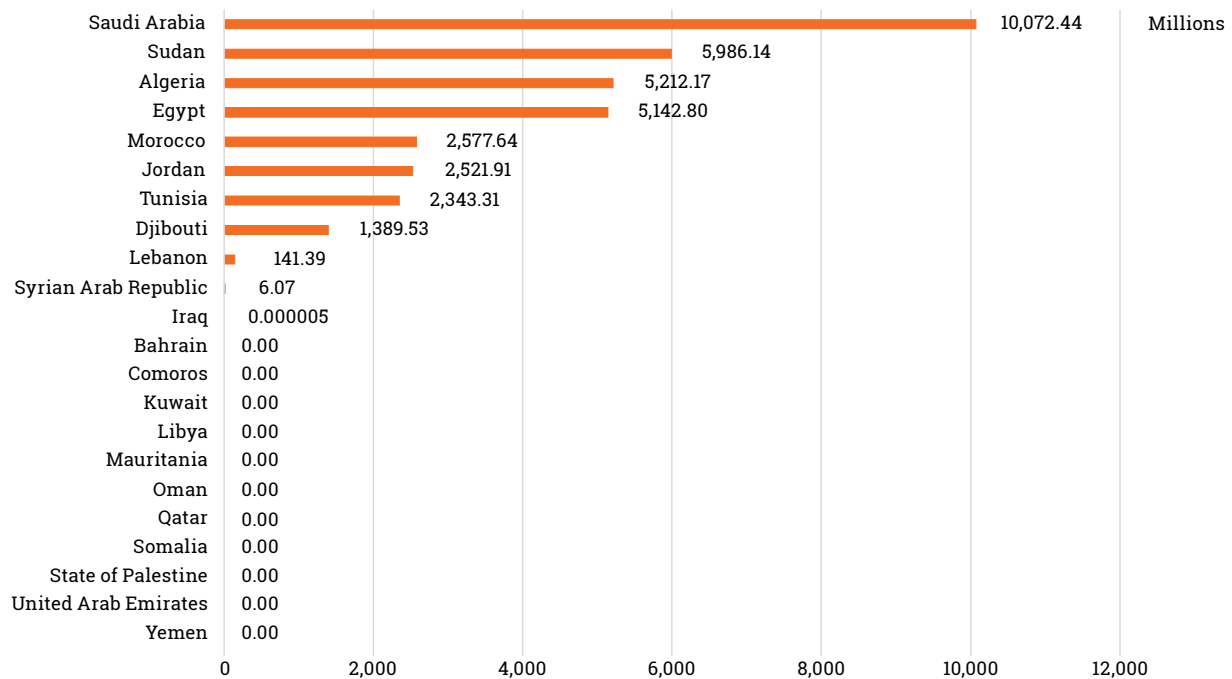
2. Country graphs

Figure 9.1 Four series of indicator 9.1.2 - Passenger and freight volumes, by mode of transport

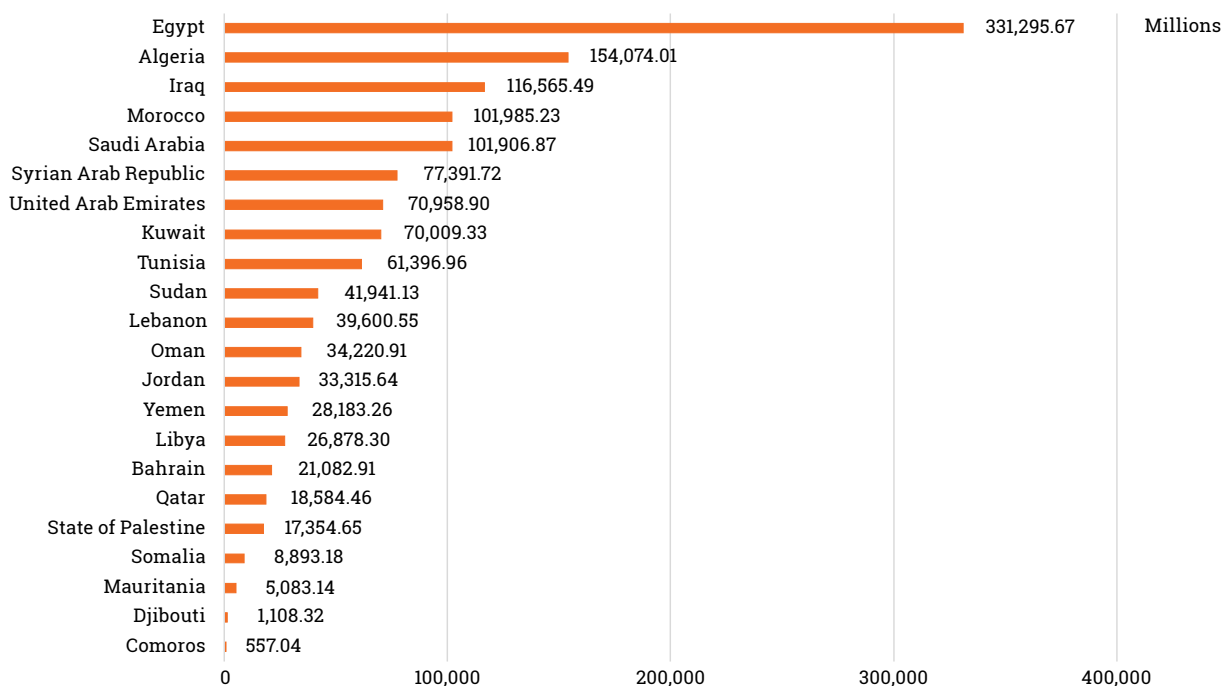
Freight volume by road transport (tonne-kilometres)



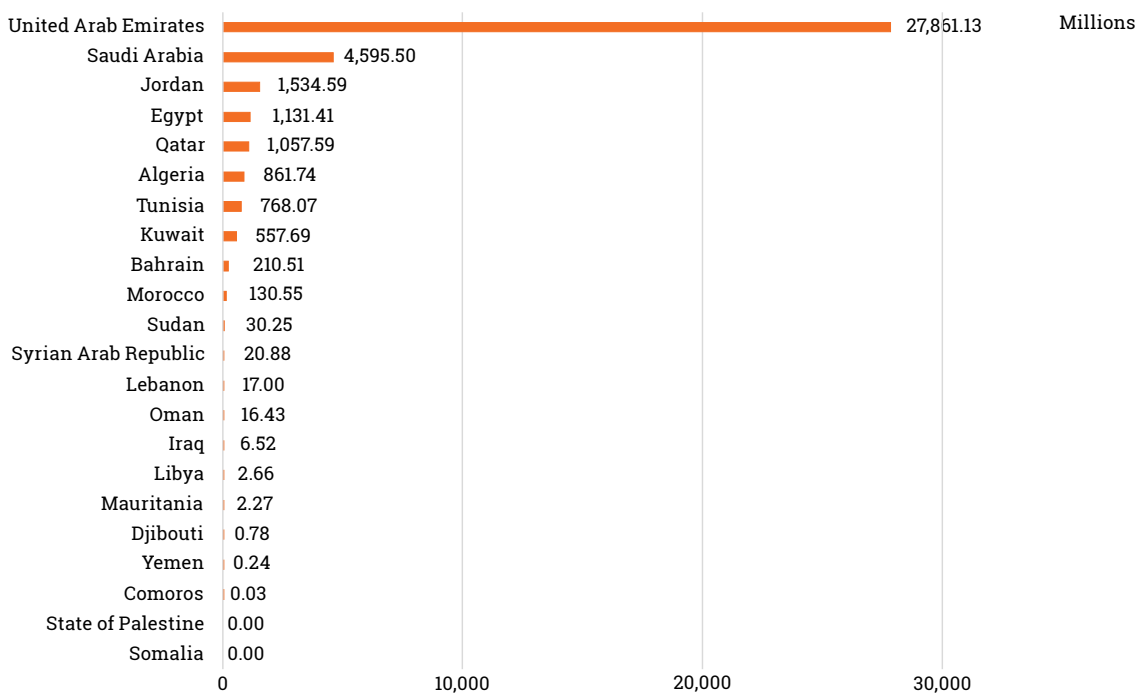
Freight volume by rail transport (tonne-kilometres)



Passenger volume by road transport (passenger kilometres)

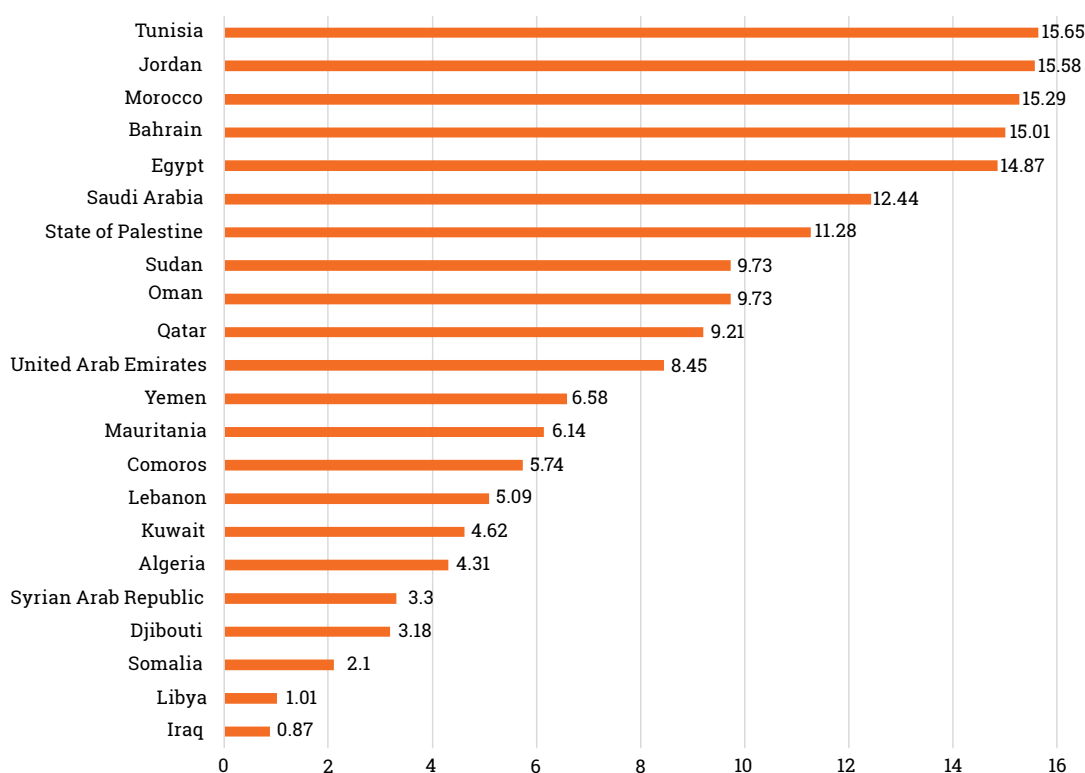


Passenger volume by rail transport (passenger kilometres)



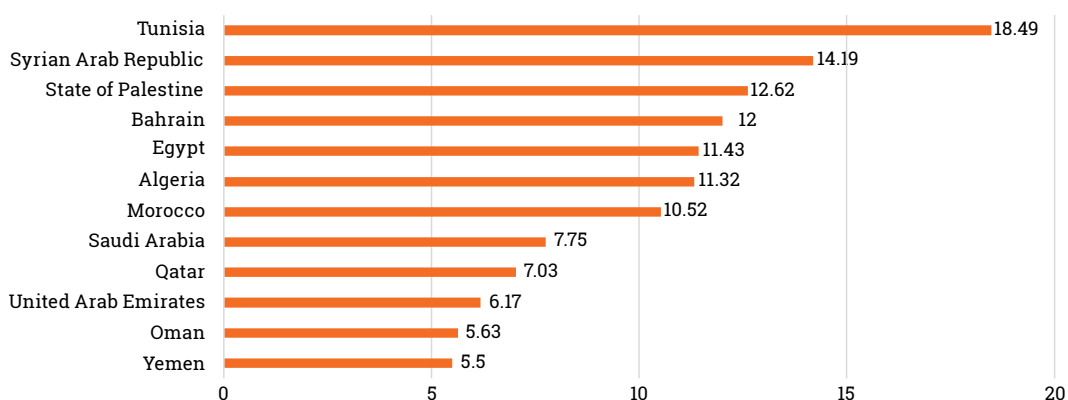
Note: All data for indicator 9.1.2 are from 2017.

Figure 9.2 Indicator 9.2.1 - Manufacturing value added as a proportion of GDP and per capita
 Manufacturing value added as a proportion of GDP (percentage)



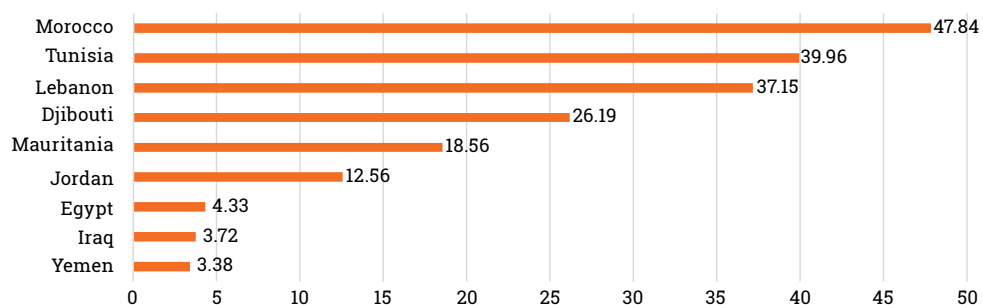
Note: All data are from 2017.

Figure 9.3 Indicator 9.2.2 - Manufacturing employment as a proportion of total employment
 Manufacturing employment as a proportion of total employment (percentage)



Note: Data are from various years as follows: Bahrain, Oman (2010), Syrian Arab Republic (2011), Morocco (2012), Algeria, Yemen (2014), Tunisia (2015), Egypt, Saudi Arabia, State of Palestine, Qatar, United Arab Emirates (2016).

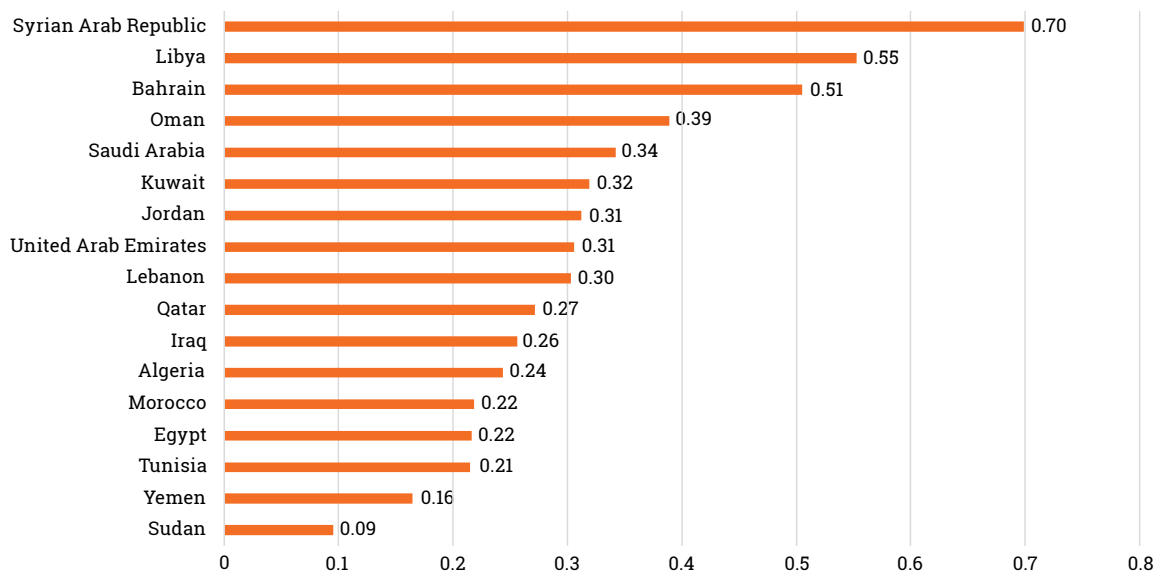
Figure 9.4 Indicator 9.3.2 - Proportion of small-scale industries with a loan or line of credit
 Proportion of small-scale industries with a loan or line of credit (percentage)



Note: All data are from 2013 apart from Iraq (2011), Mauritania (2014) and Egypt (2016).

Figure 9.5 Indicator 9.4.1 - Carbon dioxide emission per unit of value added

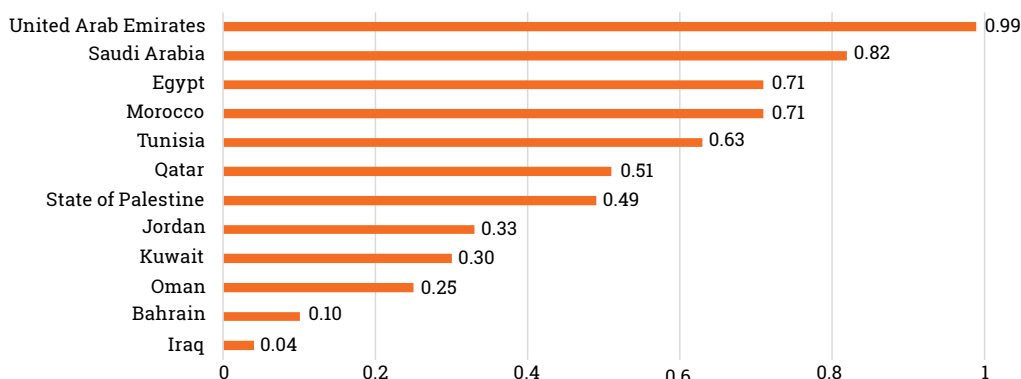
Carbon dioxide emissions per unit of manufacturing value added (kilograms of carbon dioxide per constant 2010 United States dollars)



Note: All data are from 2015.

Figure 9.6 Indicator 9.5.1 - Research and development expenditure as a proportion of GDP

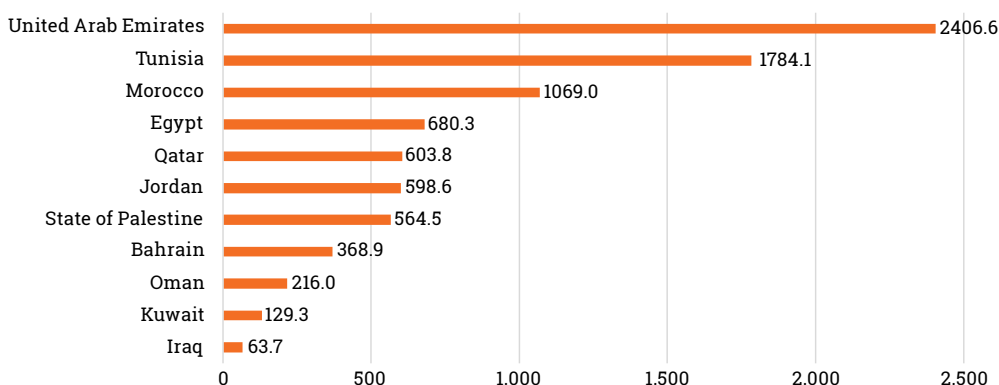
Research and development expenditures as a proportion of GDP (percentage)



Note: Data are from various years as follows: Morocco (2010), Kuwait, Saudi Arabia, State of Palestine (2013), Bahrain (2014), Oman, Qatar, Tunisia (2015), Egypt, Iraq, Jordan, United Arab Emirates (2016).

Figure 9.7. Indicator 9.5.2 - Researchers (in full-time equivalent) per million inhabitants

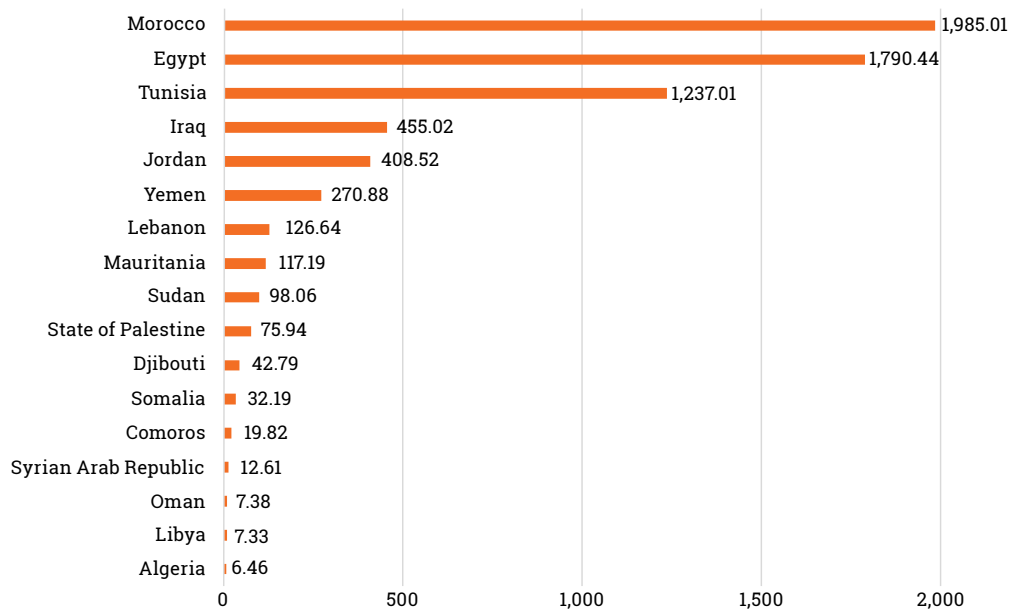
Number of researchers in full-time equivalent (per million inhabitants)



Note: Data are from various years as follows: Kuwait (2012), State of Palestine (2013), Bahrain (2014), Oman, Qatar, Tunisia (2015), Egypt, Iraq, Jordan, Morocco, United Arab Emirates (2016).

Figure 9.8 Indicator 9.a.1 - Total official international support (official development assistance plus other official flows) to infrastructure

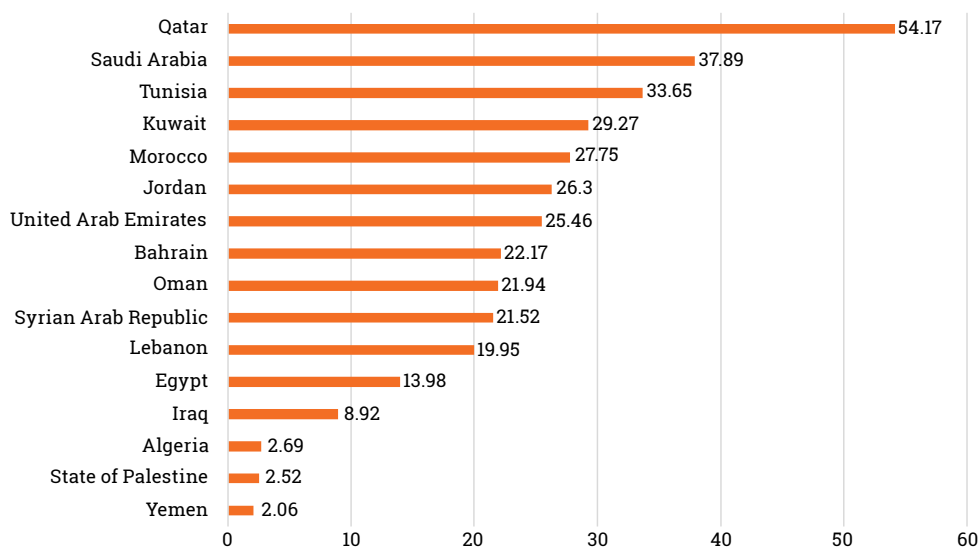
Total official flows for infrastructure, by recipient countries (millions of constant 2017 United States dollars)



Note: All data are from 2017 apart from Oman (2010).

Figure 9.9 Indicator 9.b.1 - Proportion of medium and high-tech industry value added in total value added

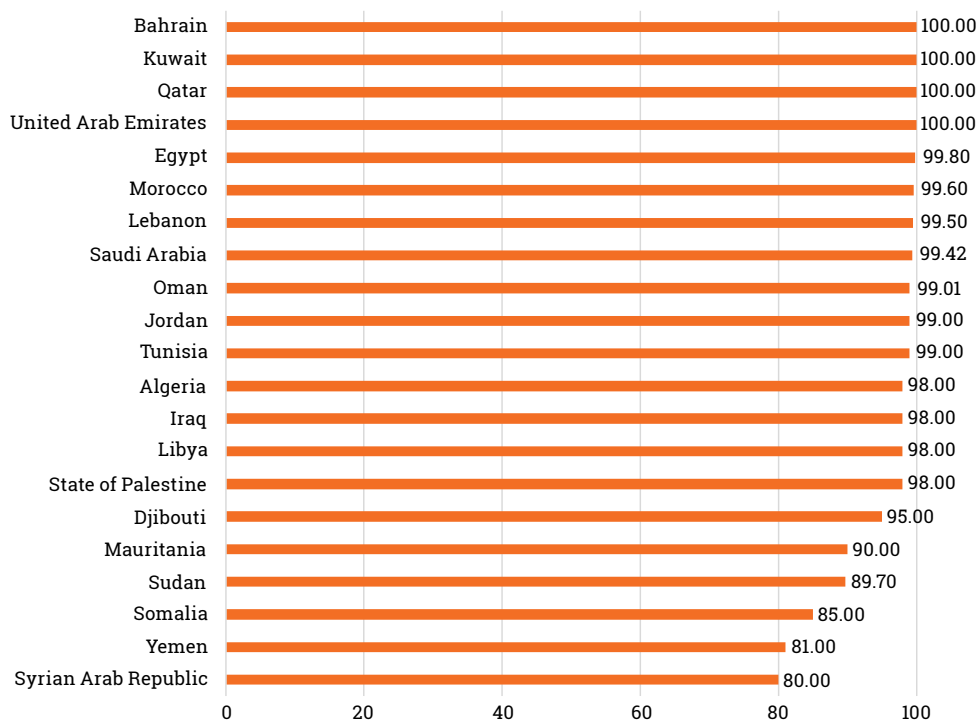
Proportion of medium and high-tech industry value added in total value added (percentage)



Note: All data are from 2016.

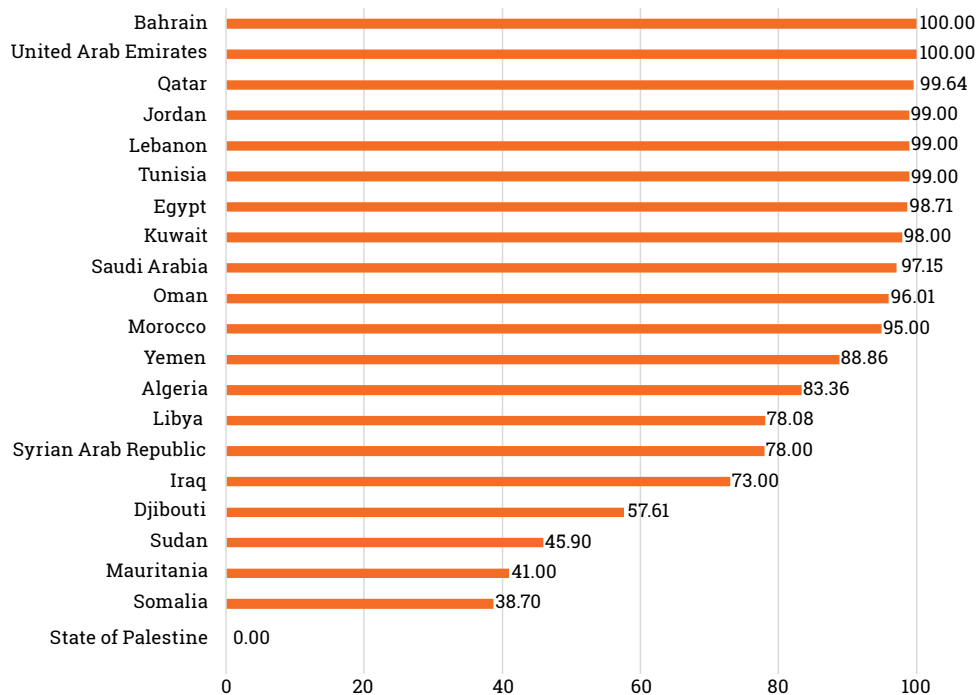
Figure 9.10 Indicator 9.c.1 - Proportion of population covered by a mobile network, by technology

2G mobile network (percentage)



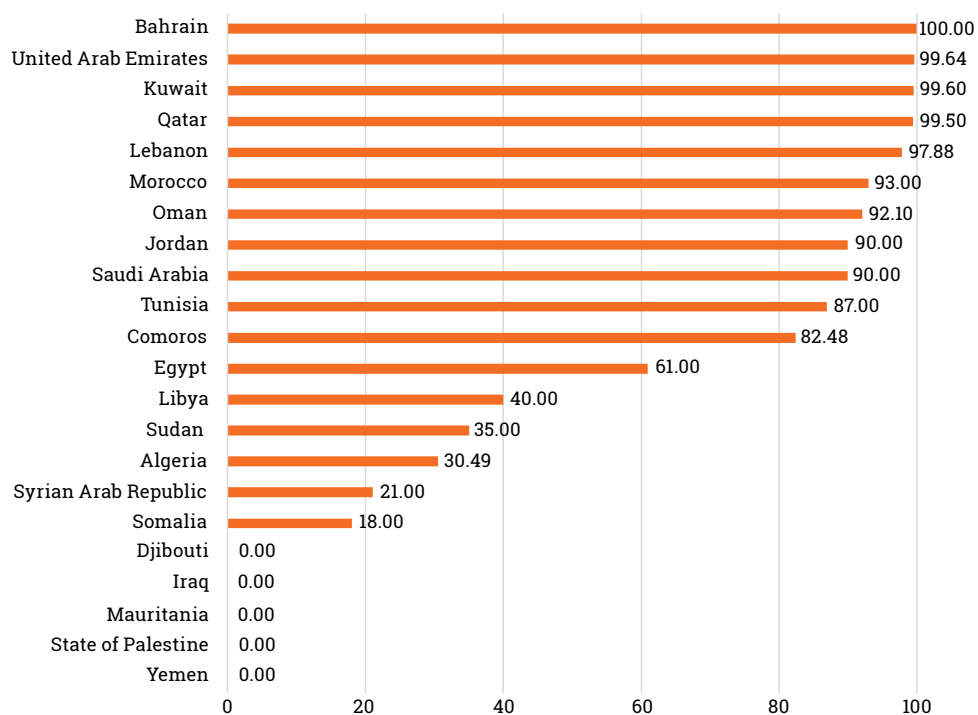
Note: All data are from 2016 apart from Djibouti (2012), Libya (2013), Somalia (2014), and Lebanon, Iraq (2015).

3G mobile network (percentage)



Note: All data are from 2016.

4G mobile network (percentage)



Note: All data are from 2017.