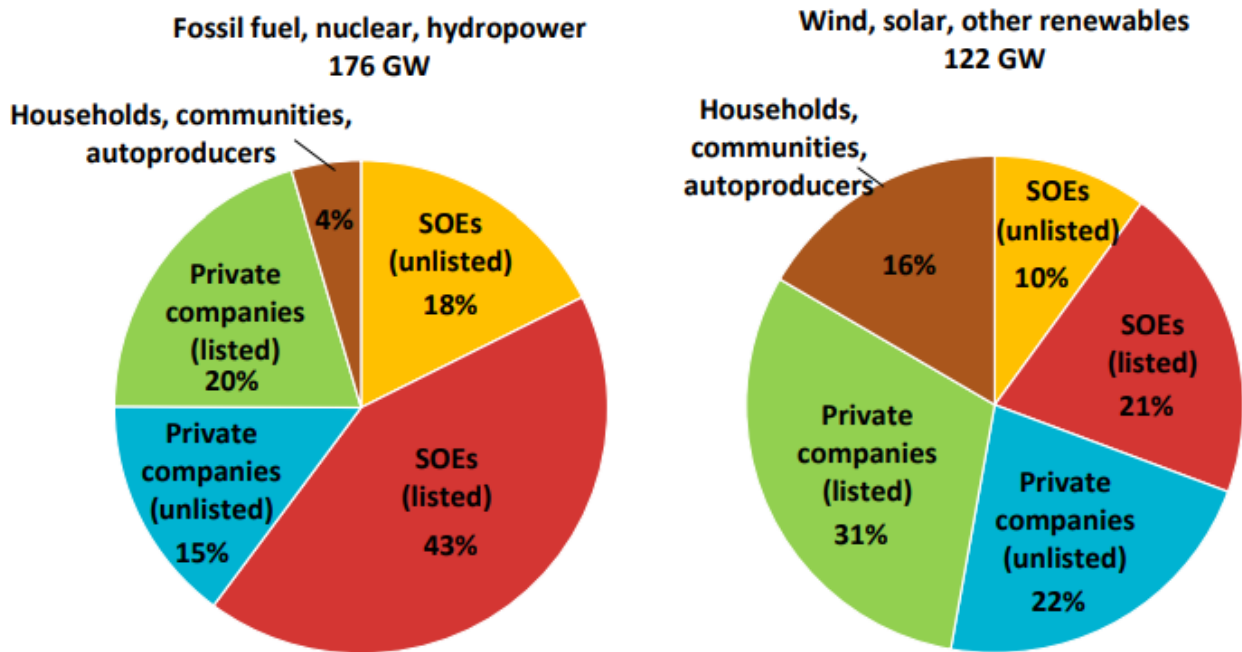


The political economy of the energy transition

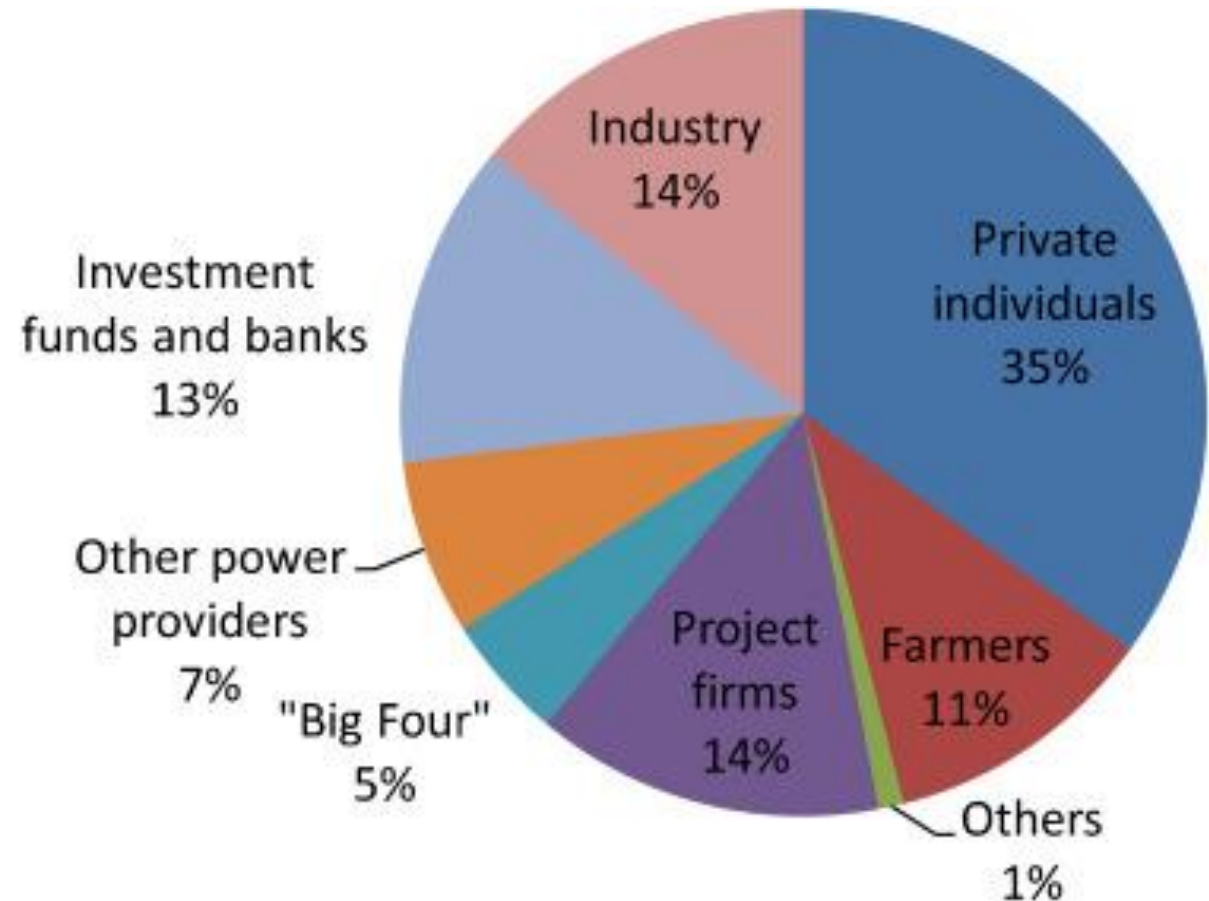
Jan Osička

Democratization of the energy system ownership

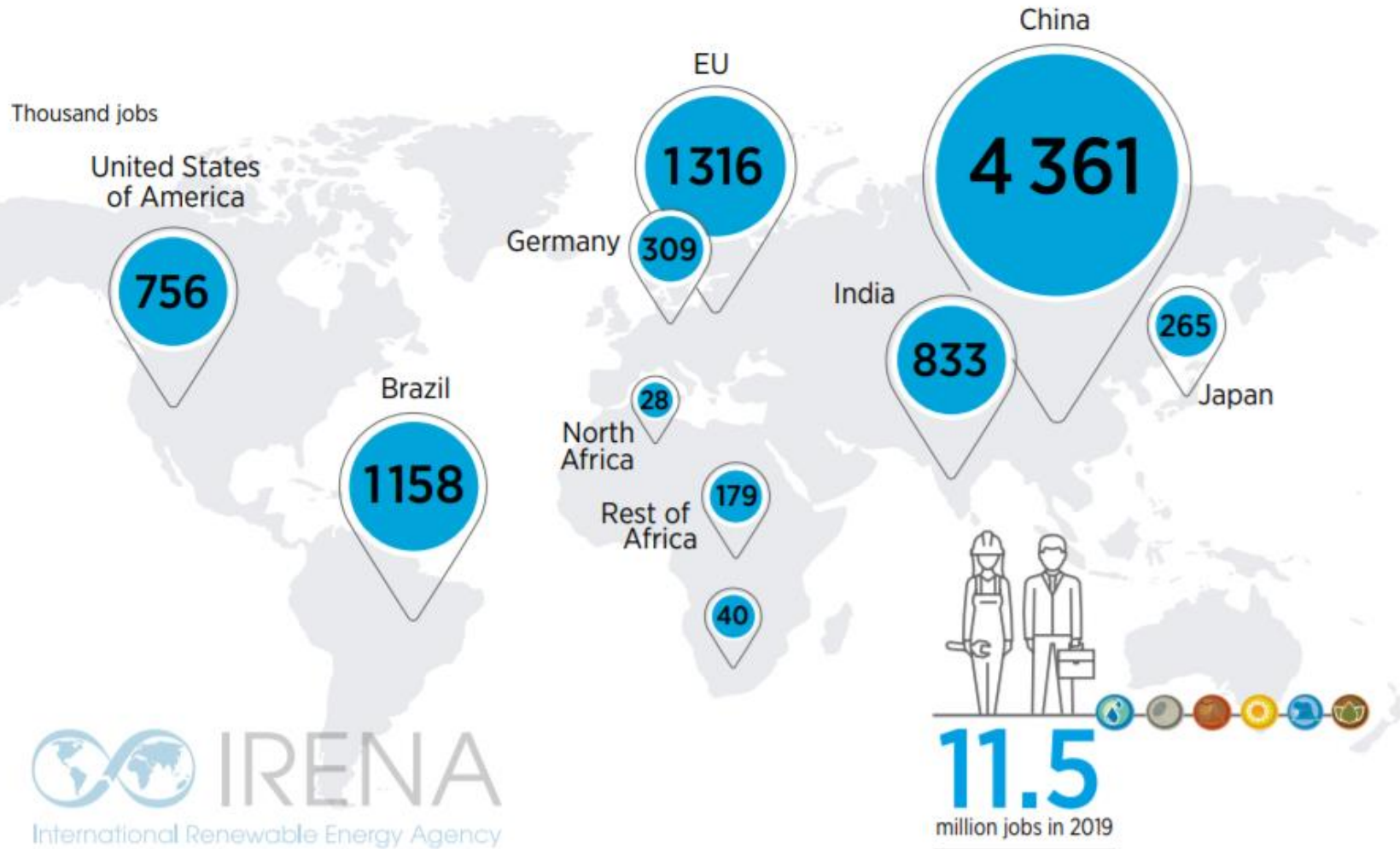
Ownership of global power generation capacity commissioned in 2015



Ownership of installed RE capacity in Germany (2012)



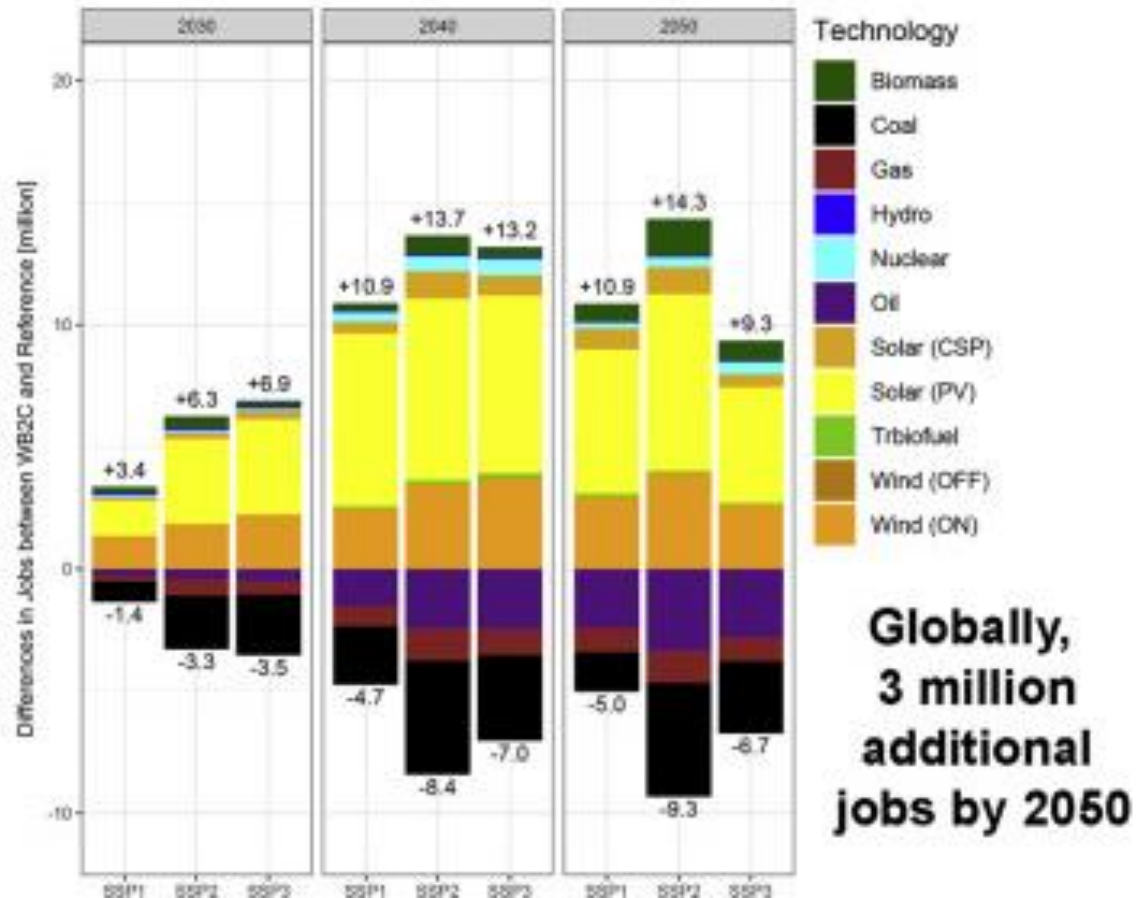
Changes in employment structure



- 11.5 M jobs in RE as of 2019
- 1 M USD invested (USA)
=> 7.5 jobs in RES
=> 2.6 in fossil energy

Sources: [IRENA](#),
[Garret-Peltier 2017](#)

Changes in employment structure

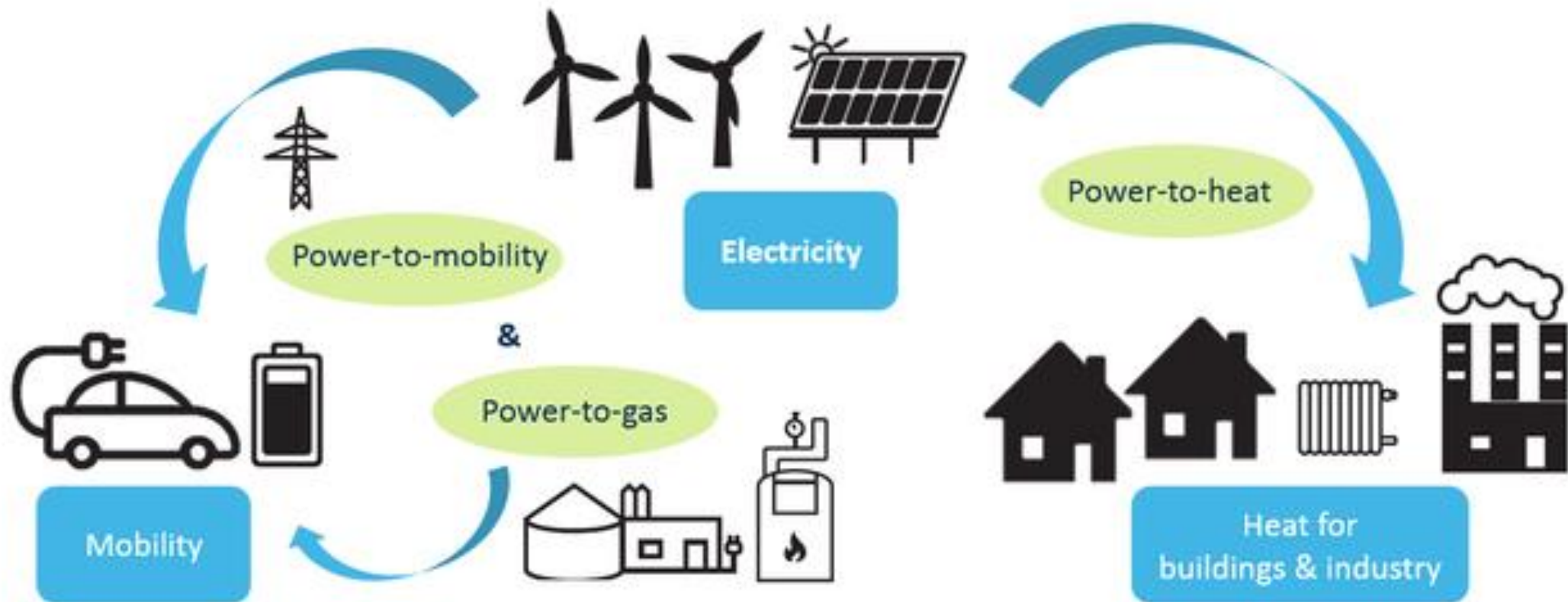


RES jobs additions to outweigh fossil fuels job losses

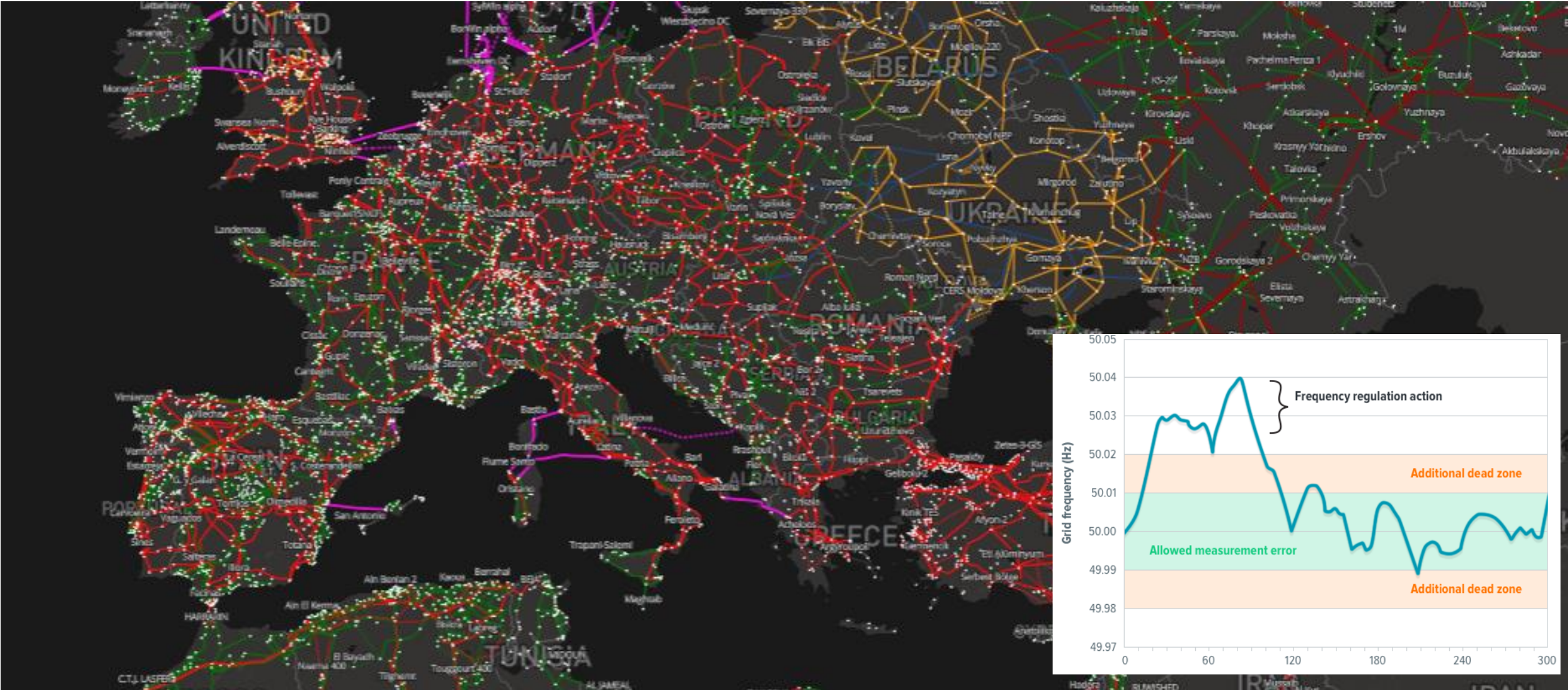
Source: [Pai et al. 2021](#)

Electrify everything = increase complexity

Sector coupling – an integrated energy system based on renewable electricity



New security challenges



Blackouts, cyber attacks

Recent blackouts

- India 2012: 700 million people affected
- India 2001: 230 million
- Indonesia 2005: 120 million
- Brazil 1999: 97 million
- Brazil and Paraguay 2009: 67 million
- Italy 2003: 57 million
- USA and Canada 2003: 50 million

May 7, 2021 Colonial Pipeline attack

- Billing operations affected
- 75 BTC (4.4 M USD) requested
- Ransom paid
- 64 BTC (2.3 M USD) later recovered by the FBI

- 99 corporations infected
- 47% paid the ransom
- Avg ransom 1.9 M USD

Will new energy materials breed new Saudi Arabias?

SPECIAL REPORT: THE GEOPOLITICS OF ENERGY

Clean could get dirty

A scramble for the minerals used in renewable energy is under way

America produces few of the commodities it needs

Print edition | Special report >
Mar 15th 2018



TO GLIMPSE A potentially troubling side of the clean-energy business, look at the giant Anglo-Swiss oil-trading firms. They are betting on a scramble for battery materials to power electric vehicles.

- DR Congo produces 60% of the world's cobalt
- South Africa controls over 75% of platinum
- China produces 95% of rare earth minerals and controls nearly half of the world's lithium
- China halted shipments of rare earths to Japan over fishing dispute in 2010



ALL THE METALS WE MINED

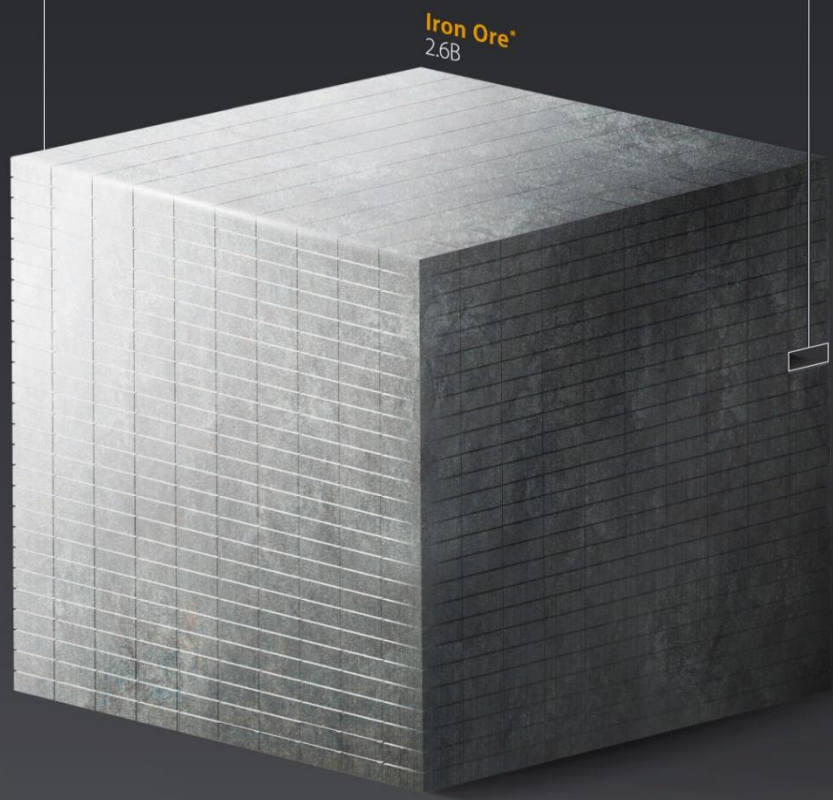
IN 2021

The world produced roughly **2.8 billion tonnes** of metals in 2021. Here are all the metals we mined, visualized on the same scale.

IRON ORE

2,600,000,000 tonnes*

= 1,000,000 tonnes

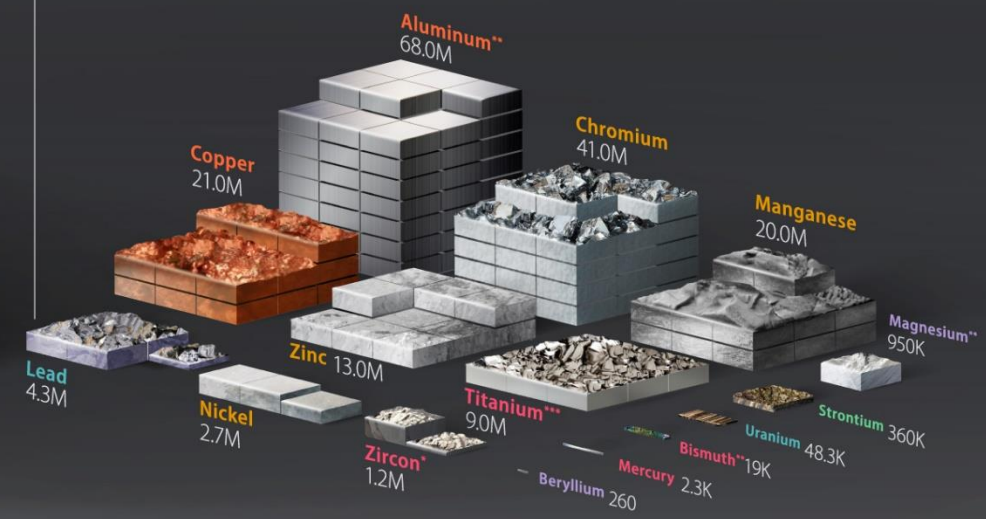


LARGEST END-USE

- Steelmaking**
- Construction**
- Chemicals**
- Alloying Agents**
- Energy/Batteries**
- Magnets**
- Electronics**
- Other**

INDUSTRIAL METALS

181,579,892 tonnes

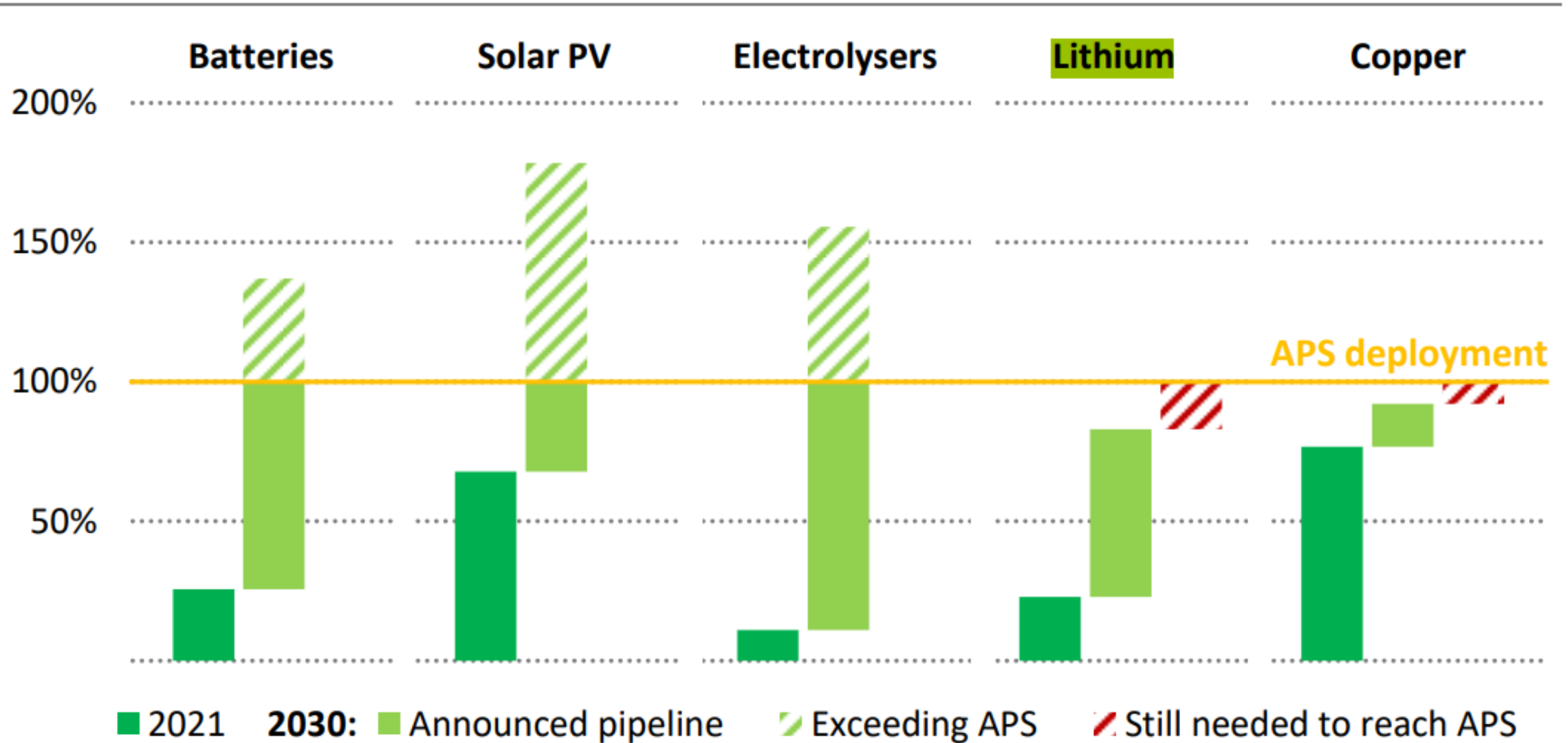


TECHNOLOGY AND PRECIOUS METALS

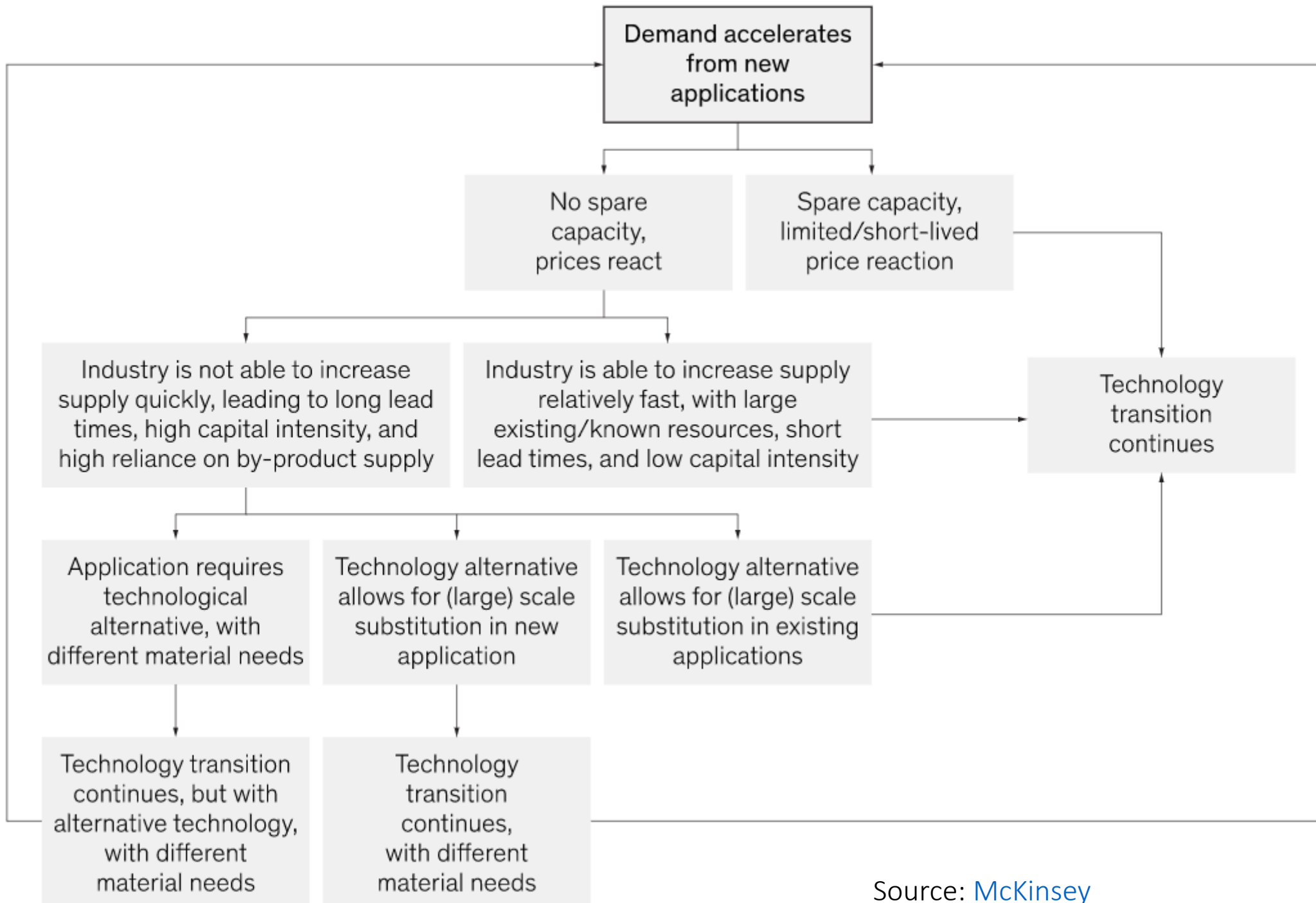
1,474,889 tonnes



Figure 1.25 ▶ Announced manufacturing capacity for selected energy technologies relative to deployment in the APS, 2021 and 2030

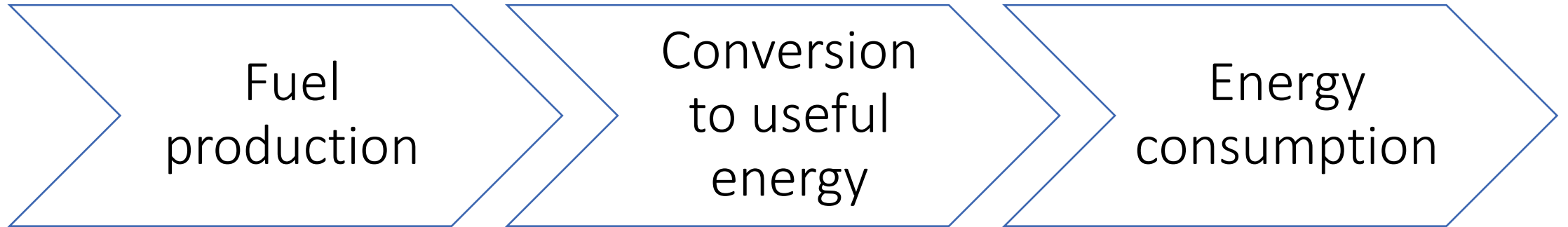


Material shortages: prices and substitution

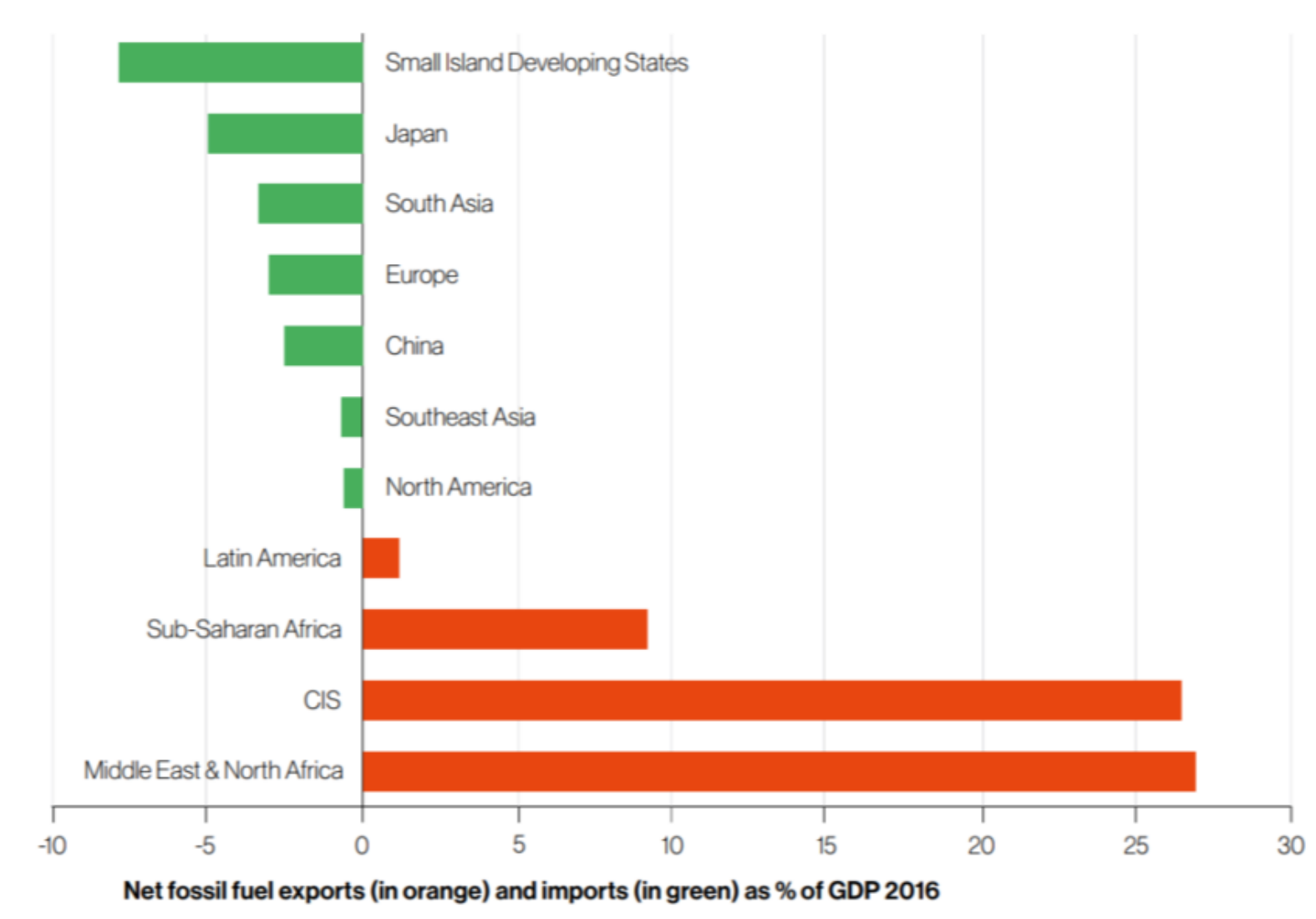


Source: [McKinsey](#)

Value distribution in the supply chains



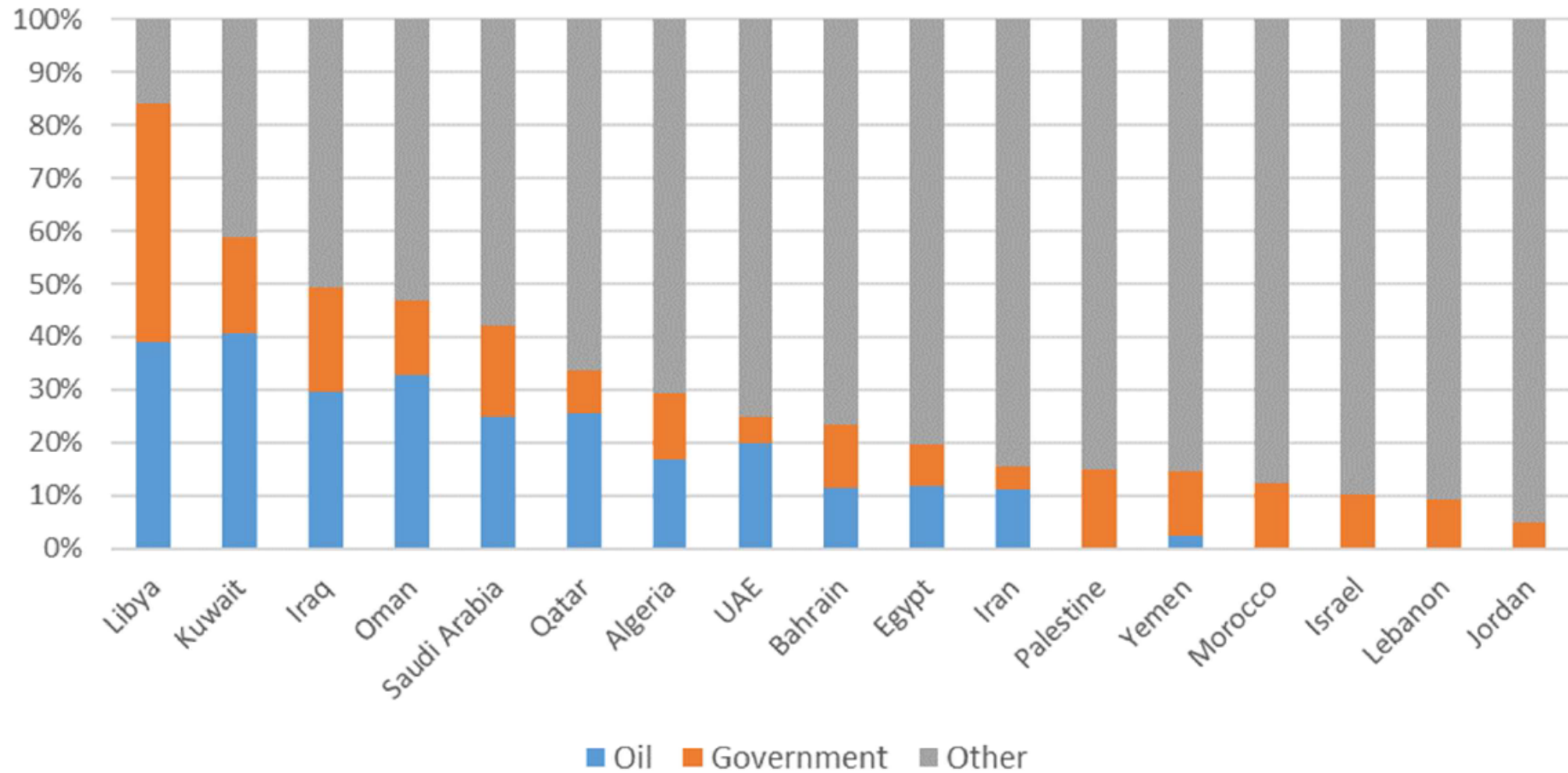
Regional impact of the transition



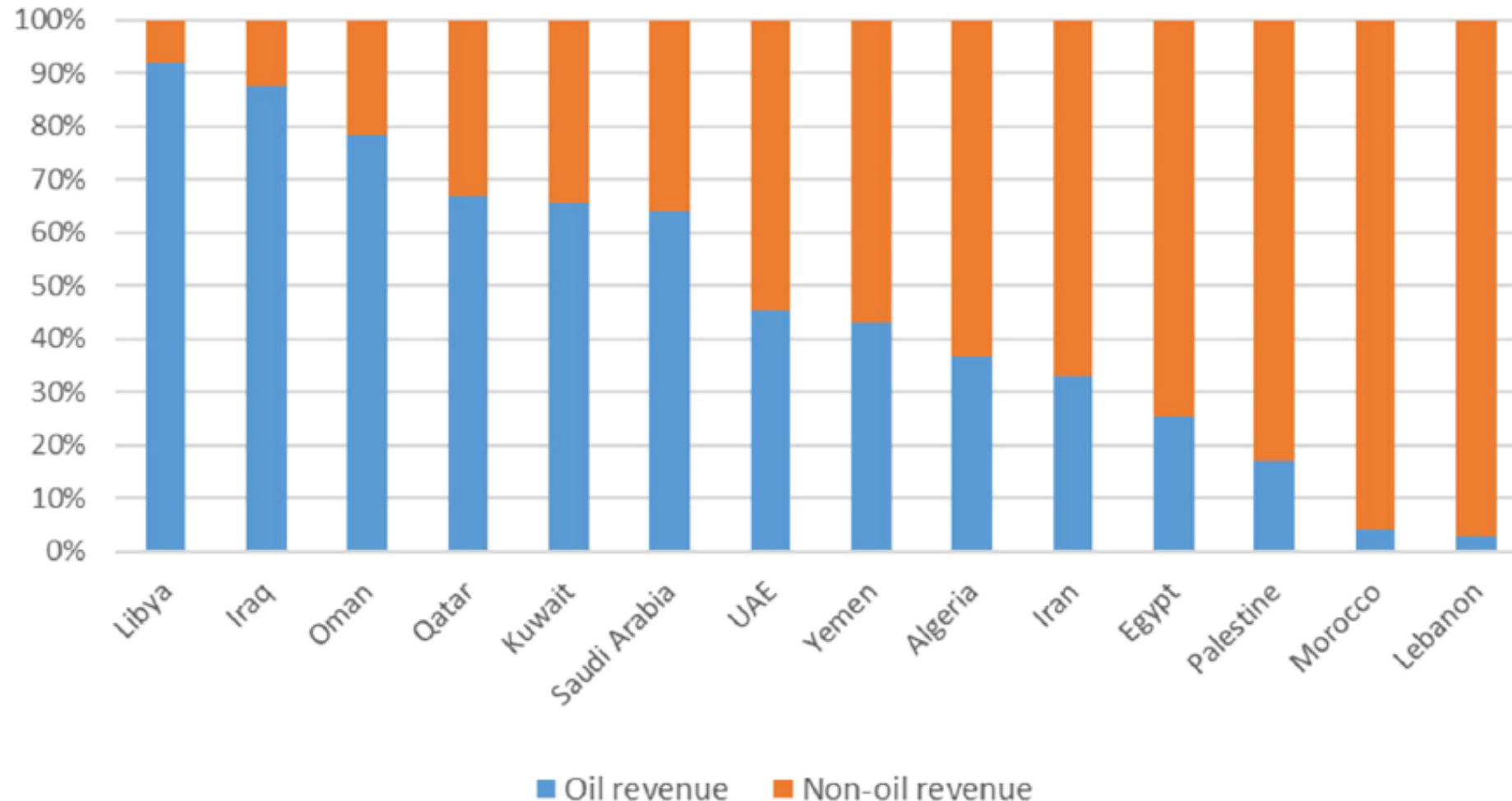
Macroeconomics of the MENA region

- For 5 regional oil exporters (Libya, Kuwait, Iraq, Oman, SA), more than 40% of GDP based on oil and oil-related government activities.
- Four other (Qatar, Algeria, UAE, Bahrain) varies between 20-40%.
- Main sources of manufacturing value-added are refinery, chemical and mining/extractive industries, construction.
- In some MENA countries oil is the primary source of fiscal revenues. Non-oil fiscal revenues, however, often also relate to oil industry (Qatar – practically all investment income and the bulk of corporate income tax from Qatar Petroleum).
- Oil makes more than 50% of total exports from MENA oil exporting countries. Limited economic diversification.

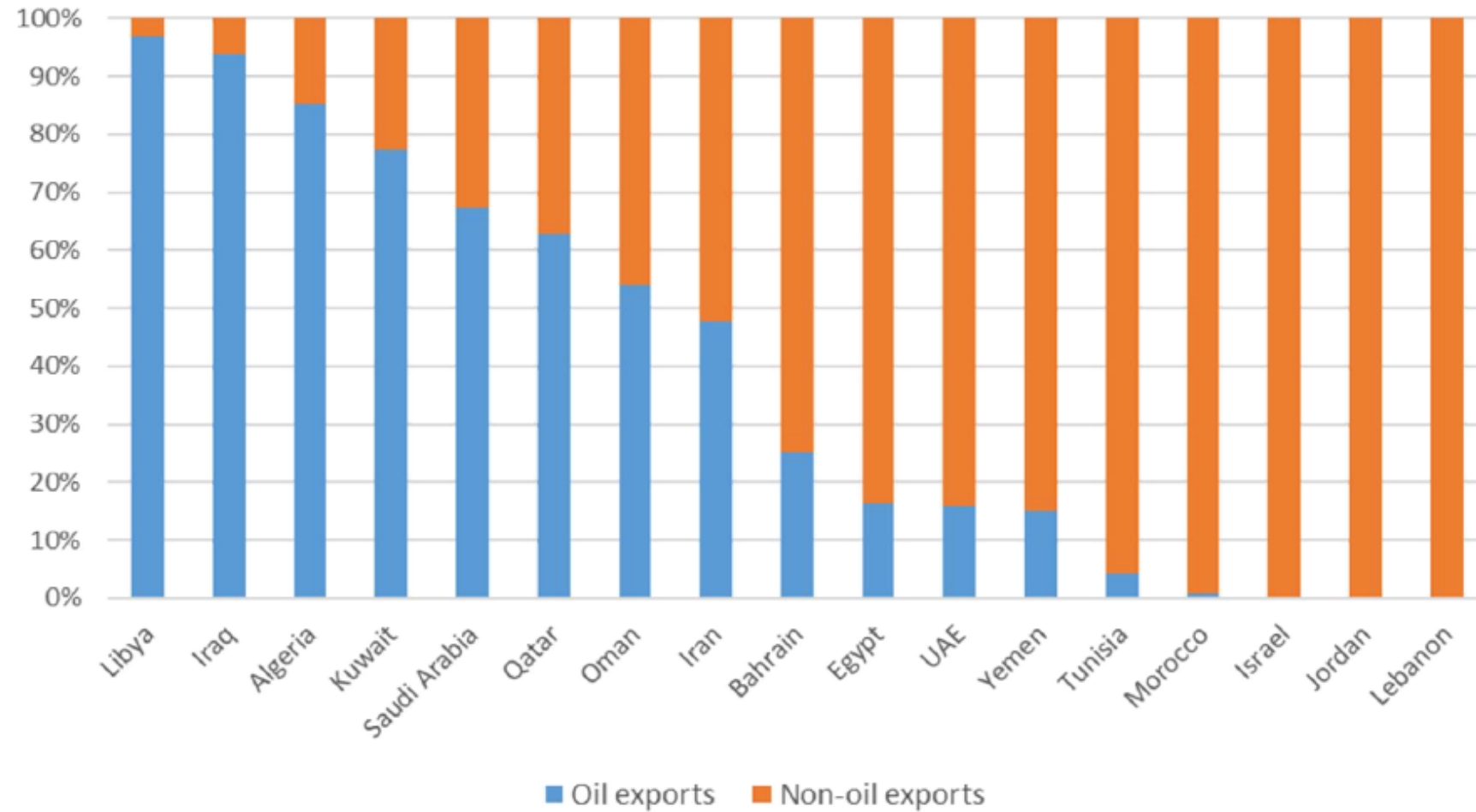
GDP composition of MENA countries, 2016



Oil and non-oil fiscal revenue in selected MENA countries, 2016 (% of general government revenue)

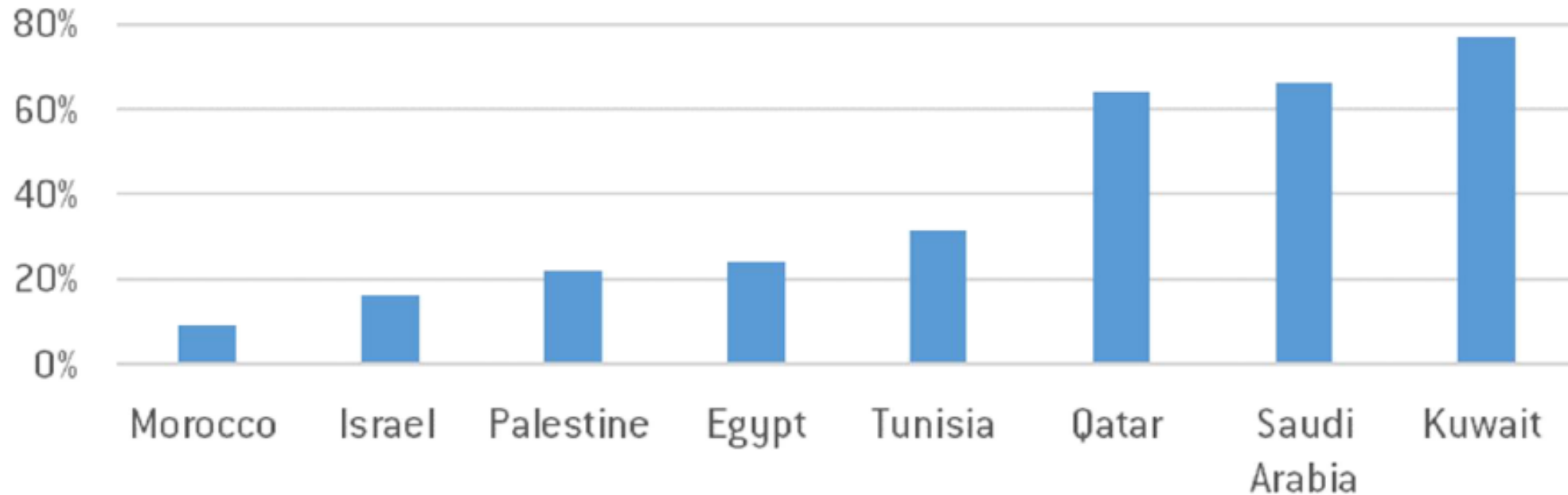


Oil and non-oil exports in MENA countries, 2016



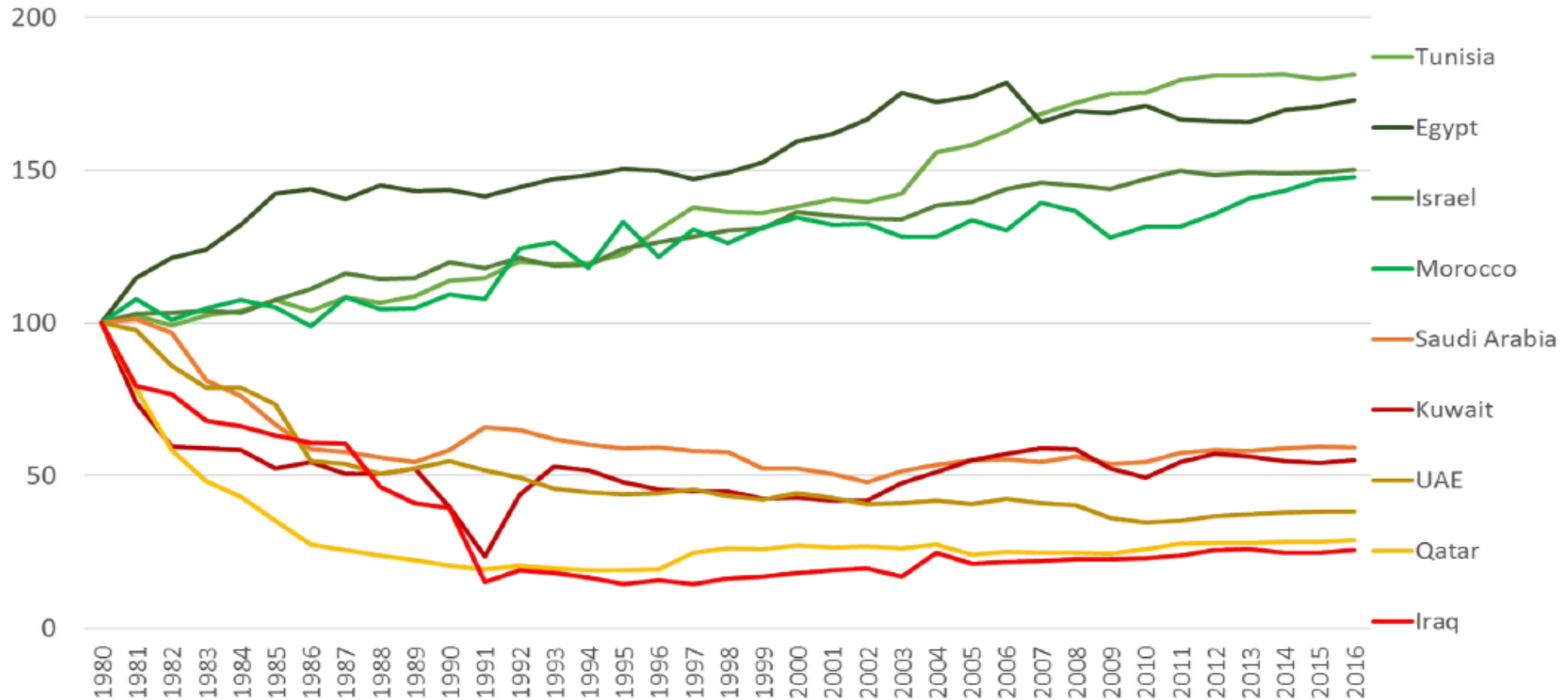
Note: Low shares of oil in exports from the UAE and Bahrain are because non-oil exports include a large share of re-exports.

Public sector employment in selected MENA countries (% of total employment of nationals)

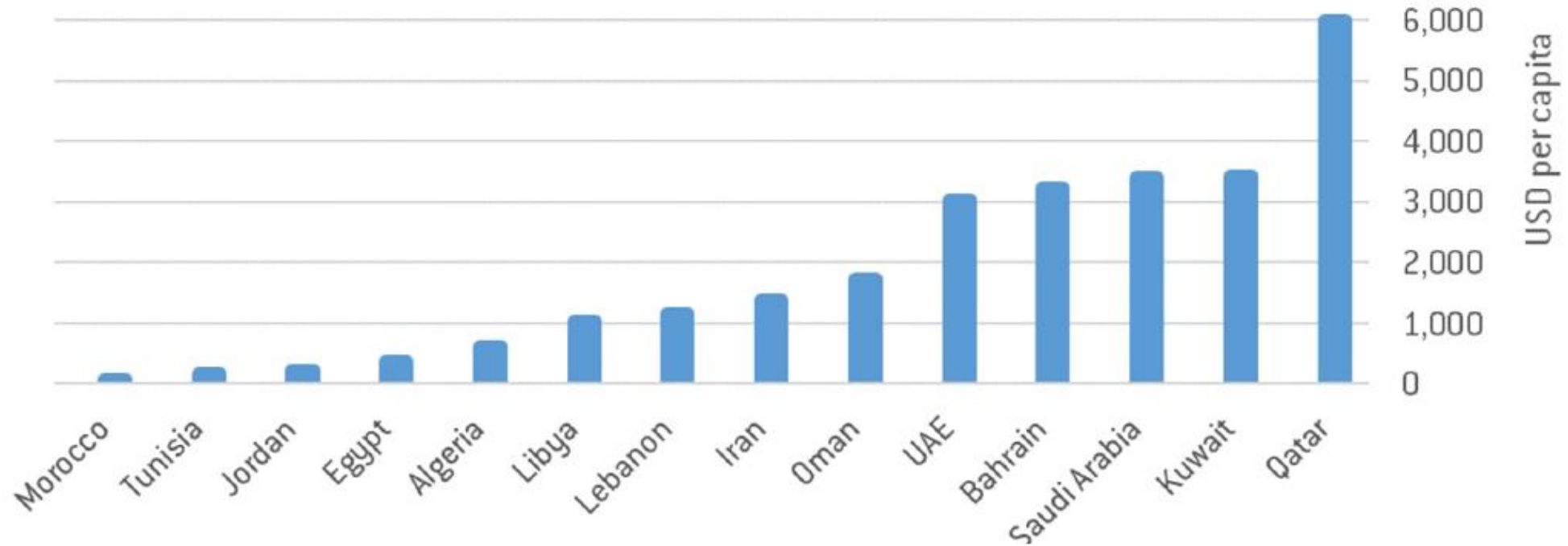


High shares of public employment in usually protected jobs with high wages contributes to low labour productivity of MENA oil-exporting countries. Emphasized by imported cheap non-national labour (since 80s), reducing productivity also in private sector. That prevents its development to internationally competitive form.

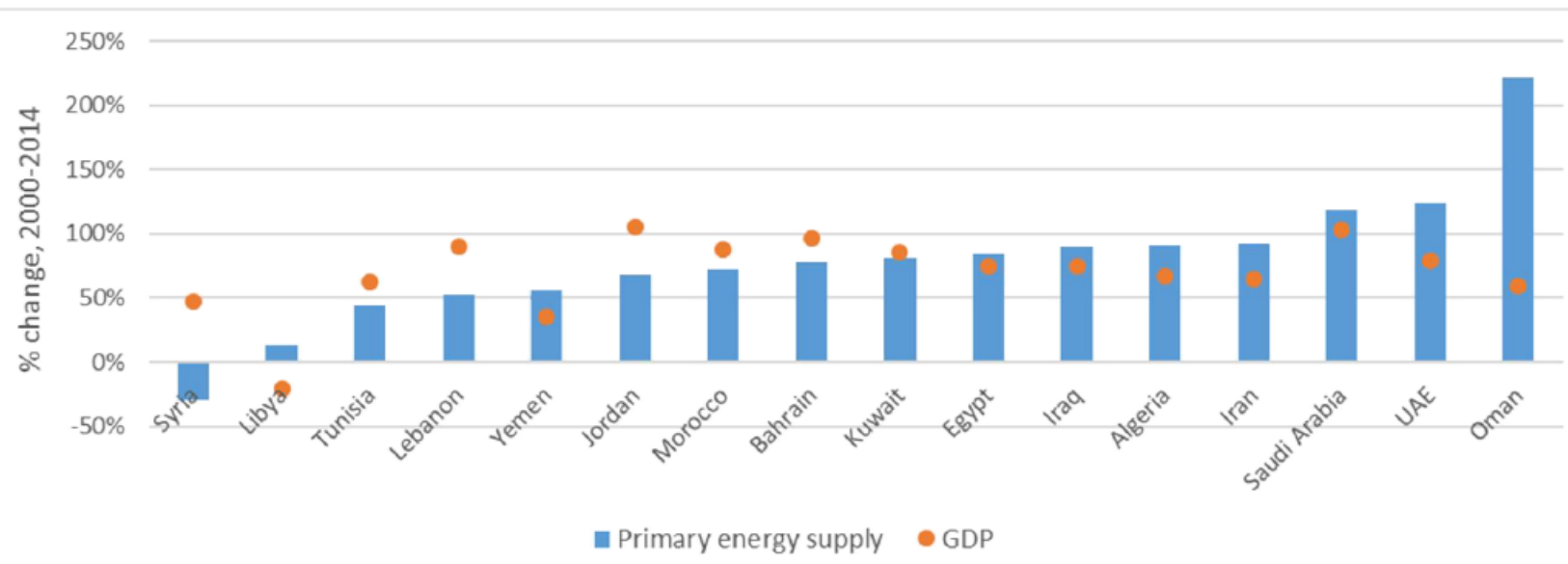
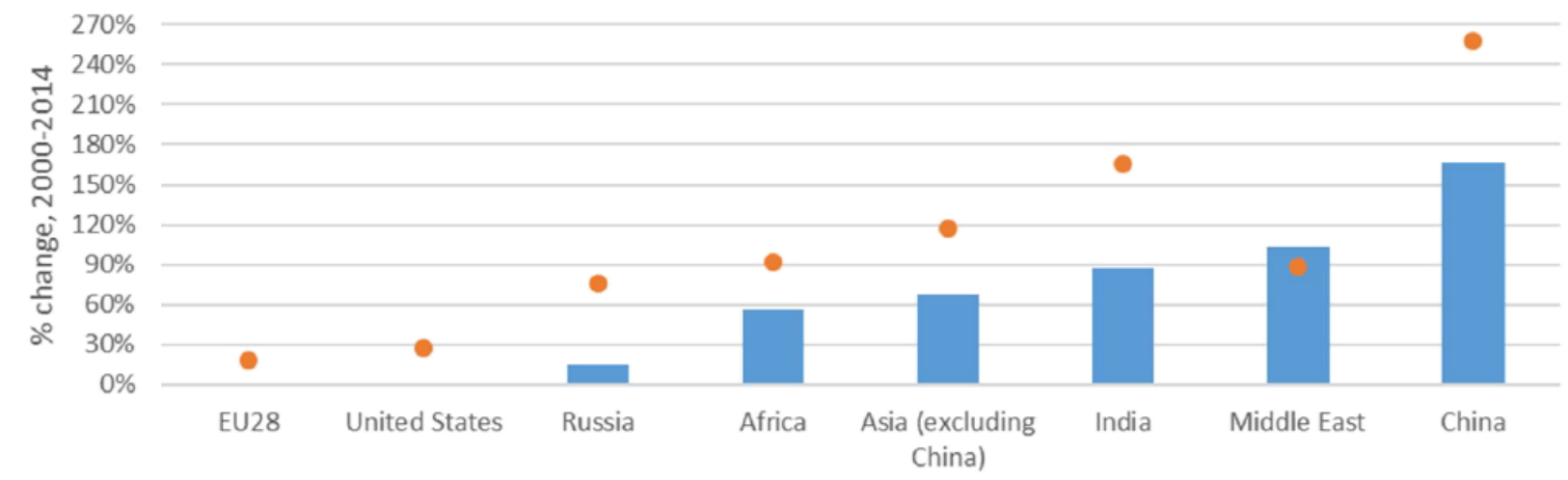
Labour productivity in selected oil-importing and oil-exporting MENA countries



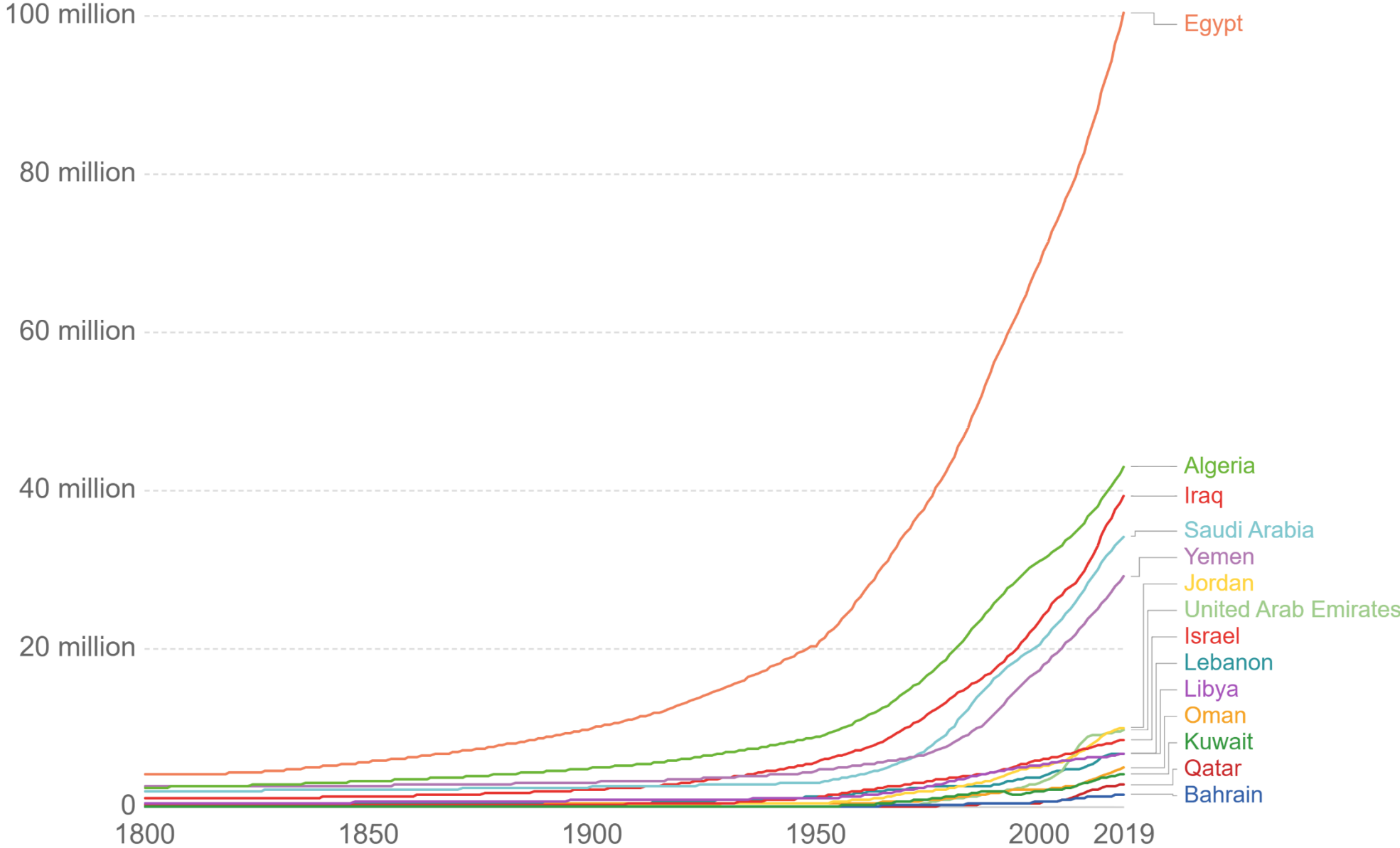
Post tax energy subsidies in selected MENA countries, 2015



Changes in primary energy supply and GDP

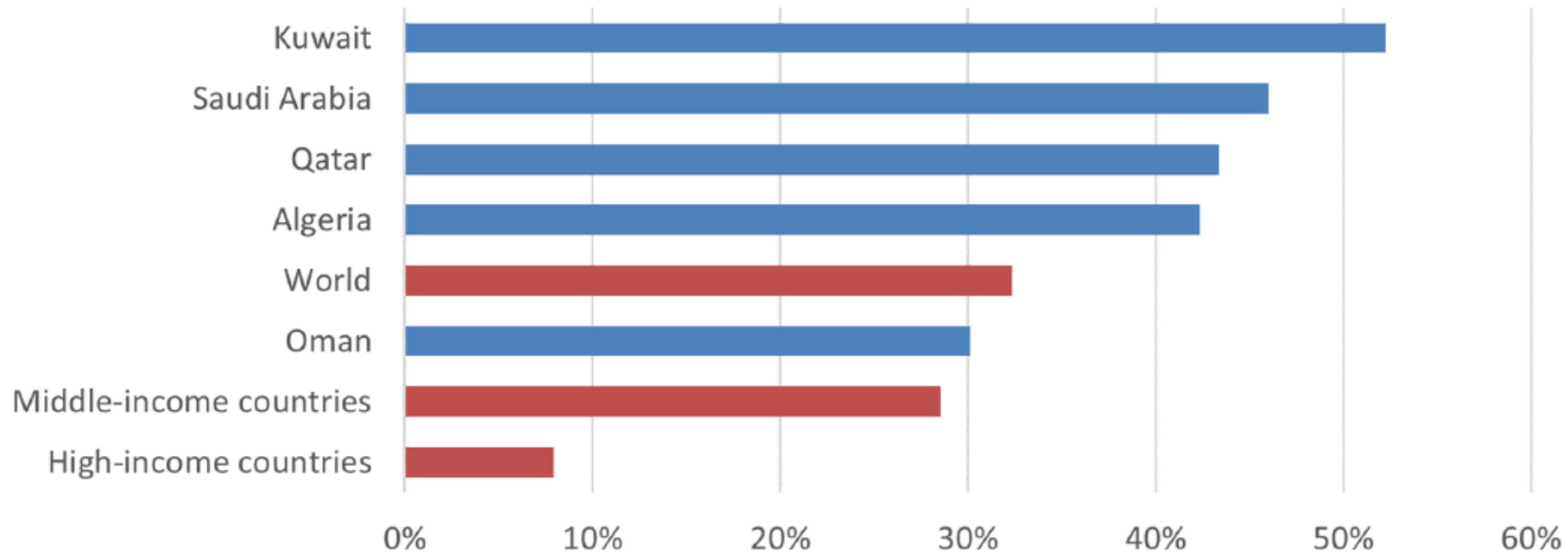


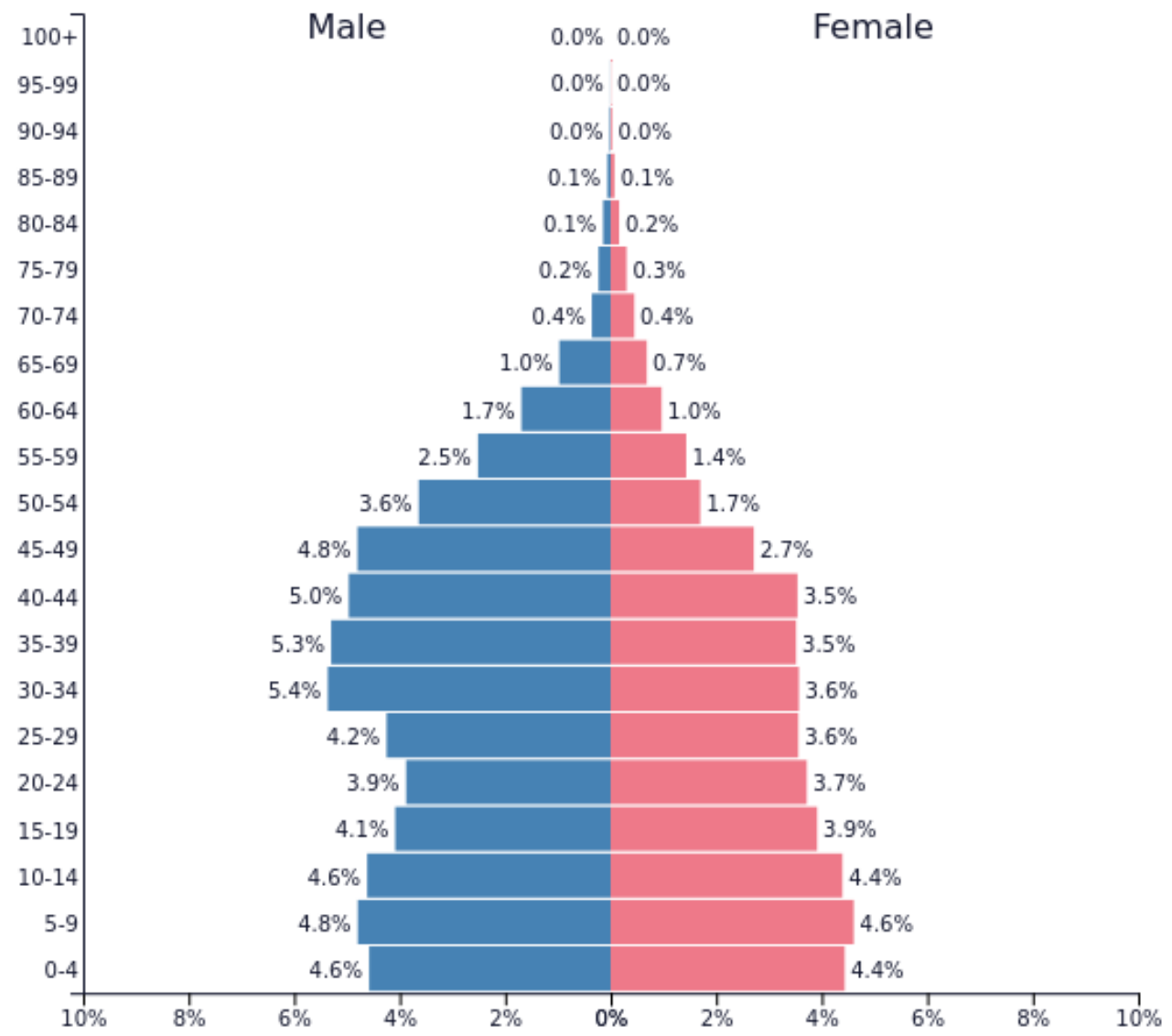
Population



Source: Gapminder; HYDE & UN Population Division (2019)

Expected population growth between 2015-2050





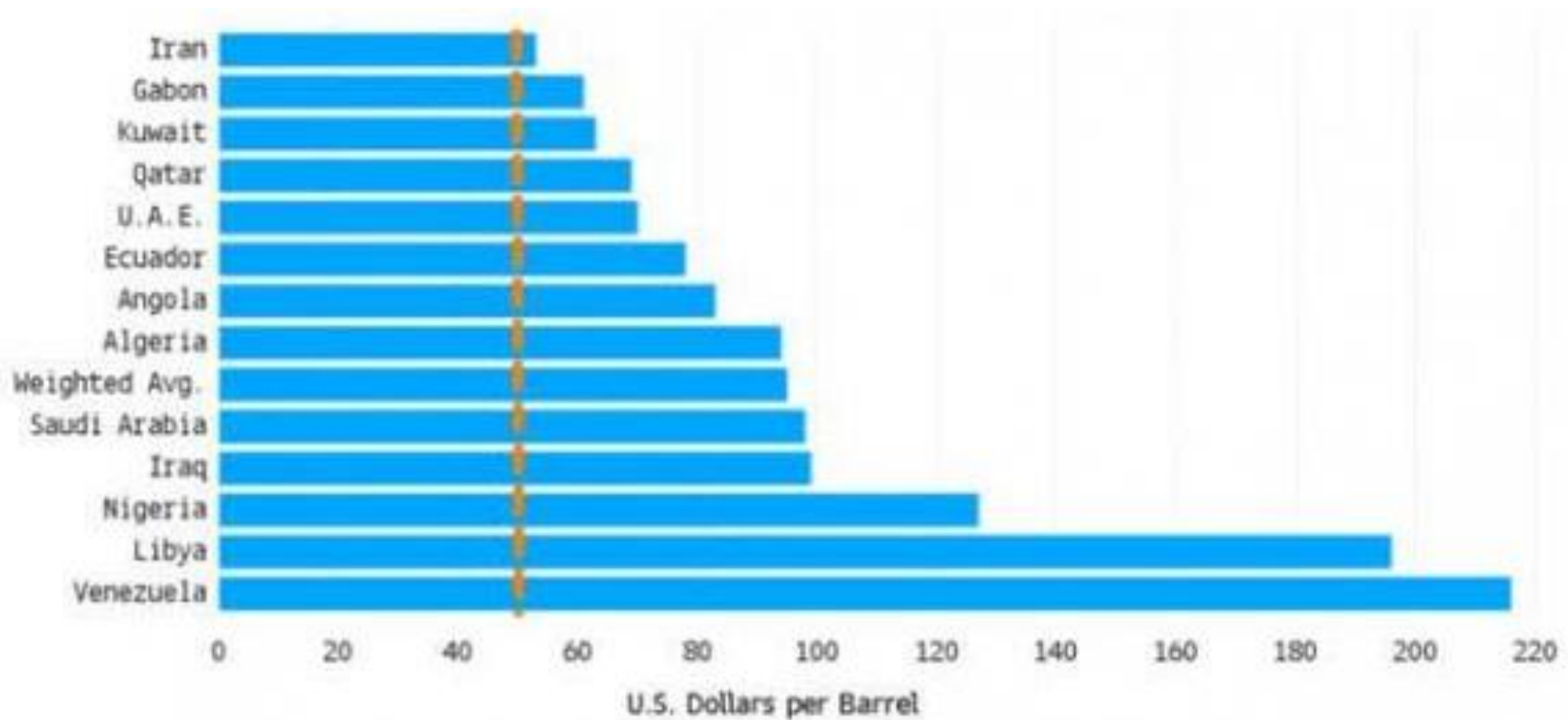
Saudi reaction to Arab Spring (2011)

- \$10.6 billion in new funding for housing loans via Real Estate Development Fund.
- \$7.9 billion in funding to increase the capital of the Saudi Credit Bank.
- \$266 million to enable social insurance to increase the number of family members covered.
- \$320 million to expand social services.
- \$933 million to help the needy repair their homes and pay utility bills.
- \$127 million to support programs for needy students at the Ministry of Education.
- \$3,9 billion to support the General Housing Authority.
- A 15% pay increase for state employees.
- A 50% increase in the annual allocations for charitable organizations.
- 27 million annually allocation to project of the National Charitable Fund.

Oil-related sovereign wealth funds

Country	ISO3 code	Region	Value (bn\$)	per capita (k\$)	% GDP	% Gvt revenue
United Arab Emirates	ARE	Middle-East	1214	134	304%	805%
Saudi Arabia	SAU	Middle-East	792	26	106%	284%
Kuwait	KWT	Middle-East	592	158	362%	527%
Qatar	QAT	Middle-East	256	118	122%	257%
Iran	IRN	Middle-East	62	1	15%	100%
Oman	OMN	Middle-East	40	9	49%	103%
Iraq	IRQ	Middle-East	1	0	0%	1%
Libya	LBY	North Africa	66	11	160%	392%
Algeria	DZA	North Africa	50	1	23%	70%
Angola	AGO	Sub-Saharan Africa	5	0	4%	10%
Nigeria	NGA	Sub-Saharan Africa	1	0	0%	2%
Russia	RUS	Other: CIS	139	1	7%	20%
Kazakhstan	KAZ	Other: CIS	79	5	36%	149%
Azerbaijan	AZE	Other: CIS	37	4	50%	128%
Canada	CAN	Other: Americas	18	0	1%	3%
Mexico	MEX	Other: Americas	6	0	0%	2%
Venezuela	VEN	Other: Americas	1	0	0%	1%
Norway	NOR	Other: Europe	848	165	170%	316%

Oil break-even price (2017)



Source: IMF, World Bank, RBC Capital Markets
Note: Indonesia not featured