



SEforALL Analysis of SDG7 Progress - 2020

SDG7 Data 2010-2018



- The purpose of this document is to:
 - Highlight the progress made towards achieving SDG7
 - Highlight specific areas where there are challenges
 - Help organizations prioritize where to focus and what to focus on

Executive summary

SDG7.1.1: Electricity access

SDG7.1.2: Clean cooking access

SDG7.2: Share of renewables in the energy mix

SDG7.3: Energy efficiency

Snapshot: SDG7 tracking report data 2010-2018

SDG7	2010	2011	2012	2013	2014	2015	2016	2017	2018
Indicator 7.1.1: Universal Electricity Access , millions of people without access	1,150	1,245	1,071	1,067	1,043	977	893	836	789
Indicator 7.1.2: Universal Access to Clean Fuels & Technologies for Cooking , millions of people without access	3,046	3,023	3,001	2,979	2,958	2,936	2,893	2,851	2,849
Target 7.2: Increase Share of Renewable Energy , % share energy consumption from renewables	16.3	16.5	16.7	16.9	17.0	17.0	17.2	17.3	17.3
Target 7.2: Increase Share of Renewable Energy , % share energy consumption from <i>modern</i> renewables (non biomass)	8.6	8.7	9	9.4	9.6	9.8	10.1	10.3	10.9
Target 7.3: Double Rate of Energy Efficiency Improvement , yearly rate of improvement of global primary energy intensity	-	2.4%	2.0%	2.1%	2.0%	2.9%	2.5%	1.7%	1.3% ¹

¹ Estimate

This is our reset moment. We can recover better.

- Countries must make use of affordable, modern, renewable energy sources that can support economic recovery in the aftermath of COVID-19. This could allow countries to ‘Recover Better’ and create a whole-economy approach to deliver universal sustainable energy access—in turn helping place the global economy on a trajectory in line with the Paris Agreement and SDGs.

Electricity access is growing, but not for everyone

- Significant progress on electrification has been made since 2010 with the number of unelectrified people reduced from 1.2 billion to 789 million in 2018. The decline was most significant in Asia, where the deficit shrank from 548 million in 2010 to 218 million in 2018, but in Africa the situation is basically stagnant.

We can no longer ignore the crisis: a lack of clean cooking

- The world is failing to answer the clean cooking challenge; 2.8 billion people—over a third of the world’s population—are unable to cook cleanly and safely. If current trends continue, almost 30 percent of the global population will still be without access to clean cooking solutions by 2030. Although gains have been made in Asia, population growth continues to outpace the annual increase in the number of people gaining access to clean cooking in Sub-Saharan Africa.

The renewable energy opportunity is still to be fully realized

- Decentralized, renewable solutions that will be essential for providing energy access to millions are not being deployed fast enough, and renewable energy uptake is moving only at a moderate pace. As we focus on accelerating the uptake of modern renewables for electricity, heat and the transport sector, it becomes important for each country to realize the advantages of integrated and comprehensive energy policy and planning based on data and evidence.

Energy inefficiency is costing us

- Slow progress on energy efficiency is undermining efforts towards all SDG7 targets and carbon reduction. Since peaking at a 3 percent rate of improvement in 2015, this year’s report shows a continuing decline in the pace of progress on energy efficiency.

Executive summary

ELECTRICITY ACCESS: Based on current trends, we are not on track to achieve SDG7.1.1 by 2030

- Projections show that we are not on track to achieve universal electricity access by 2030, with between 620 and 690 million people expected to remain unelectrified based on current trends
- To address this, organizations should prioritize working with countries that have large unelectrified populations and have not made significant progress to reducing them over the past few years, such as the Democratic Republic of Congo, Ethiopia, Nigeria and Pakistan
- By 2030, Pakistan will represent >70 percent of the unconnected Asian population based on current trends

CLEAN COOKING ACCESS: Based on current trends, we are not on track to achieve SDG7.1.2 by 2030

- Projections show that we are not on track to achieve universal access to clean fuels and technologies for cooking by 2030, with between 2.3 and 2.9 billion people expected to remain without access based on current trends
- To address this, organizations should prioritize working with countries that have large populations without access that have not made significant progress to reducing them over the past few years, such as Bangladesh, China, Ethiopia, India, Nigeria, and Pakistan

RENEWABLE ENERGY: Based on current trends, we expect to see moderate gains in the share of renewables in the energy mix by 2030 but *modern renewables need to accelerate*

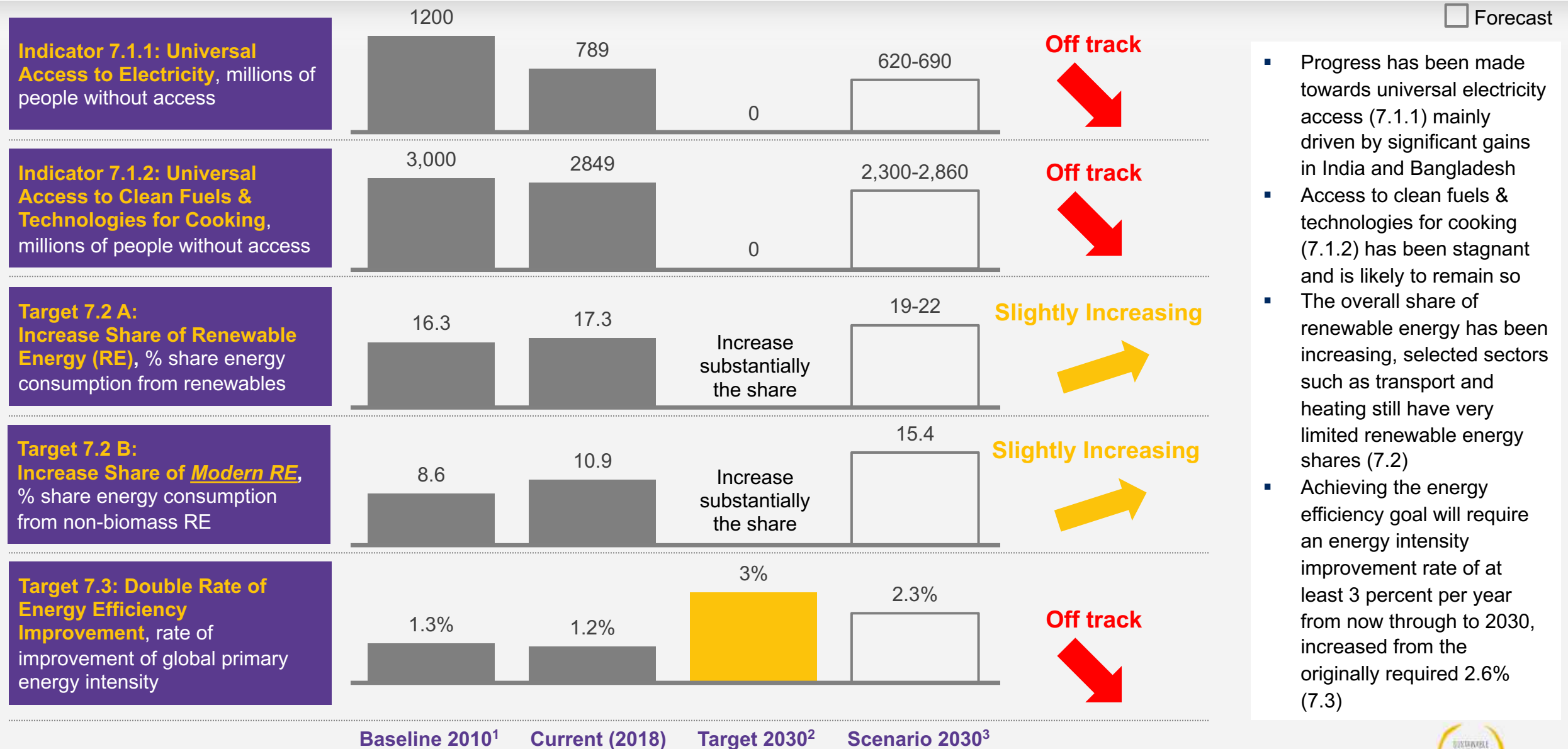
- Projections show an increase in the share of renewables, which includes traditional biomass, in the energy mix to between 19 percent and 22 percent by 2030, and we expect to see an escalation in renewables to 2050
- Africa has the lowest share of modern renewable energy at 1.8 percent, with 52.6 percent traditional biomass. To address this, organizations should prioritize working with countries to ensure unelectrified populations are connected with clean, renewable energy

ENERGY EFFICIENCY: Based on current trends, an energy intensity improvement rate of at least 3 percent per year from now through to 2030 will be necessary to achieve SDG7.3

- Data indicate a slowdown in the rate of improvement of energy intensity, thus requiring higher efforts to reach SDG7.3 going forward.
- To ensure they get on track, organizations should prioritize and invest in efficiency, incentivize consumers to be more energy efficient and explore ways for industry to increase its energy efficiency



We are lagging behind in providing access to electricity and clean cooking, and much more needs to be done to increase efficiency and renewables



- Progress has been made towards universal electricity access (7.1.1) mainly driven by significant gains in India and Bangladesh
- Access to clean fuels & technologies for cooking (7.1.2) has been stagnant and is likely to remain so
- The overall share of renewable energy has been increasing, selected sectors such as transport and heating still have very limited renewable energy shares (7.2)
- Achieving the energy efficiency goal will require an energy intensity improvement rate of at least 3 percent per year from now through to 2030, increased from the originally required 2.6% (7.3)

1: Baseline for Goal 7.3: Double Rate of Energy Efficiency Improvement is the value for the years 2006-2010

2 Yearly rate of energy efficiency improvement required to meet 2030 Target. 3 Yearly rate of energy efficiency improvement assumed in Scenario 2030

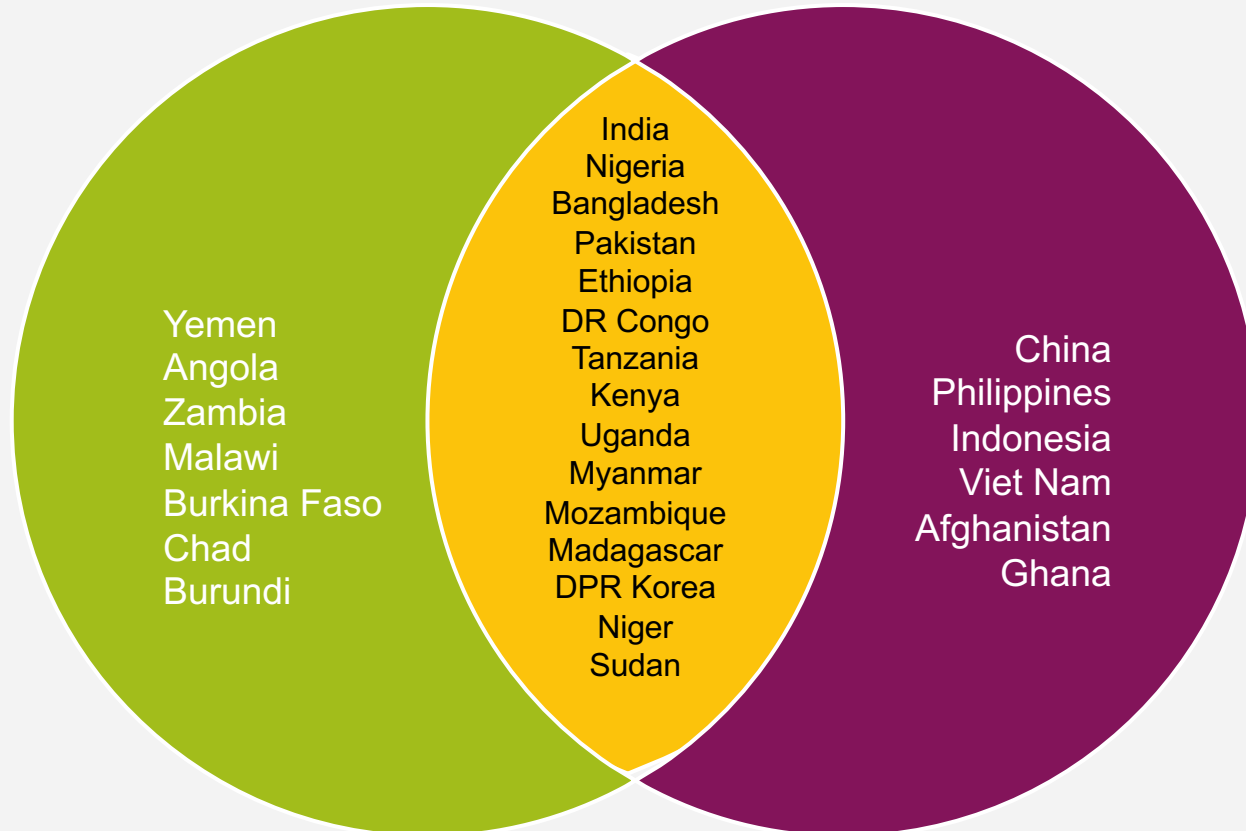


There are significant overlaps between electrification and clean cooking

15 countries contribute to the top 80 percent of the challenge in both electricity and clean cooking access

~789 million people lack access to electricity with the countries making the top 80% being...

~2.8 billion people lack access to clean cooking with the countries making up the top 80% being...



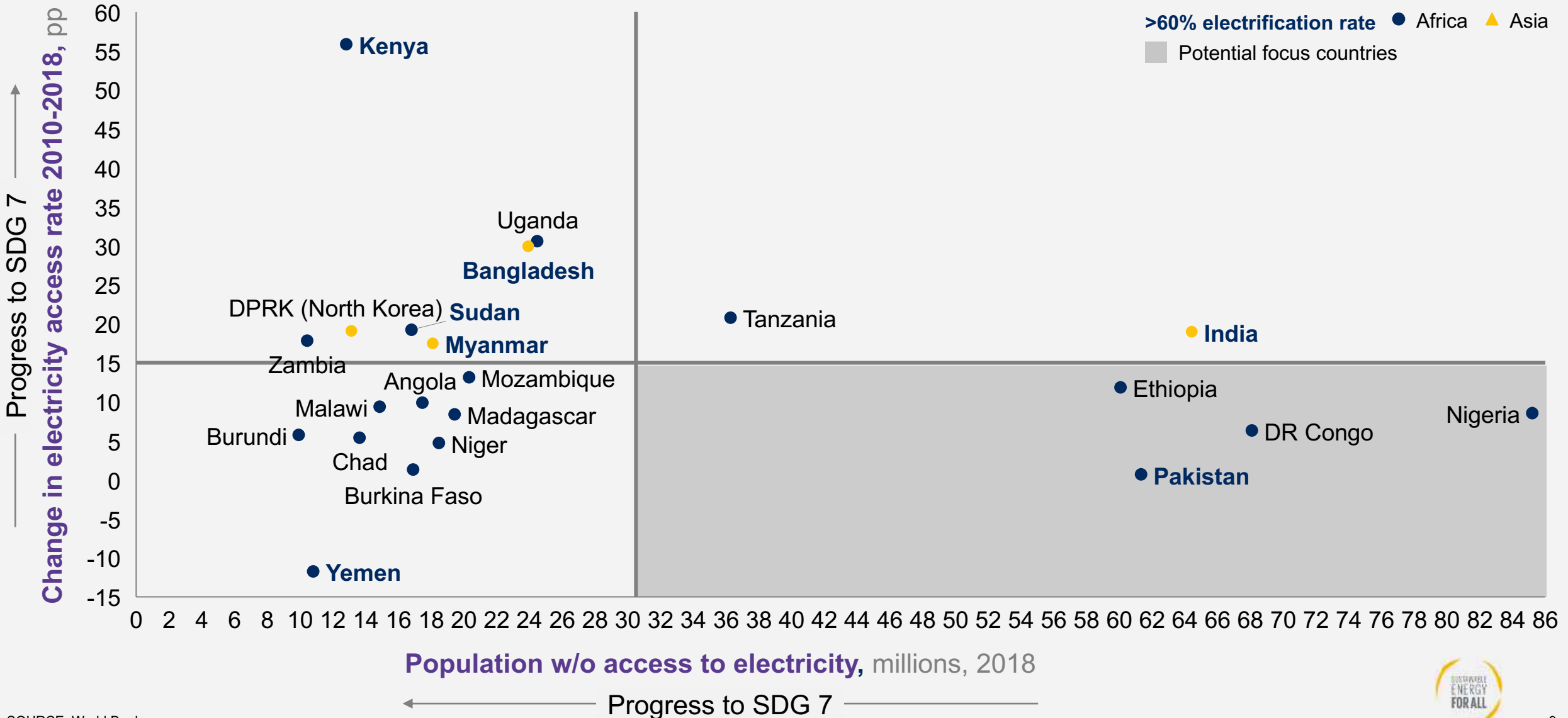
There is a correlation between electrification and access to clean cooking

- **Electrification solves some of the clean cooking challenge** as some households switch from traditional fuels to electricity for some of their domestic needs such as lighting and cooking
- It has been shown that electrification of a household can reduce households'
 - CO₂ emissions by 32 – 36kg/year¹
 - black carbon emissions by 225 – 455kg CO₂ equivalent/year¹
- Clean cooking technologies (such as solar cookers) are often used as an entry product to unelectrified households
- ~40% of the people in Africa and ~90% of those in Asia without access to clean fuels and technologies for cooking have electricity access²

¹ Based on a study of the effects of Tier 2 electrification (low power and ~4 hours of electricity a day) in Kenya, Ethiopia and Bangladesh; ² Assumes that no one with access to clean cooking lacks access to electricity

Organizations should focus on countries with large unelectrified populations and slow progress

Population without access to electricity vs change in electricity access rates (Top 22 countries), 2018



Organizations should focus on countries with large populations without access to clean cooking and slow progress

Population without access to clean cooking vs change in clean cooking access rates (Top 21 countries), 2018



SOURCE: ESMAP Tracking SDG7 Database, 2020



Executive summary

SDG7.1.1: Electricity access

SDG7.1.2: Clean cooking access

SDG7.2: Share of renewables in the energy mix

SDG7.3: Energy efficiency

SDG7.1.1 Electricity access

There are 789 million people without access to electricity, with 72 percent of them in Africa and 27 percent in Asia

- 80 percent of the unconnected people live in just 22 countries, 16 of them in Africa and the remaining 6 in Asia
- Differences in the rural and urban electrification rates mean that different approaches will be required to close the gap on each continent
 - The Asian countries typically have close to 100 percent urban electrification rates and high rural electrification rates of over 70 percent on average, meaning they now need to serve the last mile in the rural areas
 - The African countries have 67 percent urban electrification rates and rural electrification rates of just over 20 percent on average, meaning they need to serve a combination of the last mile in urban areas, as well as needing to roll out large scale rural electrification schemes

Looking back, we see that significant progress has been made since 2010 with the number of unelectrified people reduced from 1,150 million to 789 million in 2018

- 91 percent of this improvement has been driven by significant gains in Asia, particularly in India and Bangladesh
- While there have been improvements in the electrification rate in Africa from 44 percent to 56 percent, this hasn't been enough to match the population growth, resulting in the number of Africans lacking access to electricity effectively remaining constant

Looking forward, based on current trends, we are not on track to achieve SDG7.1.1 by 2030

- Projections show that we are not on track to achieve universal electricity access by 2030, with between 620 and 690 million people expected to remain unelectrified based on current trends
- To address this, organizations should prioritize working with countries that have large unelectrified populations and have not made significant progress to reduce them over the past few years, such as Democratic Republic of Congo, Ethiopia, Nigeria and Pakistan

Description

Data Source







- The following data were gathered from the World Bank Open Data with data available between 1990 and 2018
 - Total electricity access rate and population without access to electricity per country
 - Urban electricity access rate and population in urban areas without access to electricity per country
 - Rural electricity access rate and population in rural areas without access to electricity per country
 - Total population per country
 - Urban population per country
 - Rural population per country

Projections

- Straight line extrapolation projections were made via the following process
 - The rate of change of the number of people without access to electricity (Compound Annual Growth Rate, CAGR) between 2015 and 2018 was calculated for each individual country
 - Each country's 2018 population without access to electricity was projected forwards to 2030 (by 12 years) by adding the calculated average change to the 2018 population 12 times
 - 0 was set as a minimum to prevent the unconnected population from being negative
 - The projected data was then summed up according to each country's regional classification
- IEA stated policy scenario was taken from the IEA's *World Energy Outlook 2019* report

Definition of electricity access

Electricity access is defined as a household being connected to an electricity supply at Tier 1 and above

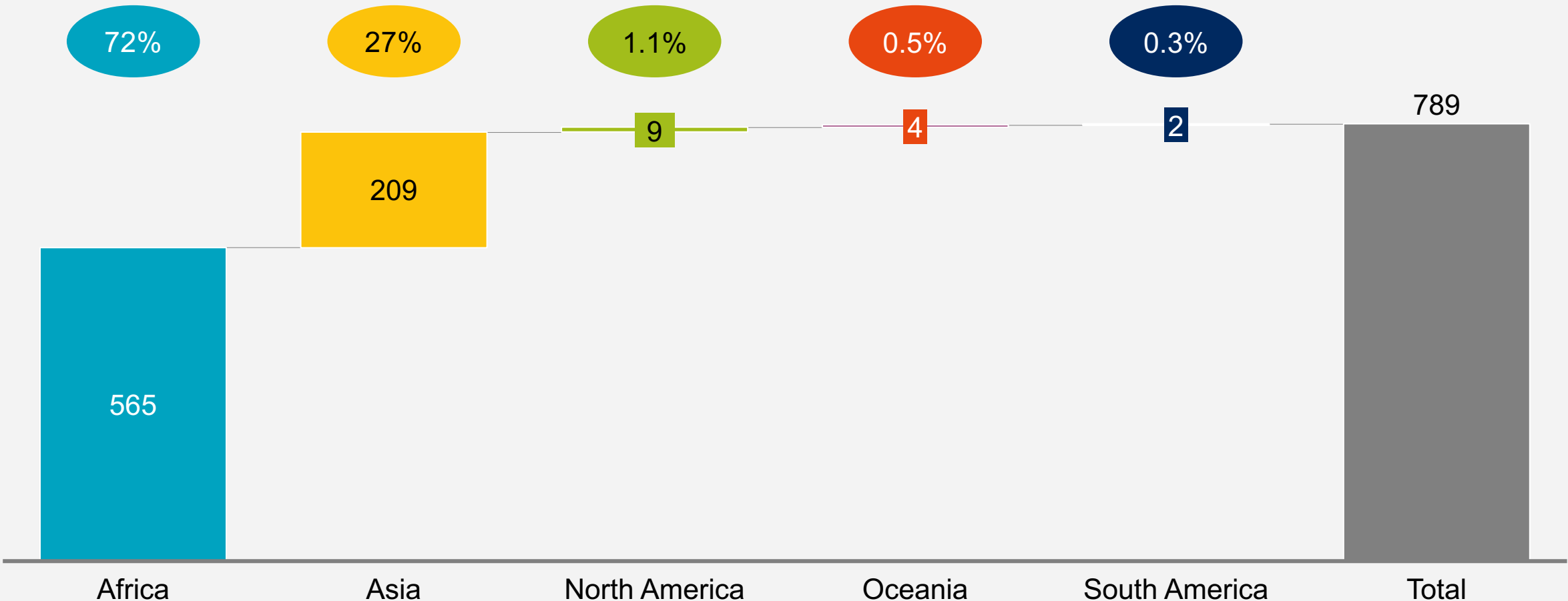
	Tier 0	Tier 1	Tier 2	Tier 3	Tier 4	Tier 5
						
Minimum hours available per day	<4 hours	4 hours	4 hours	8 hours	16 hours	23 hours
Minimum power	<3 Watts	3 Watts	50 Watts	200 Watts	800 Watts	2,000 Watts
Minimum daily power capacity	<12 Wh	12 Wh	200 Wh	1,000 Wh	3,425 Wh	8,219 Wh

Electricity access

There are ~789 million people in the world without access to electricity

(x) % of total

Population without electricity access¹, millions, 2018



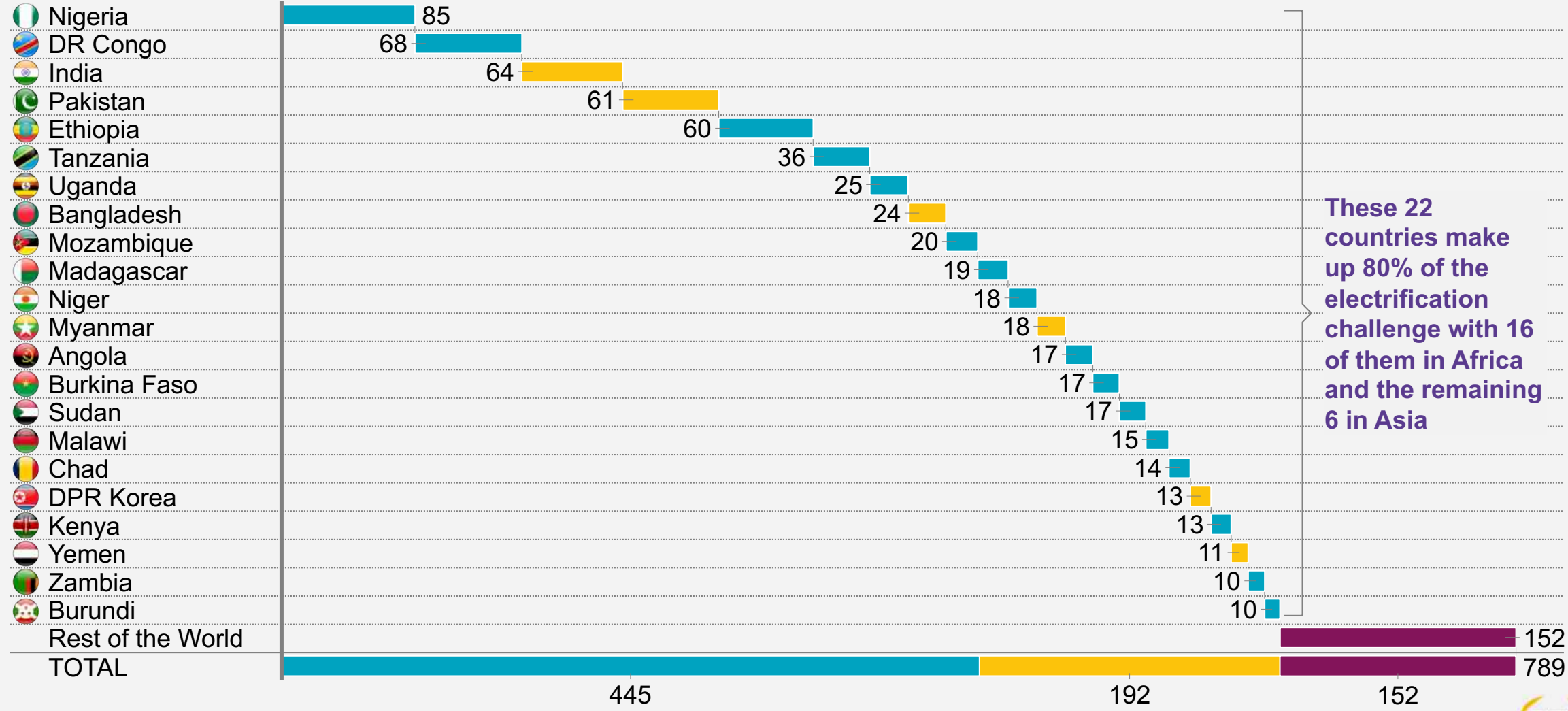
¹ Electricity access is defined as a household being connected to an electricity supply at Tier 1 and above
SOURCE: World Bank



22 countries make up 80% of the electrification challenge

Population without electricity access, millions, 2018

Africa Asia



These 22 countries make up 80% of the electrification challenge with 16 of them in Africa and the remaining 6 in Asia

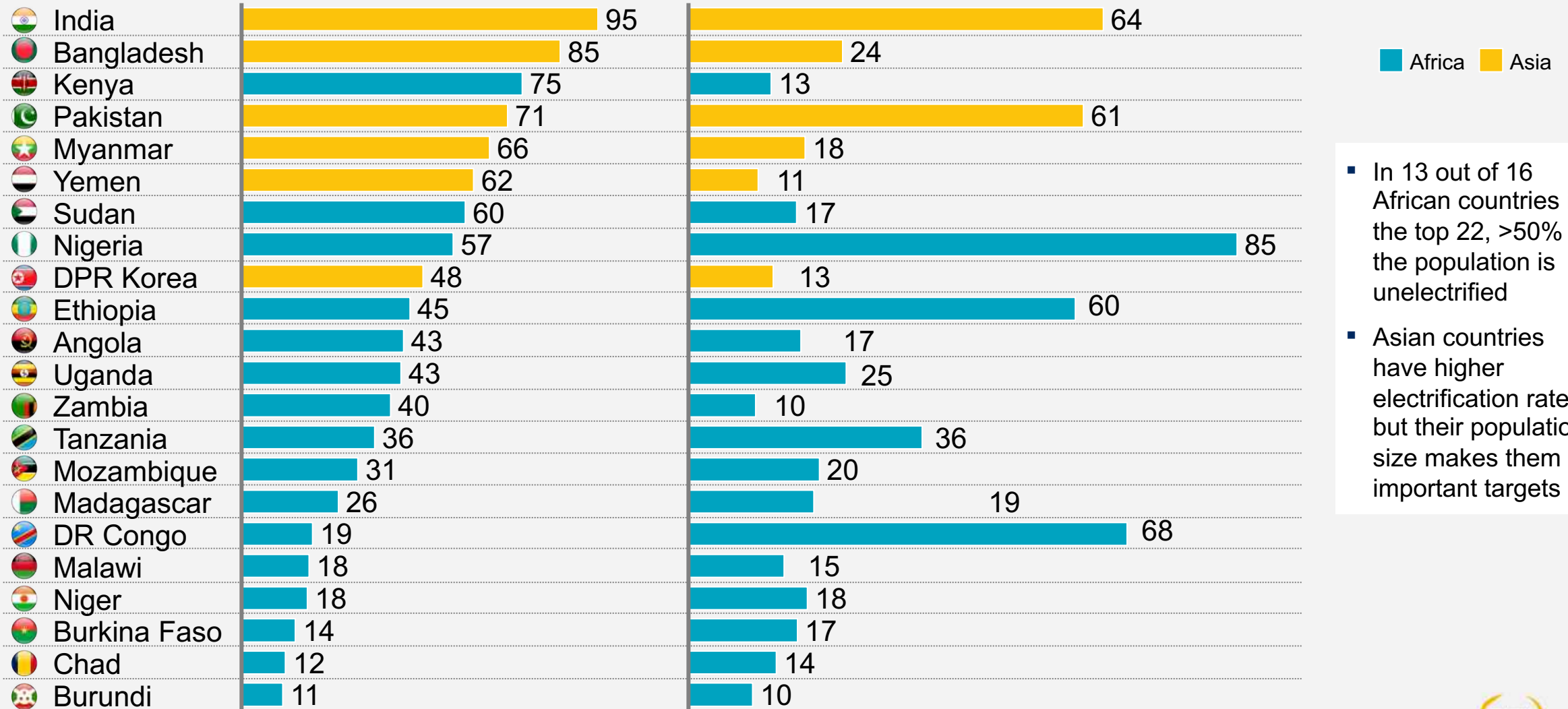
SOURCE: World Bank



The Asian countries in the top 22 typically have higher electrification rates than the African ones

Electrification rate, %, 2018

Population without electricity access, millions, 2018



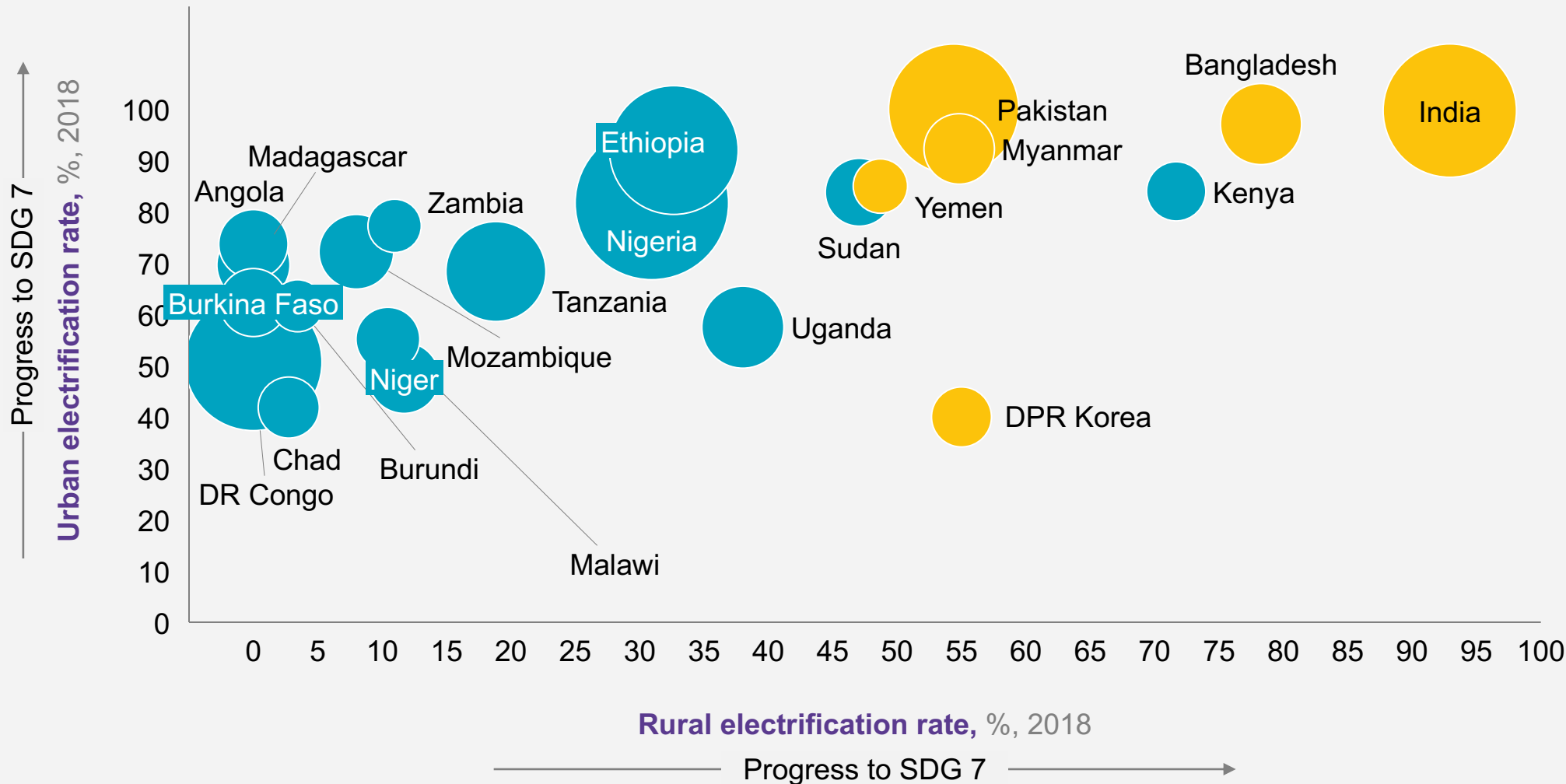
- In 13 out of 16 African countries in the top 22, >50% of the population is unelectrified
- Asian countries have higher electrification rates but their population size makes them important targets

These countries have different types of electrification challenges and thus would require tailored approaches to solve

Rural vs Urban electrification rates (top 22 countries), 2018

● Asia ● Africa

Bubble size = Total unelectrified population

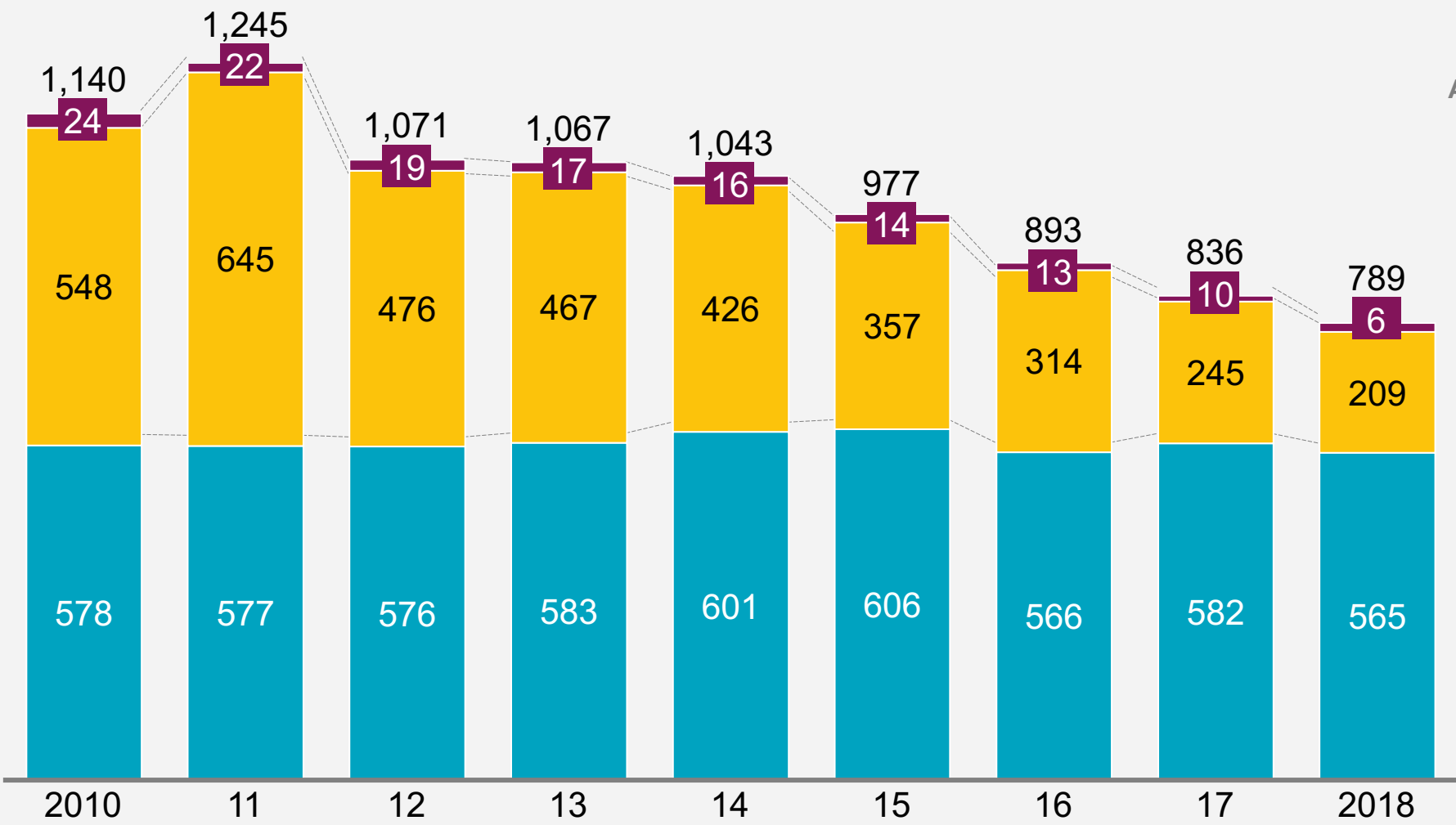


- The Asian countries typically have close to 100% urban electrification rates and high rural electrification rates meaning that they need to serve the last mile in the rural areas
- The African countries typically need to serve the last mile in urban areas but also have low rural electrification rates and need to roll out large scale rural electrification schemes

Total number of unelectrified people has declined from 1,150 million in 2010 to ~789 million in 2018; however, most of this decline is from Asia with the situation in Africa remaining stagnant

Population without electricity access, millions, 2018

Rest of the World Asia Africa



Average Annual Growth Rate¹

-5%

-15%

-11%

-0.3%

- The number of unelectrified people in the world decreased by ~361 million between 2010 and 2018
- This was driven by significant gains in Asia (91% of decrease)

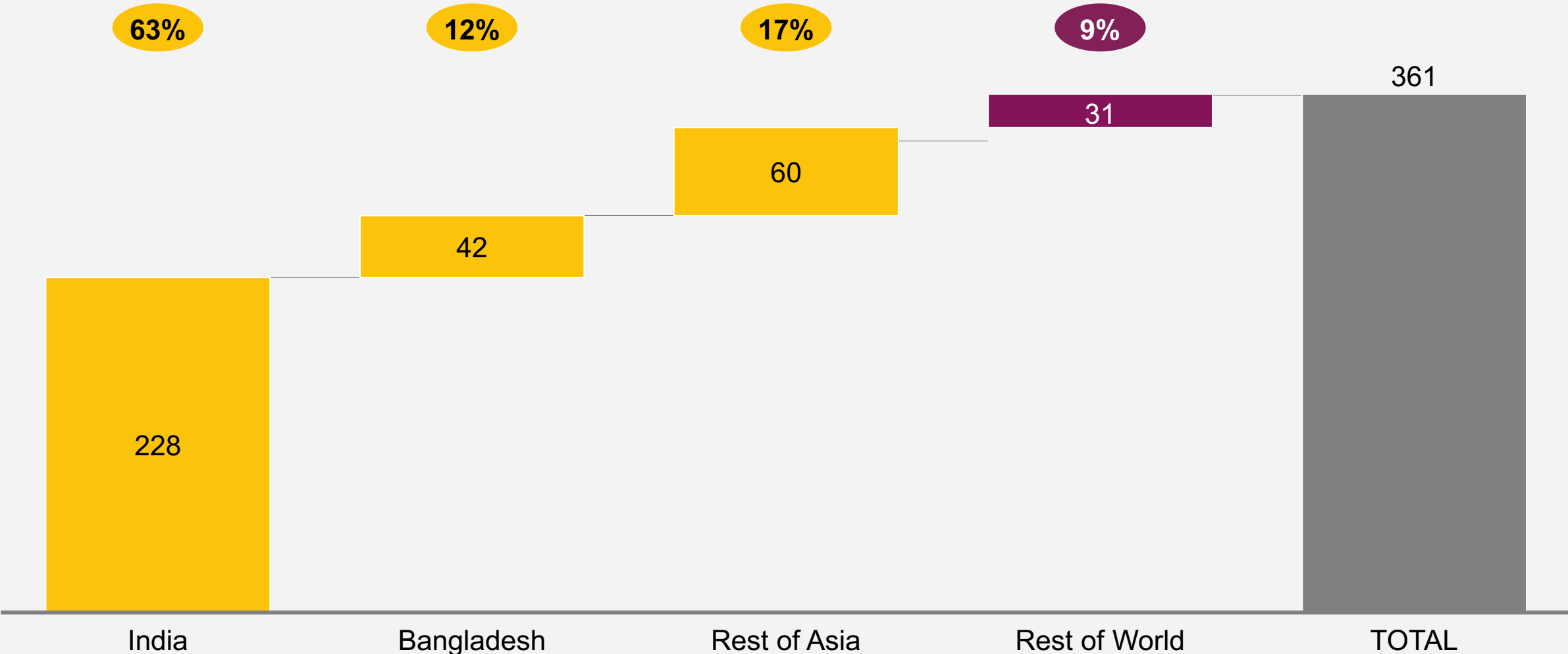
¹ 2010 – 2018 Compound annual growth rate: The average annual growth rate
SOURCE: World Bank



The majority of the improvement in Asia is seen in India and Bangladesh

Reduction in unelectrified population between 2010 and 2018, millions

x% Share of total reduction



NOTE: These figures represent the absolute change in the number of unelectrified people between 2010 and 2018 and do not account for changes in the population due to birth rates, human migration etc.

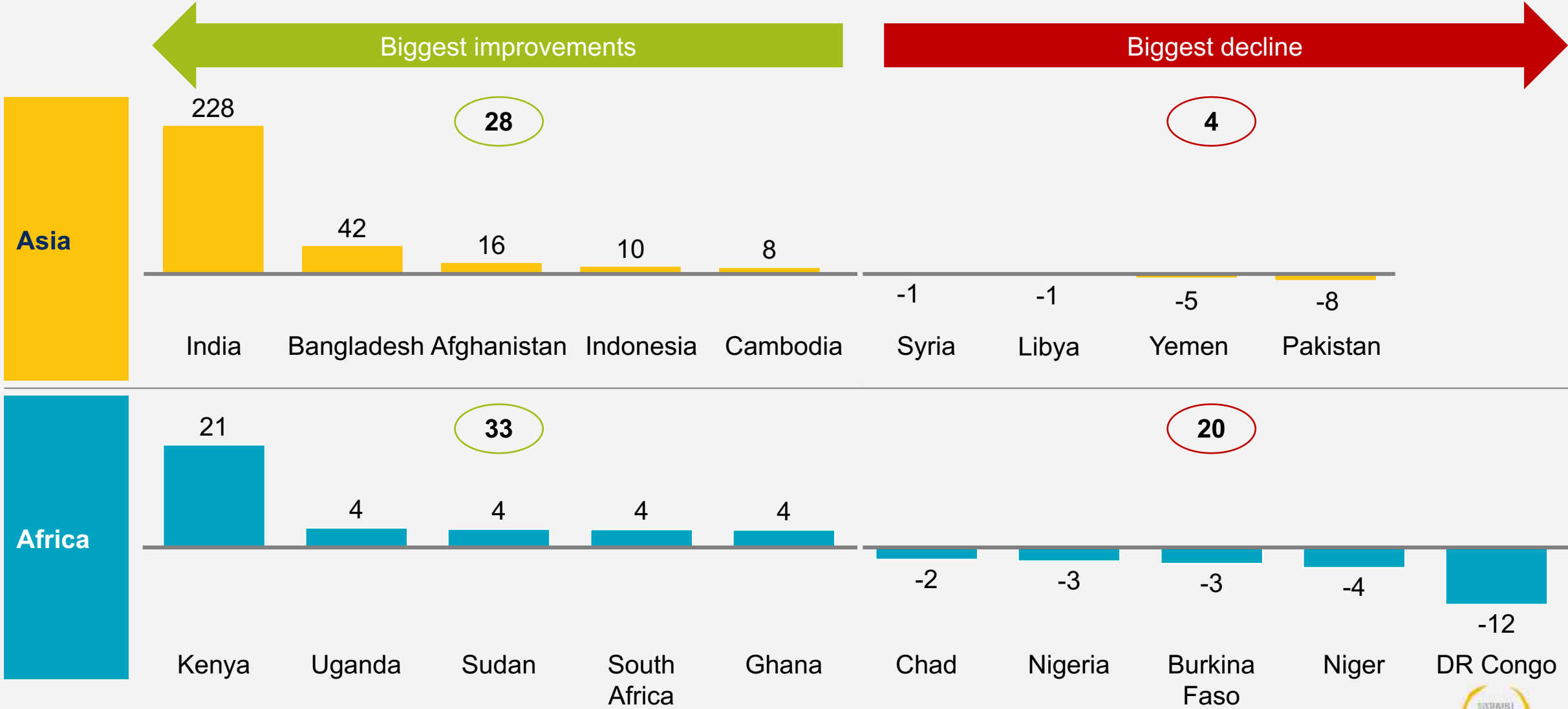
SOURCE: World Bank



Almost every Asian country has made progress since 2010

x Number of countries with improvements
x Number of countries with decline

Reduction in unelectrified population between 2010 and 2018, millions



NOTE: These figures represent the absolute change in the number of unelectrified people between 2010 and 2018 and do not account for changes in the population due to birth rates, human migration etc.

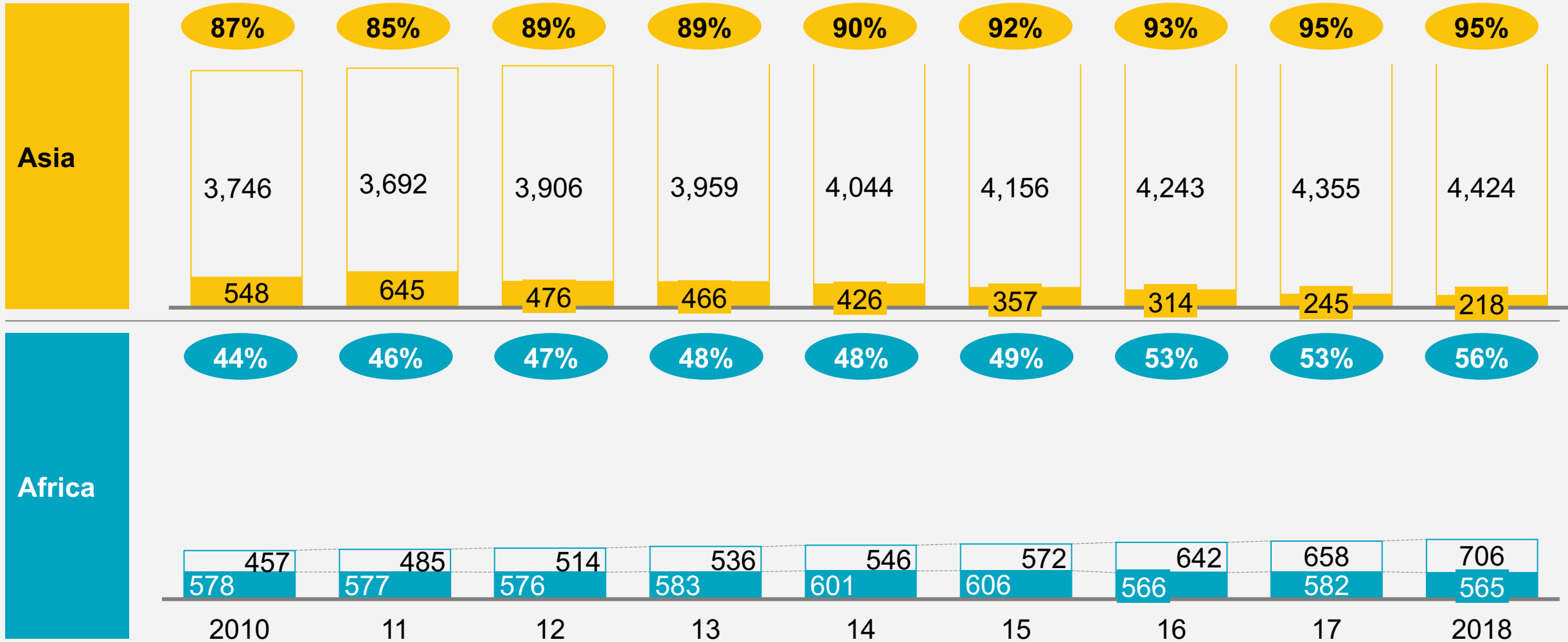
SOURCE: World Bank



Despite improvements in Africa's electrification rate, the population growth has resulted in a steady unelectrified population of 550-600 million people

Population, millions

x% Electrification rate □ Electrified population ■ Unelectrified population

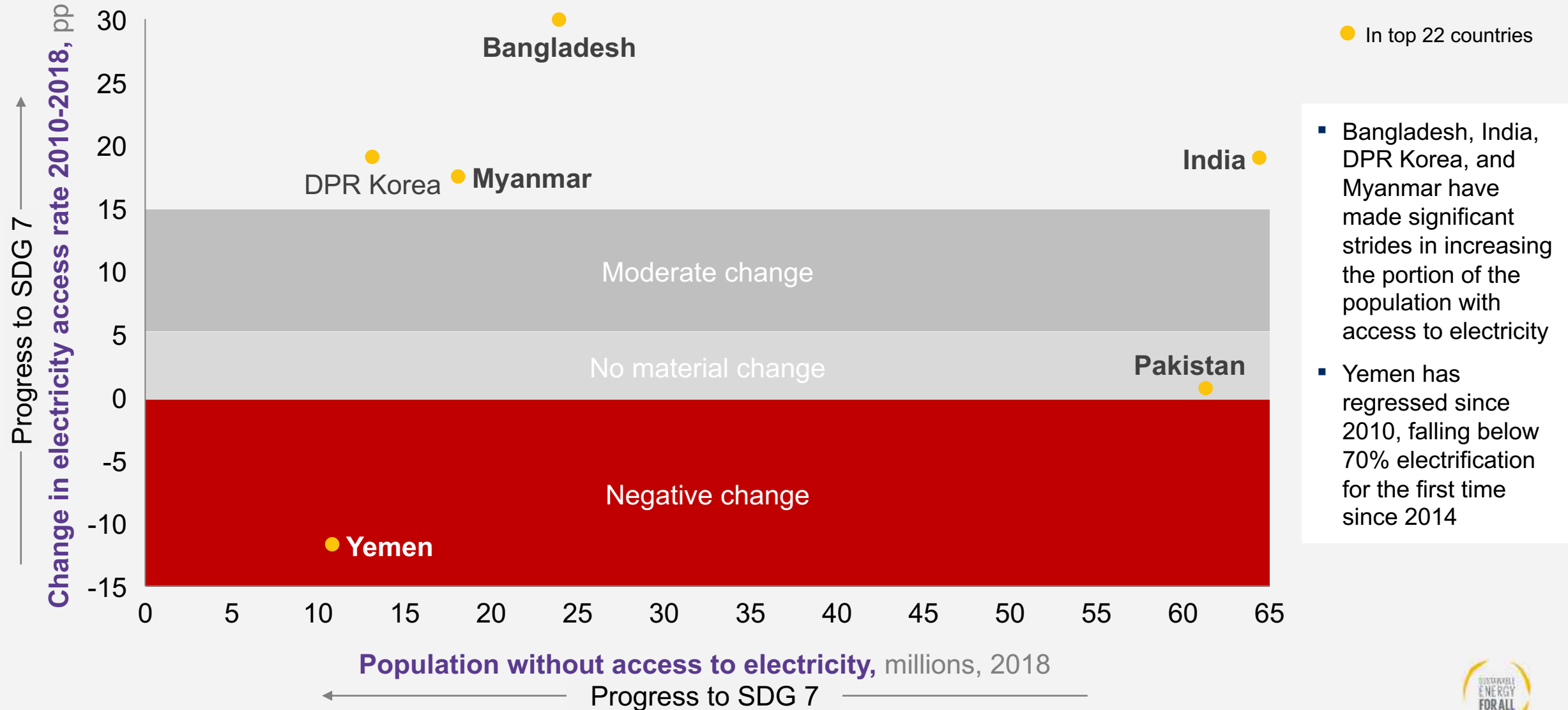


SOURCE: World Bank



Electricity access: Deep dive on Asia

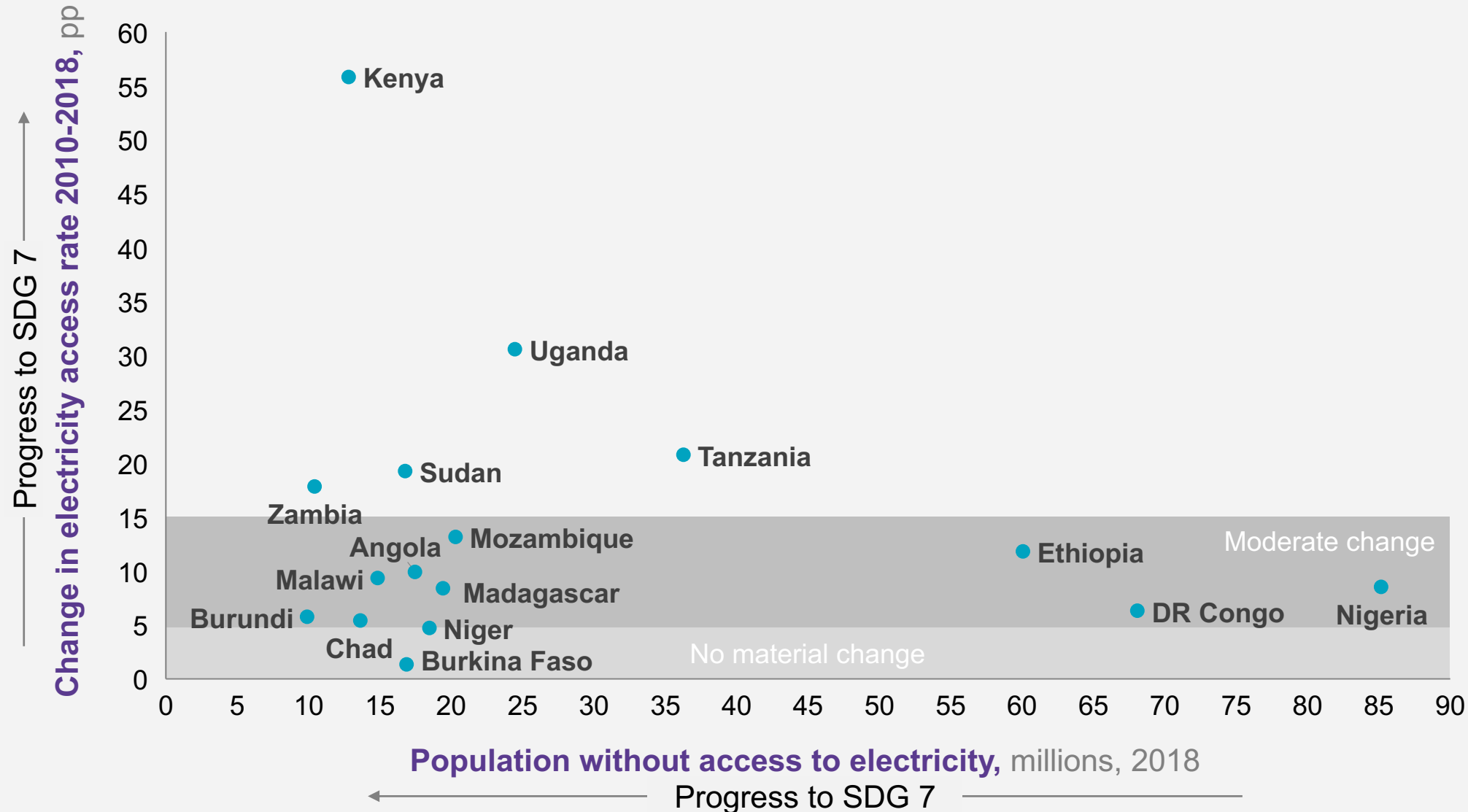
Population without access to electricity vs change in electricity access rates (Asian countries), 2018



Electricity access: Deep dive on Africa

Population without access to electricity vs change in electricity access rates (African countries), 2018

● In top 22 countries

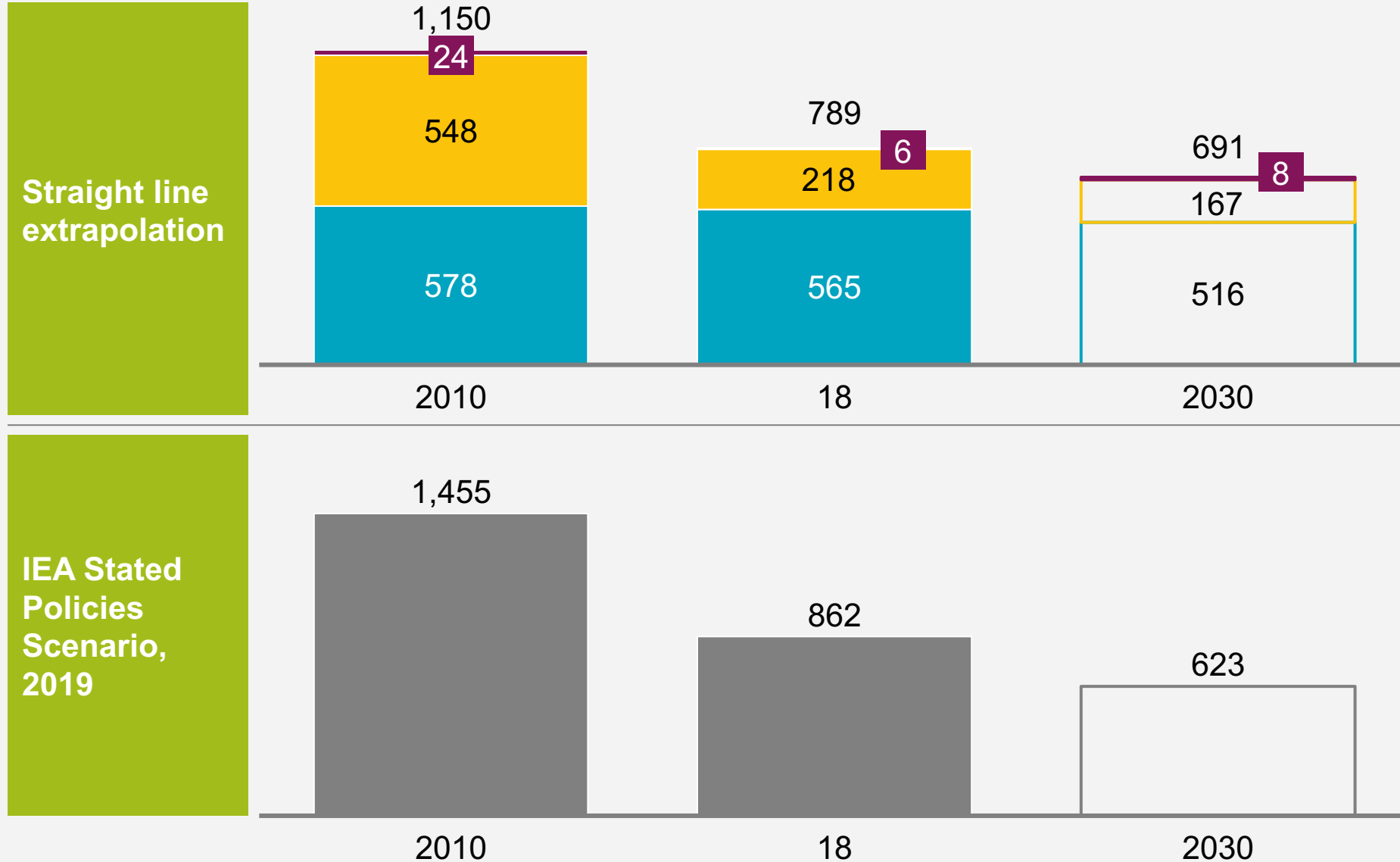


- The majority of the African countries in the top 22 countries have only shown moderate improvement in the electricity access rate since 2010
- Kenya has made significant progress increasing the electrification rate with Sudan, Tanzania, Uganda and Zambia also showing strong progress

Projections show that we are not on track to reach universal electricity access by 2030

Projected population without access to electricity, millions

Forecast Rest of world Asia Africa

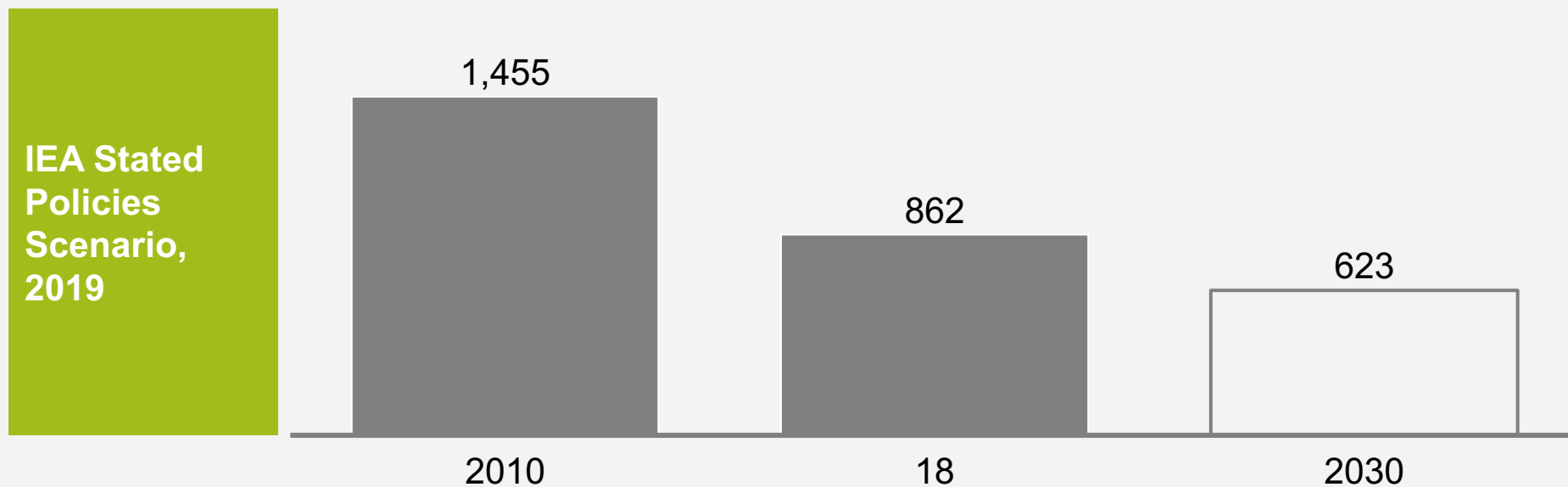
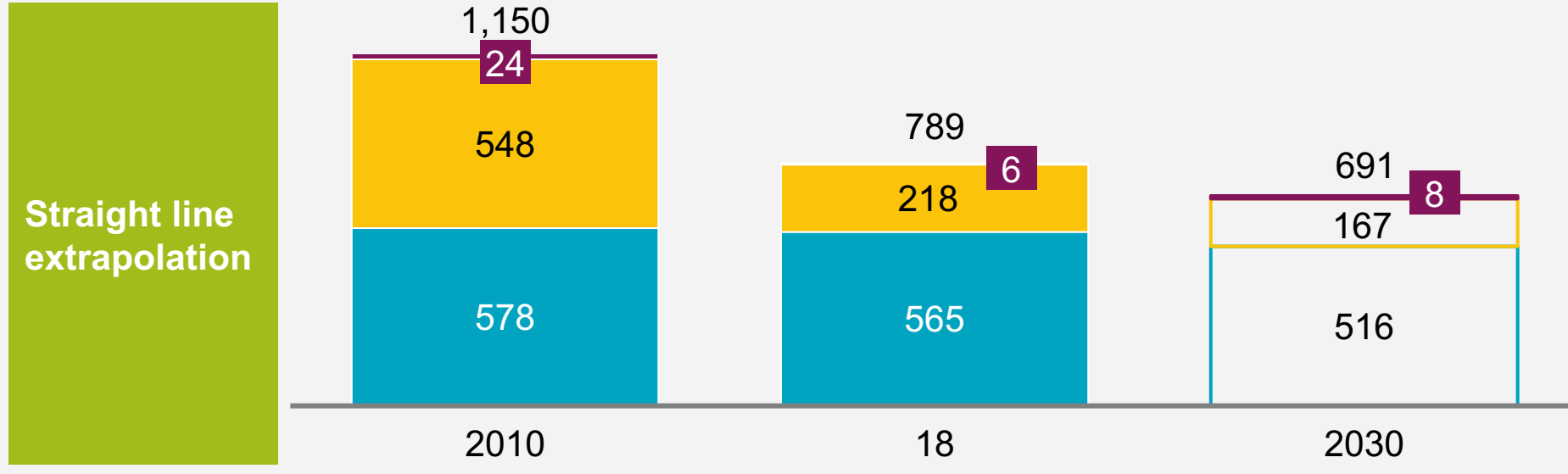


- Without more progressive policy and investment, the projection indicates that it is very difficult for African countries to achieve universal access by 2030.
- Meanwhile, IEA's Stated Policy Scenario projects that effective policies should allow Ethiopia, Ghana, Kenya, Rwanda, Senegal, and South Africa to reach universal access. This means we can break the past slow trends by implementing effective policy and further investments.

Projections show that we are not on track to reach universal electricity access by 2030

Projected population without access to electricity, millions

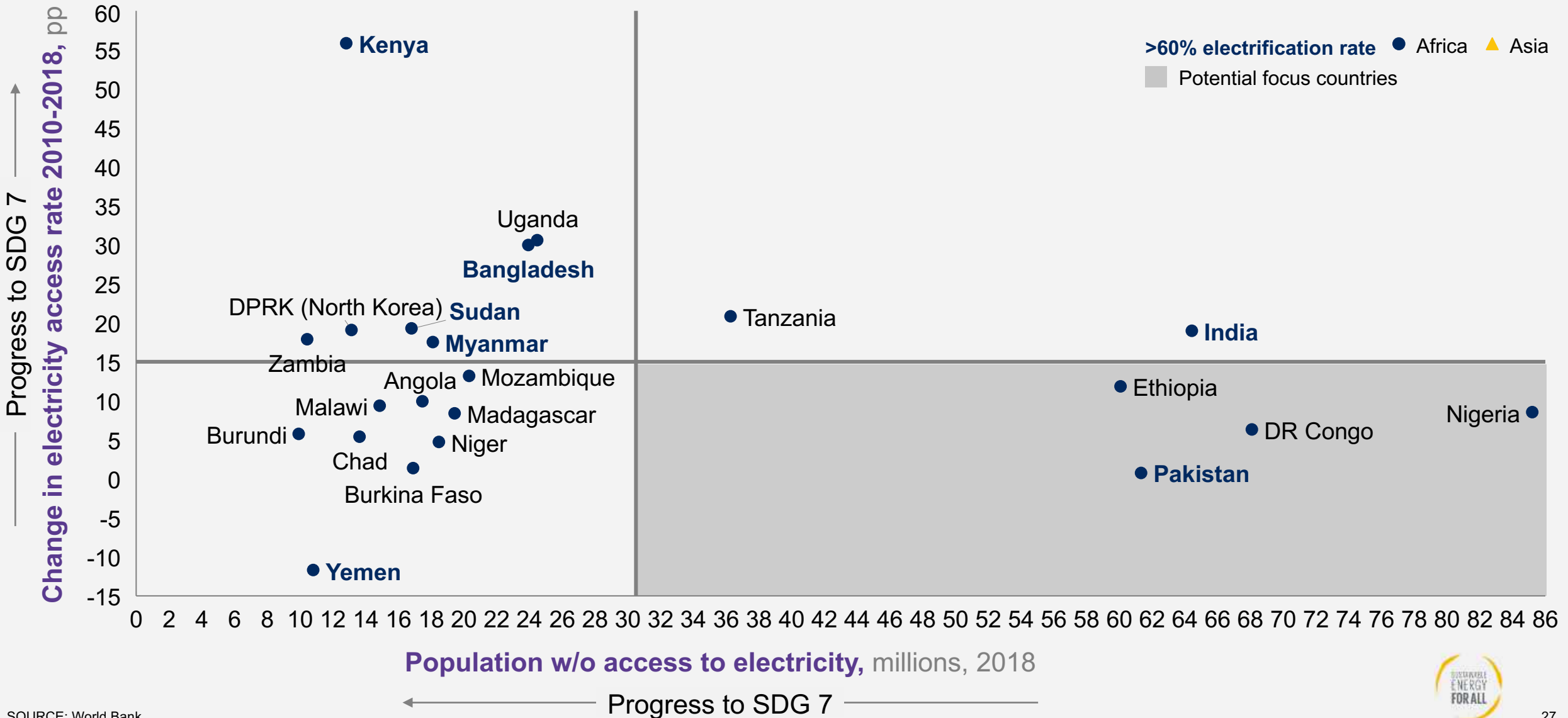
Forecast Rest of world Asia Africa



- 14 additional countries globally would achieve universal access if they continue to deliver at current levels, including 5 Asian countries (lists in appendix)
- 15 Asian countries would still have unelectrified populations (list in appendix)
- 12 African countries would still have significant unelectrified populations of ~10million or more (list in appendix)

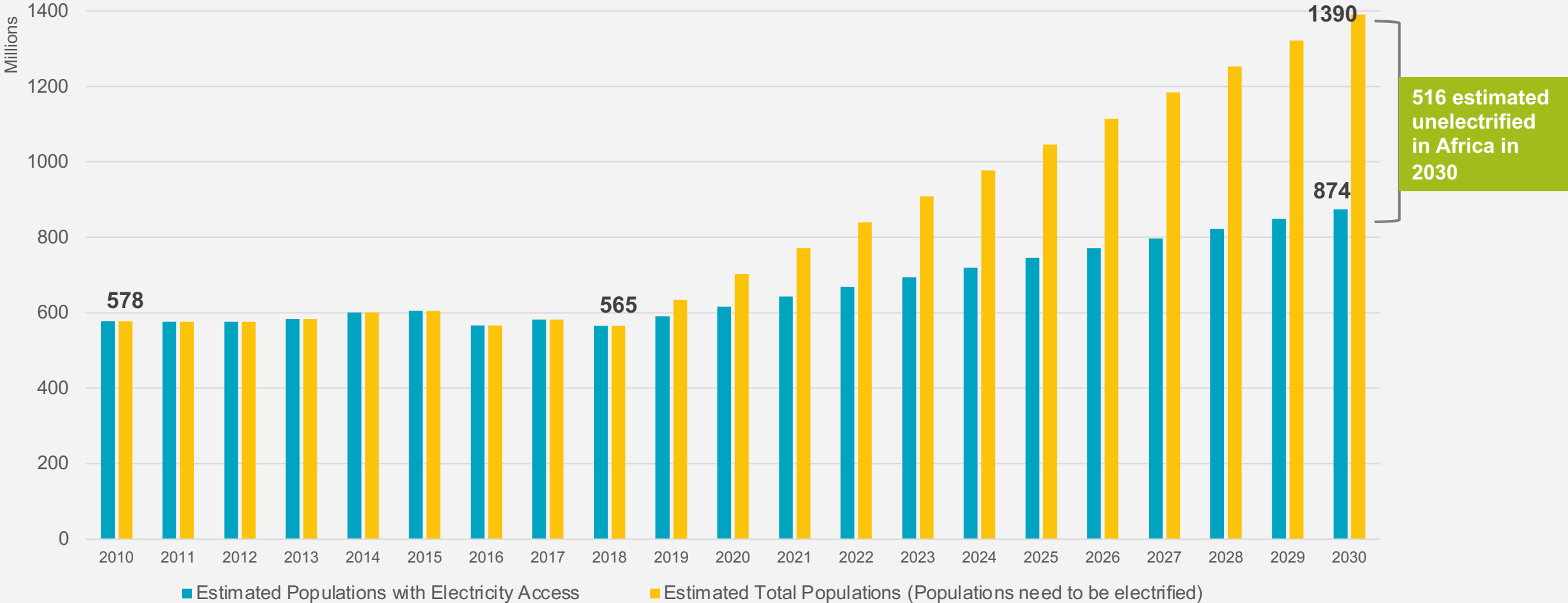
Organizations should focus on countries with large unelectrified populations and slow progress

Population without access to electricity vs change in electricity access rates (Top 22 countries), 2018



Rate of electricity access in Africa

Current trend trajectory vs required trajectory to achieve electricity access



SOURCE: SEforALL



Executive summary

SDG7.1.1: Electricity access

SDG7.1.2: Clean cooking access

SDG7.2: Share of renewables in the energy mix

SDG7.3: Energy efficiency

SDG7.1.2 Clean cooking access

There are 2.8 billion people without access to clean fuels and technologies for cooking, with 64 percent of them in Asia and 32 percent in Africa

- 80 percent of the people without access live in just 21 countries, with 10 of them in Asia and the remaining 11 in Africa
 - The situation is dire in the African countries as only 2 of the 11 countries (Ghana and Sudan) that are part of the top 80 percent have access rates over 10 percent
 - The Asian countries in the top 21 mostly have higher access rates than their African counterparts; however, there is still significant room for improvement

Looking back, we see that the number of people without access has been stagnant with only a slight improvement from 3.0 billion in 2010 to 2.8 billion in 2018

- Moderate improvements have been made in Asia with the number people without access declining from 2.1 billion to 1.8 billion
- However, the number of people without access in Africa has increased from ~750 million to ~900 million people

Looking forward, based on current trends, we are not on track to achieve SDG7.1.2 by 2030

- Projections show that we are not on track to achieve universal access to clean fuels and technologies for cooking by 2030, with between 2.3 and 2.9 billion people expected to remain without access based on current trends
- To address this, organizations should prioritize working with countries that have large populations without access and have not made significant progress to reducing them over the past few years, such as Bangladesh, China, Ethiopia, India, Nigeria and Pakistan

Description

Data Source

- The following data were gathered from ESMAP's Tracking SDG 7 database ([download link](#)) with data available between for 2000, 2010, 2015 and 2018
 - Number of people without access to clean fuels and technologies for cooking per country
 - Total access rate to clean cooking per country

Projections

- Interpolation calculations were made via the following process
 - The rate of change of the number of people without access to clean cooking (Compound Annual Growth Rate, CAGR) between 2010 and 2015 was calculated for each individual country
 - Each country's number of people without access to clean cooking in 2010 was projected forward for each year between 2010 and 2015 using the calculated CAGR as the growth rate
 - The projected data were then summed up according to each country's regional classification
- Straight-line extrapolation projections were made via the following process
 - The average change made between 2015 and 2018 was calculated for each individual country
 - Each country's 2018 population without access to clean cooking was projected forwards to 2030 (by 12 years) by adding the calculated average change to the 2018 population 12 times
 - 0 was set as a minimum to prevent the unconnected population from being negative
 - The projected data was then summed up according to each country's regional classification
- IEA stated policy scenario was taken from the IEA's *World Energy Outlook 2019* report

Definition of clean cooking access

Clean cooking access is defined as a household using clean fuels or improved technologies for cooking as defined by the WHO¹

Clean fuels for cooking



Clean fuels recommended by WHO¹ are

- LPG
- Ethanol
- Biogas
- Solar cookers
- Electricity

Improved technologies for cooking



Emissions rates for improved technologies are defined by the WHO¹ and should be less than

- 0.23mg/min (unvented) and 0.8mg/min (vented) of PM_{2.5}²
- 0.16g/min (unvented) and 0.59g.min (vented) of CO

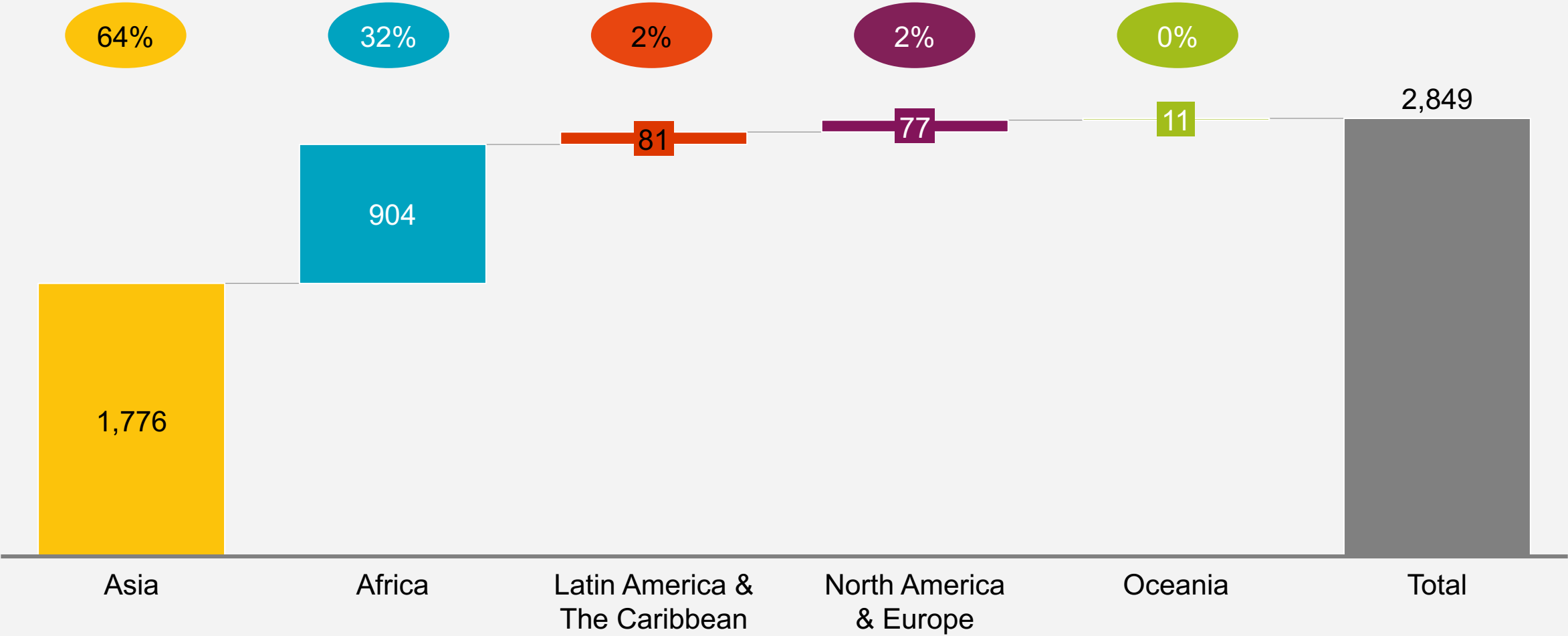
¹ In the Normative guidance World Health Organization guidelines for indoor air quality: household fuel combustion

² Atmospheric Particulate Matter with diameter less than 2.5 micrometers

There are ~2.8 billion people in the world without access to clean fuels and technologies for cooking

Population without access to clean fuels and technologies for cooking¹, millions, 2018

(x) % of total



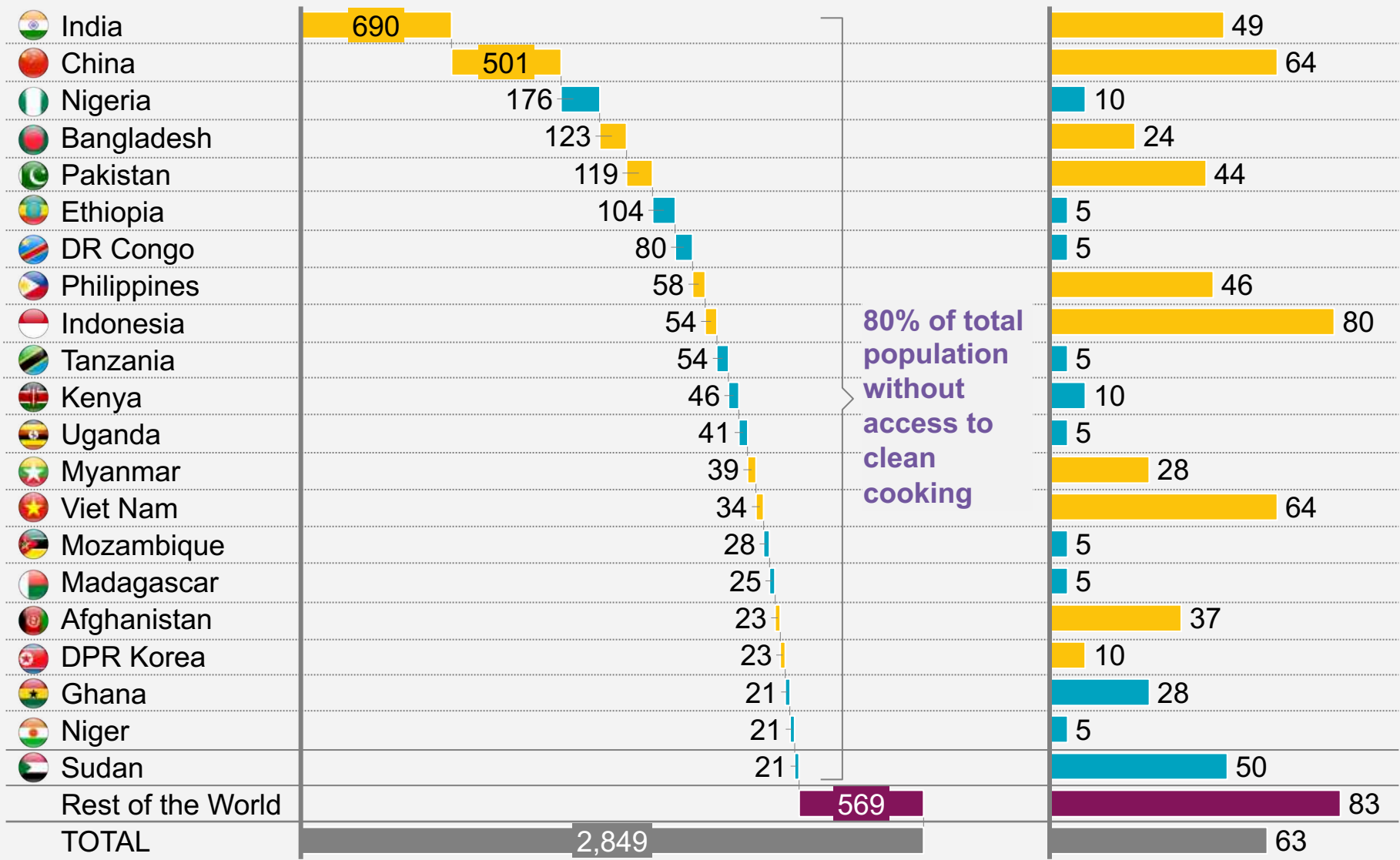
¹ Clean cooking access is defined as a household using clean fuels or improved technologies for cooking as defined by the WHO
SOURCE: ESMAP Tracking SDG7 Database, 2020



21 countries make up 80% of the access to clean cooking challenge

Population without access to clean cooking, millions, 2018

Access rate, %, 2018



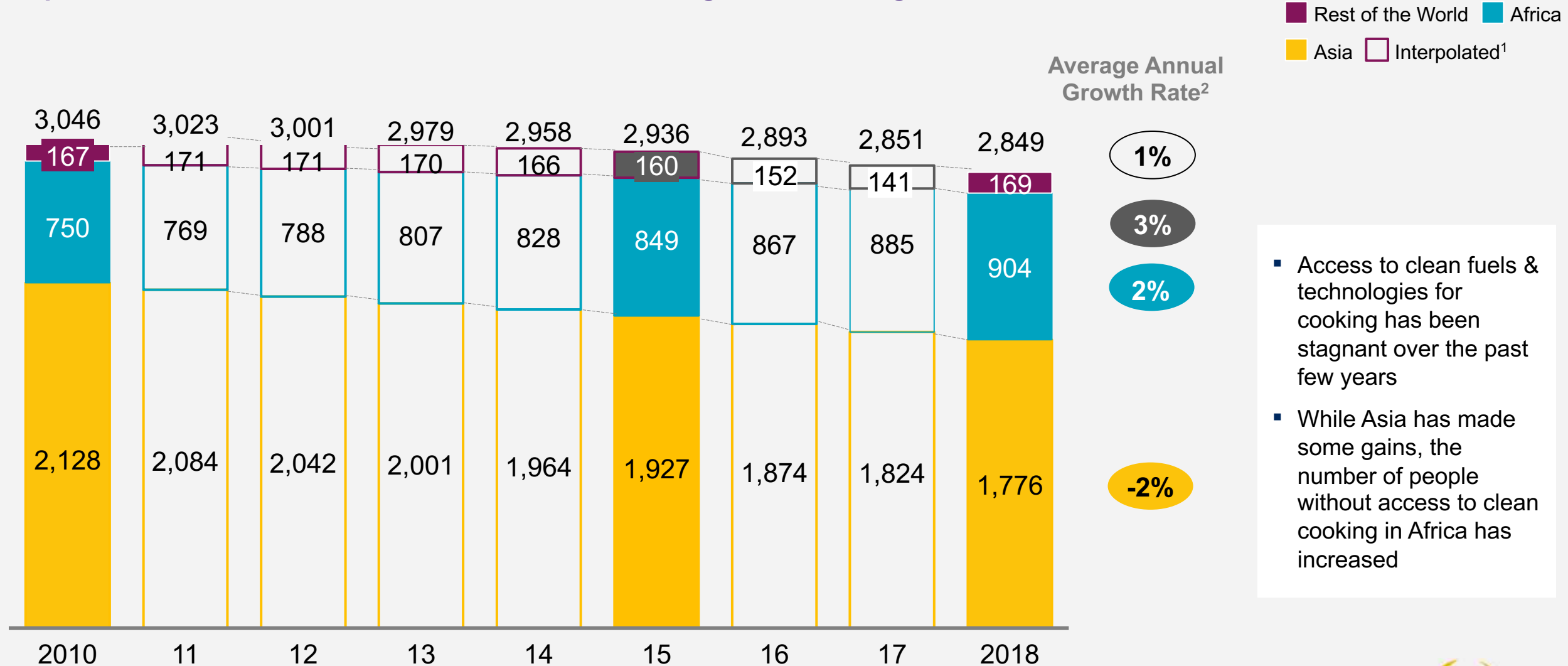
- 21 countries account for 80% of the clean cooking challenge with 10 in Asia and 11 in Africa
 - The situation is dire in the African countries as only 2 of the 11 countries that are part of the top 80% have access rates over 10%
 - The Asian countries in the top 21 mostly have higher access rates than their African counterparts, however, there is still significant room for improvement

SOURCE: ESMAP Tracking SDG7 Database, 2020



The number of people without access to clean fuels and technologies for cooking has declined slightly from 3.0 billion in 2010 to 2.8 billion in 2018

Population without access to clean fuels and technologies for cooking¹, millions, 2018



- Access to clean fuels & technologies for cooking has been stagnant over the past few years
- While Asia has made some gains, the number of people without access to clean cooking in Africa has increased

¹ Data unavailable for 2011 to 2015 and so was interpolated;
SOURCE: ESMAP Tracking SDG7 Database, 2020

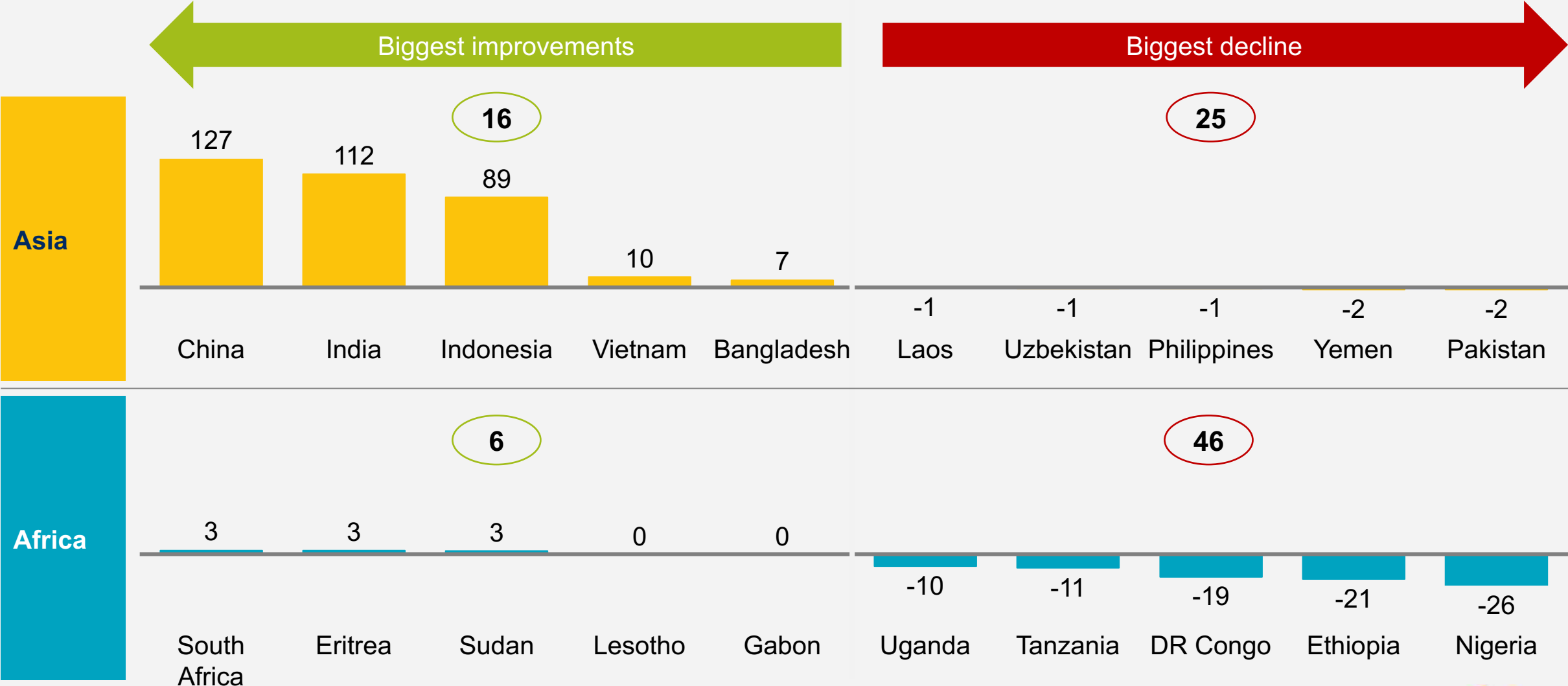
² Compound annual growth rate: The average annual growth rate



A larger number of Asian and African countries suffered declines between 2010 and 2018

- x Number of countries with improvements
- x Number of countries with decline

Reduction in population without access to clean cooking between 2010 and 2018, millions



NOTE: These figures represent the absolute change in the number of people without access to clean cooking solutions between 2010 and 2018 and do not account for changes in the population due to birth rates, human migration etc.

SOURCE: ESMAP Tracking SDG7 Database, 2020

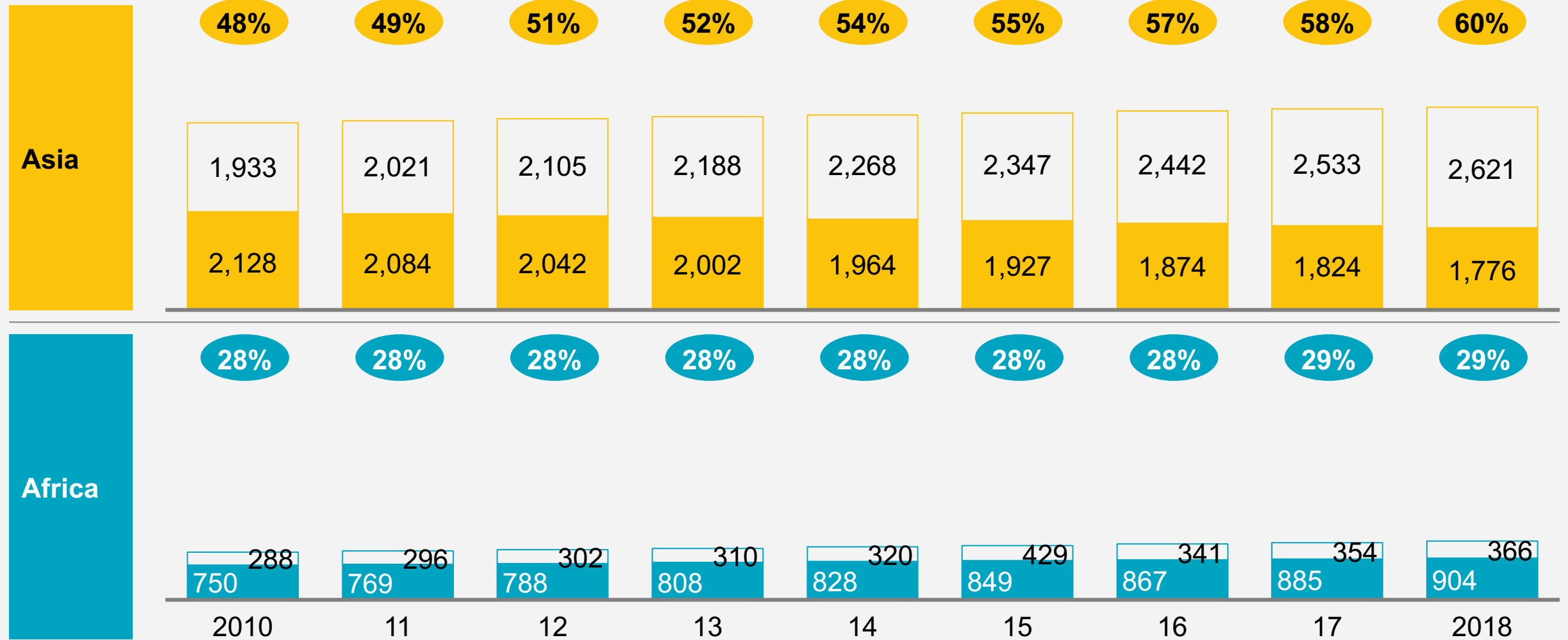


In Africa, the population growth has outmatched gains in the population with access to clean cooking

x% Clean cooking access rate

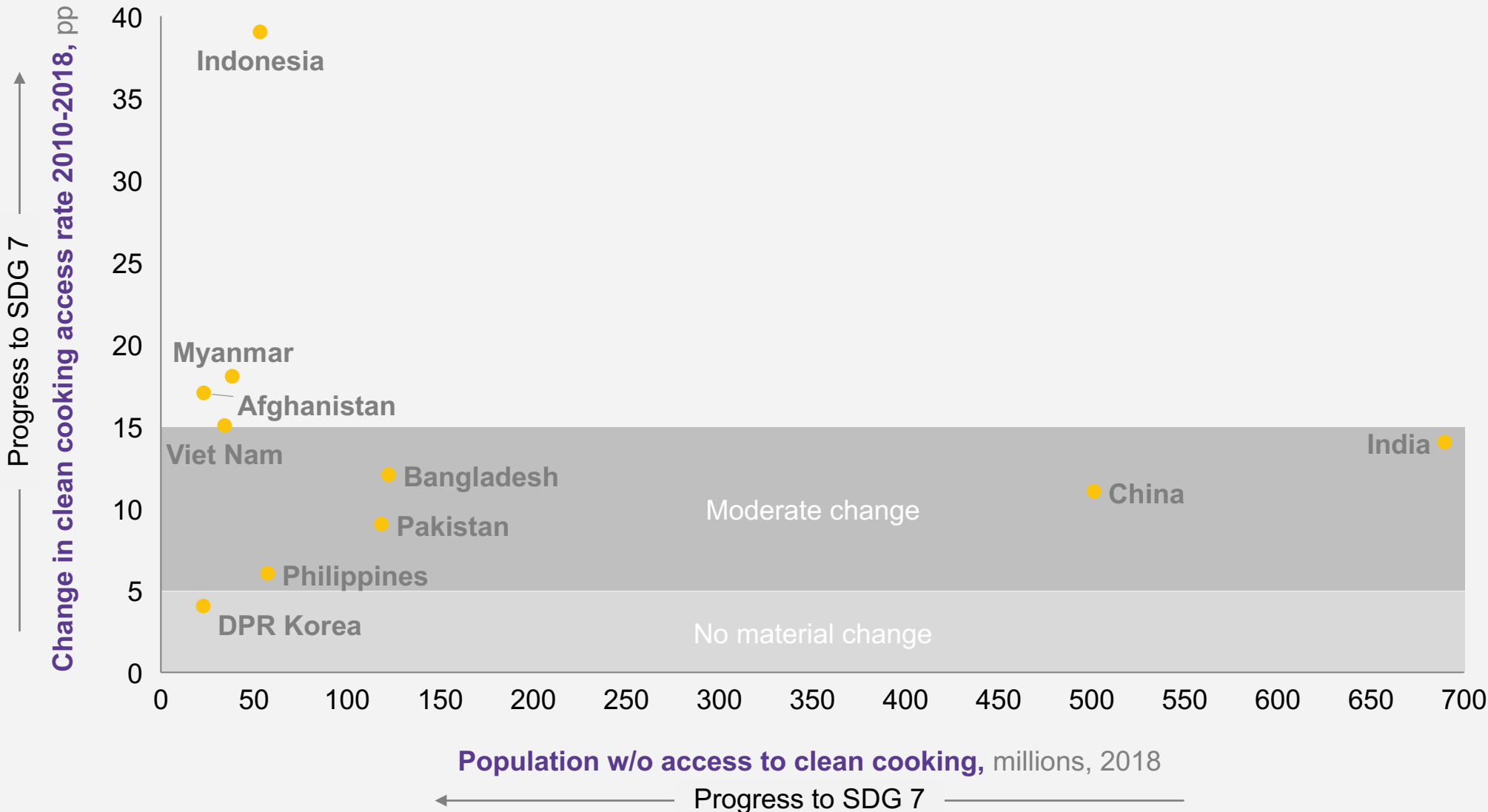
Population, millions

□ Population with access to clean cooking ■ Population w/o access to clean cooking



Clean cooking: Deep dive on Asia

Population without access to clean cooking vs change in clean cooking access rates (Asian countries), 2018

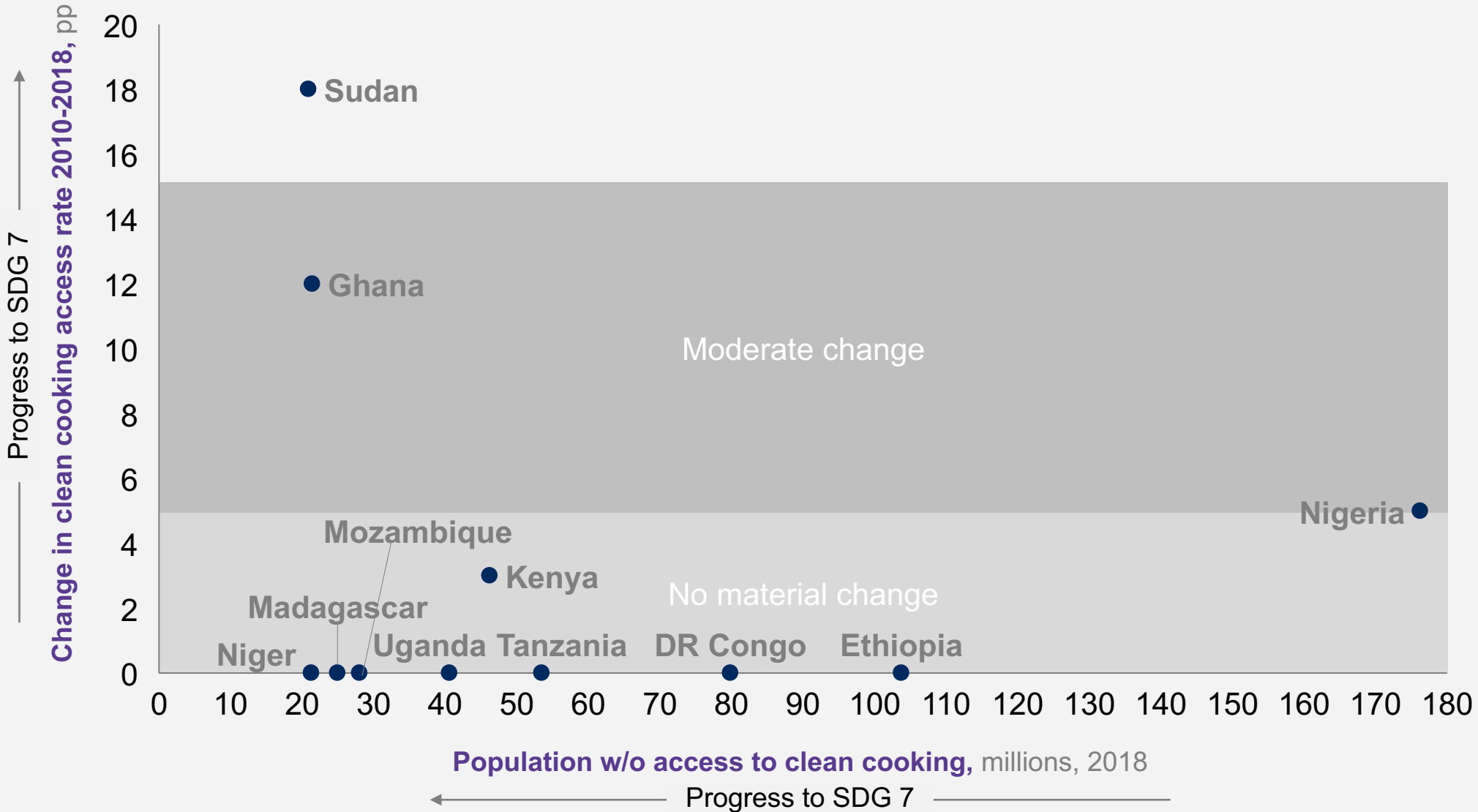


● In top 21 countries

- Four Asian countries significantly improved their clean cooking access rates (>15p.p.) between 2010 and 2018; Indonesia, Myanmar, Afghanistan and Vietnam
- Four others still have significant populations (>100 million) without access to clean cooking; Bangladesh, China, India and Pakistan

Clean cooking: Deep dive on Africa

Population without access to clean cooking vs change in clean cooking access rates (African countries), 2018



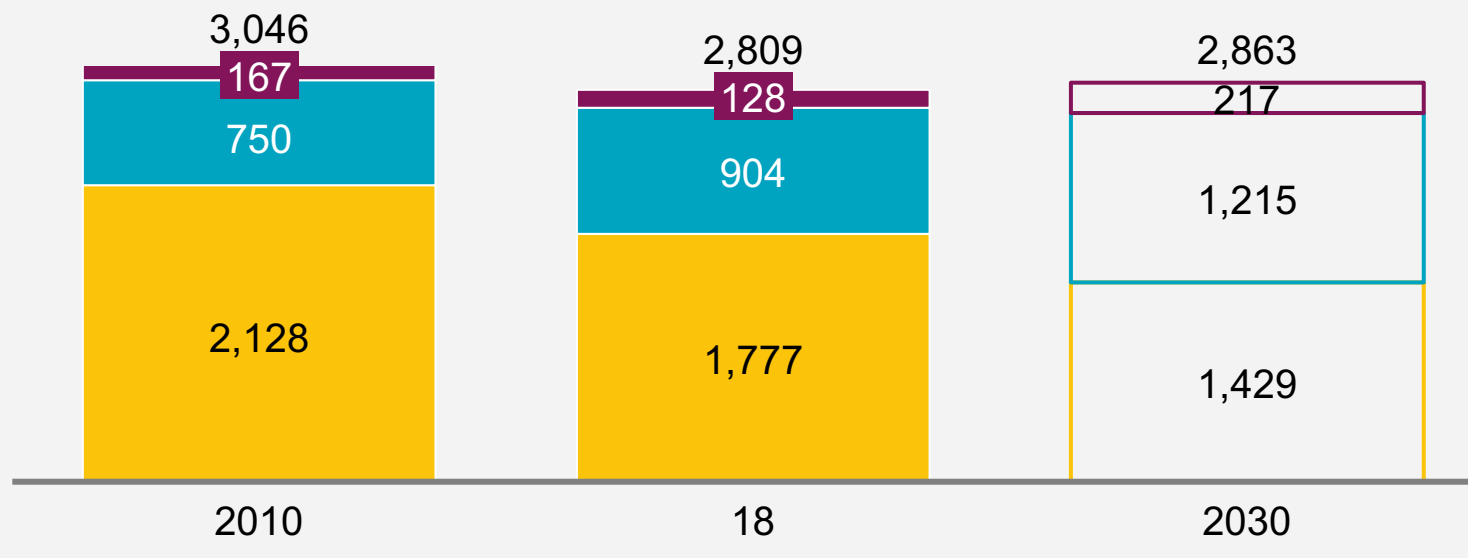
- Only Sudan amongst African countries significantly improved its clean cooking access rate (>15p.p.) between 2010 and 2018
- Two others still have significant populations (>100 million) without access to clean cooking: Ethiopia and Nigeria

Projections show that we are not on track to reach universal access to clean cooking by 2030

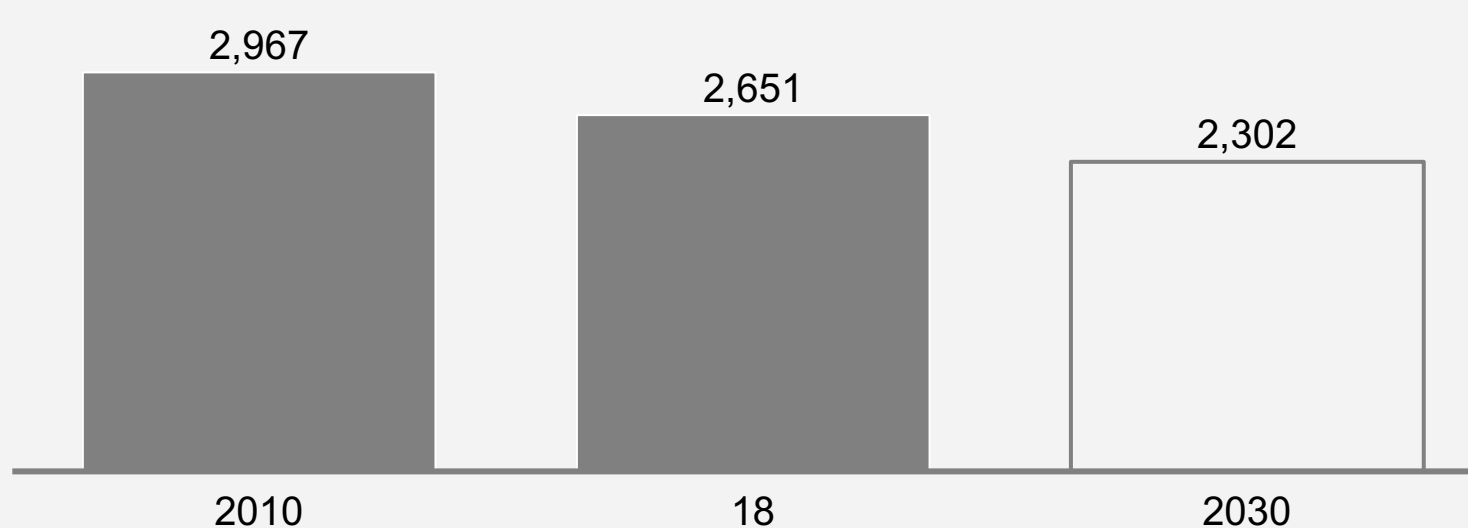
Number of people without access to clean cooking, millions, 2018

□ Forecast ■ Rest of world ■ Africa ■ Asia

Straight line extrapolation



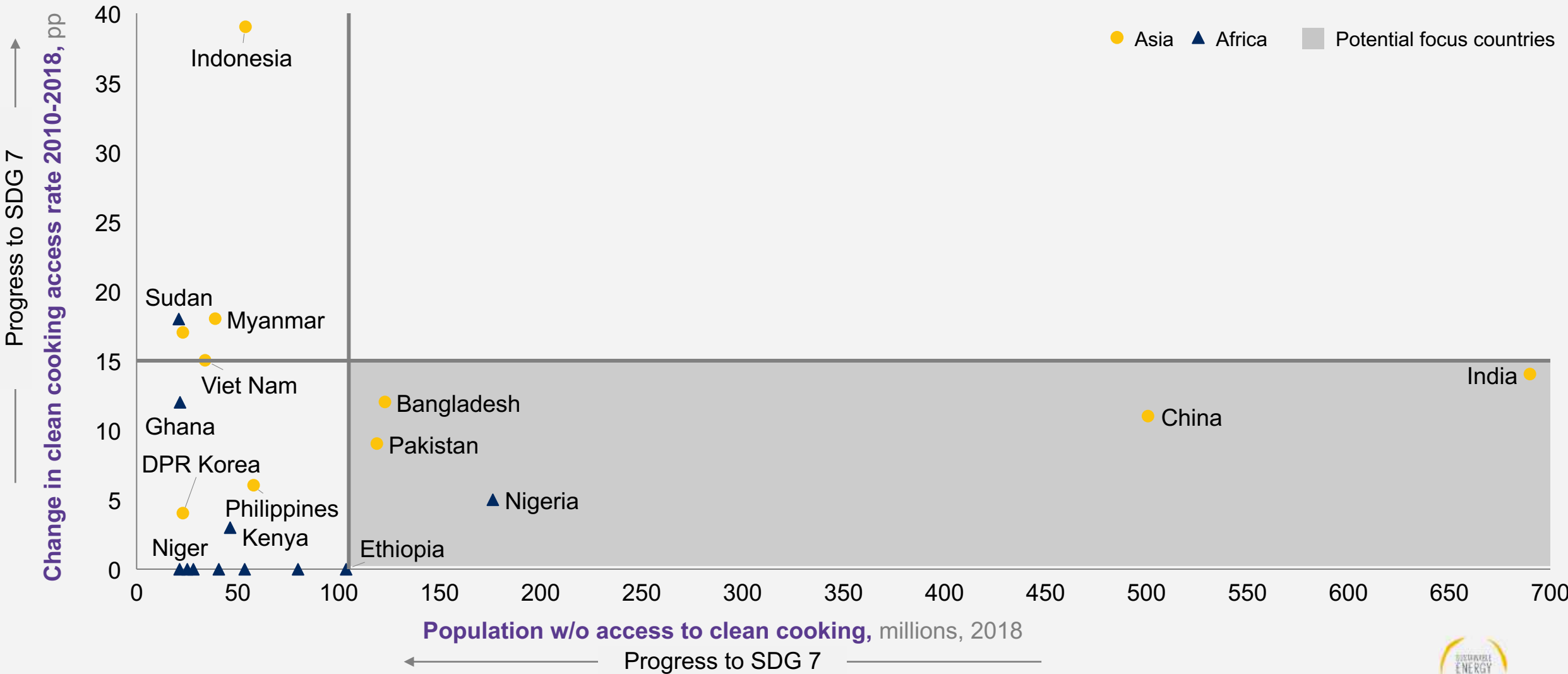
IEA Stated Policies Scenario, 2019



- We are not on track to achieve universal access to clean fuels and technologies for cooking at the current pace
 - It is expected that the population without access to clean cooking in Asia will decrease by 2030
 - It is expected that in Africa, the population without access to clean cooking will increase
 - The magnitude of the challenge will remain large and should be a priority going forward

Organizations should focus on countries with large populations without access to clean cooking and slow progress

Population without access to clean cooking vs change in clean cooking access rates (Top 21 countries), 2018



SOURCE: ESMAP Tracking SDG7 Database, 2020



Executive summary

SDG7.1.1: Electricity access

SDG7.1.2: Clean cooking access

SDG7.2: Share of renewables in the energy mix

SDG7.3: Energy efficiency

SDG 7.2 Share of renewable energy

The current share of renewables, including the use of traditional biomass, in total energy consumption is 17.3 percent

The current share of *modern* renewables in total energy consumption is 10.5 percent

- Africa has the highest share of renewables overall at 54.4 percent, but this includes only 1.8 percent modern renewables
- North America and Europe have the least share of renewables at 12.5 percent, but with 7.8 percent modern renewables

Looking back, we see that the share of *modern* renewables in the energy mix increased from 8.6 percent in 2010 to 10.5 percent in 2017

- The share of all renewables, including traditional biomass, increased from 16.3 percent in 2010 to 17.3 percent in 2017

Looking forward, based on current trends, more can be done to achieve a substantial increase in the share of renewables in the energy mix by 2030

- Projections show that the share of renewables in the energy mix is increasing to between 19.3 percent and 22 percent by 2030 and we expect to see an escalation by 2050
- To ensure we get on track, the unelectrified populations should be connected with clean renewable energy
- As the use of traditional biomass decreases, modern renewables will need to expand more quickly to reach the 7.2 target

Description

Data Source

- The following data were gathered from ESMAP's Tracking SDG 7 database ([download link](#)) with data available between 2000 and 2017
 - The total share of renewables in the energy mix in the world between 2010 and 2017
 - The total share of renewables in the energy mix per country and per region in 2010 and 2017
 - The share of solid biofuels in the energy mix per country and per region in 2017
- The following data were gathered from the *Tracking SDG7 2020* report
 - The share of modern renewables in the energy mix in the world for 2010, 2016 and 2017
- The following data were gathered from Enerdata's Global Statistical Yearbook ([link](#)) with data between 2000 and 2017
 - The total energy consumption per country
- The following data were gathered from the IEA's *World Energy Outlook 2019* report ([link](#)) with data for 2010 and 2017
 - Final energy consumption for the world in 2010 and 2017

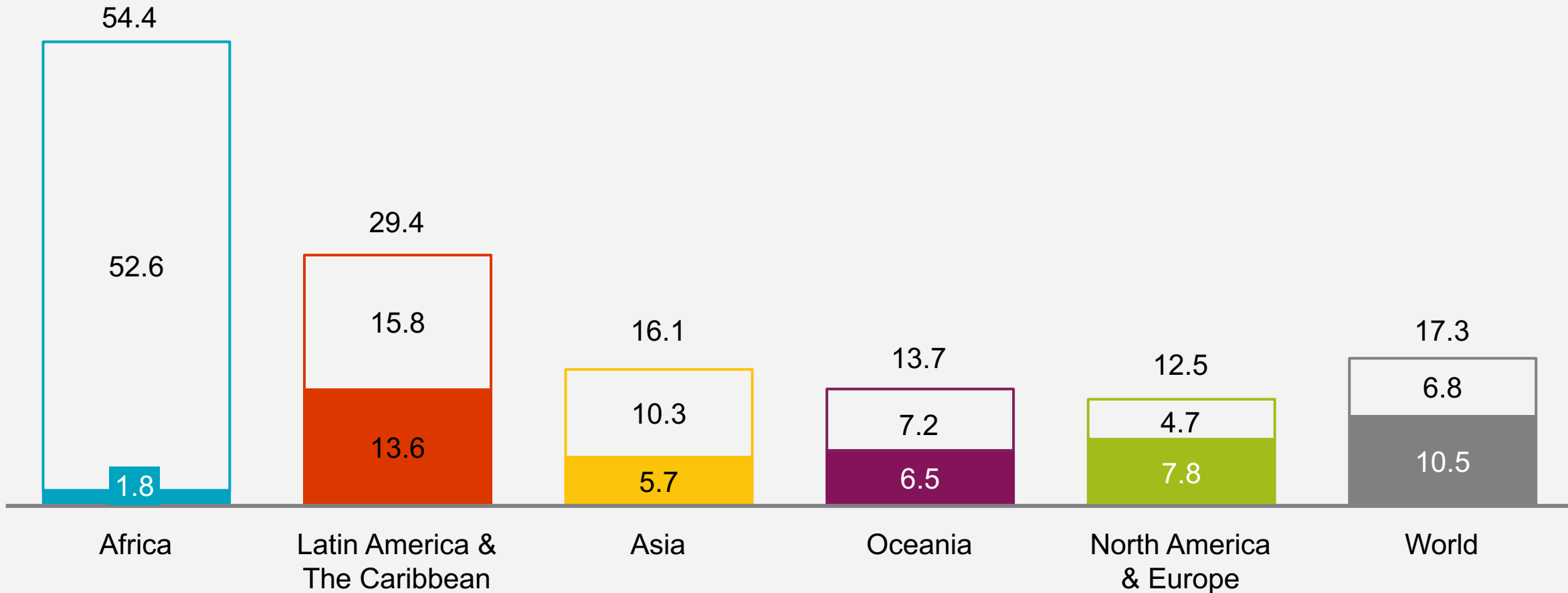
Projections

- Straight-line extrapolation projections were made via the following process
 - The rate of change of the share of renewables in final energy consumption (Compound Annual Growth Rate, CAGR) between 2010 and 2017 was calculated at a global level
 - The share of renewables in energy mix was projected forward to 2030 (by 13 years) using the calculated CAGR as the growth rate
- IEA stated policies scenario was taken from the IEA's *World Energy Outlook 2019* report
- McKinsey Global Energy Perspective was taken from McKinsey's *Global Energy Perspective 2019* report

Today, the share of renewables in the energy consumption is 17.3%

Share of renewables in energy consumption, %, 2017

□ Solid Biofuels ■ Other renewables



NOTE: We use solid biofuels instead of Traditional uses of biomass. Although “traditional uses of biomass” refers to the residential consumption of primary solid biofuels and charcoal in non-OECD countries, the current dataset does not distinguish such usage. Hence we only distinguish solid biofuel share in final energy consumption.

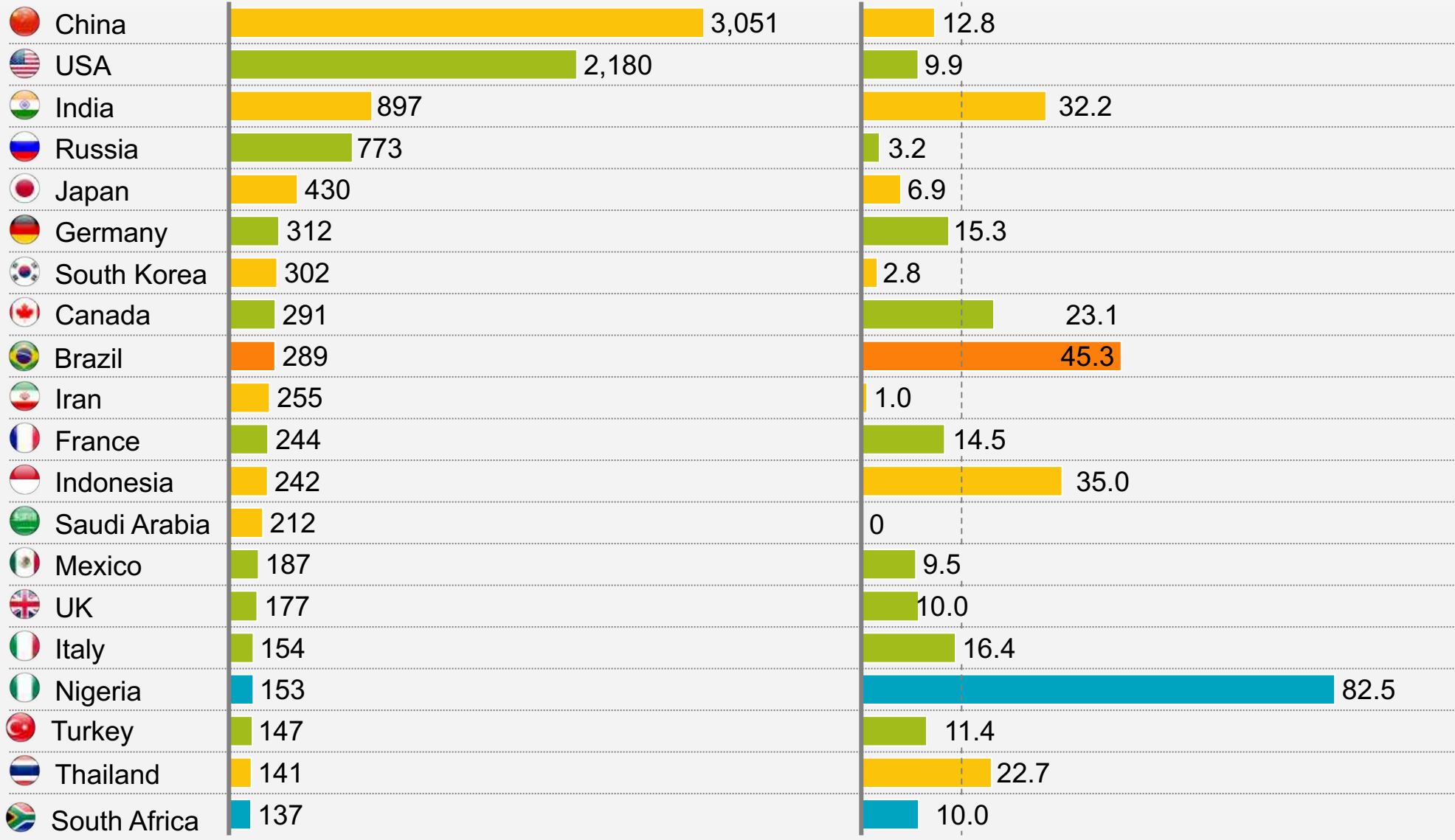
SOURCE: ESMAP Tracking SDG7 Database, 2020



The countries driving this are those that form the bulk of energy consumption

Energy consumption, Mtoe, 2017

Share of renewables, %, 2017



- Africa
- Asia
- Oceania
- North America & Europe
- Latin America & The Caribbean

These 20 countries form the bulk (75%) of energy consumption in the world

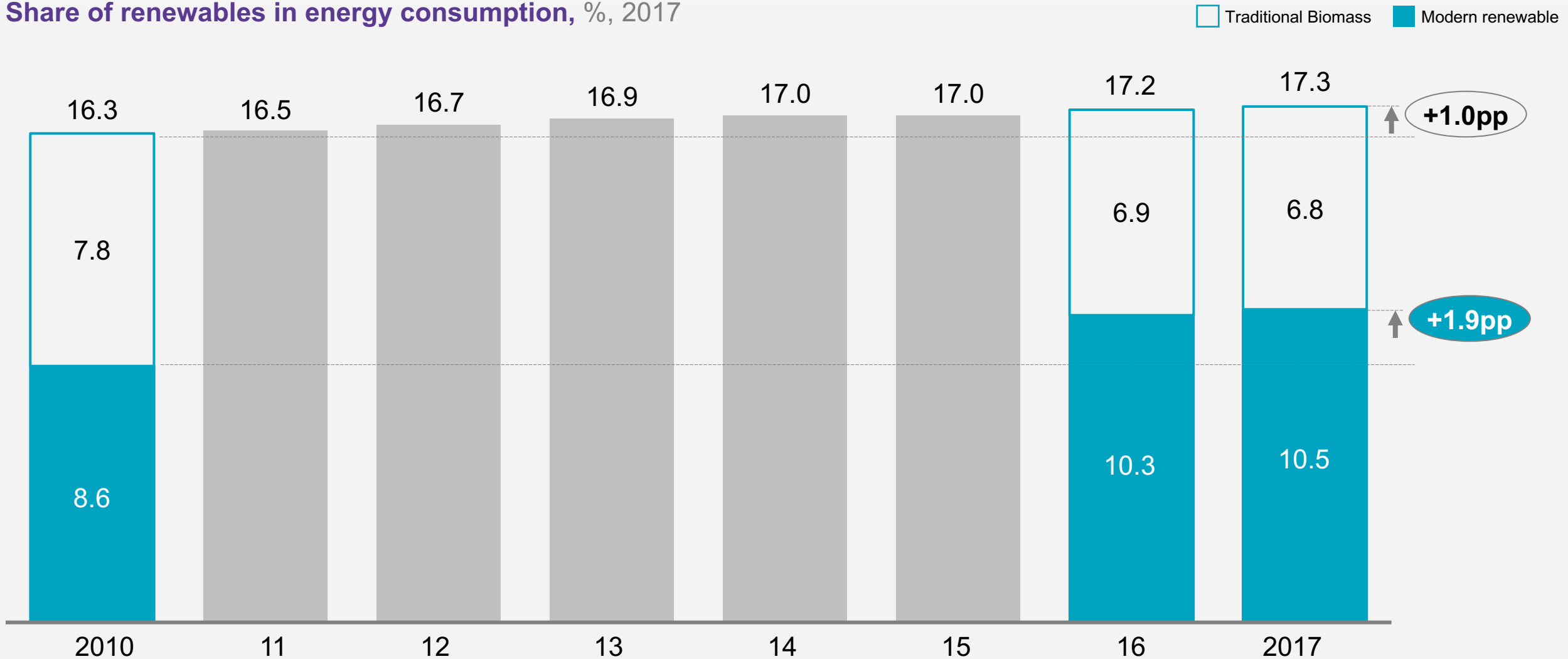
SOURCE: ESMAP Tracking SDG7 Database, 2020

World: 17.3



There has been a ~1.0 pp improvement in the share of renewables of total energy consumed since 2010 and a 1.9 pp improvement in the share of modern renewables...

Share of renewables in energy consumption, %, 2017



NOTE: "traditional uses of biomass" refers to the residential consumption of primary solid biofuels and charcoal in non-OECD countries.

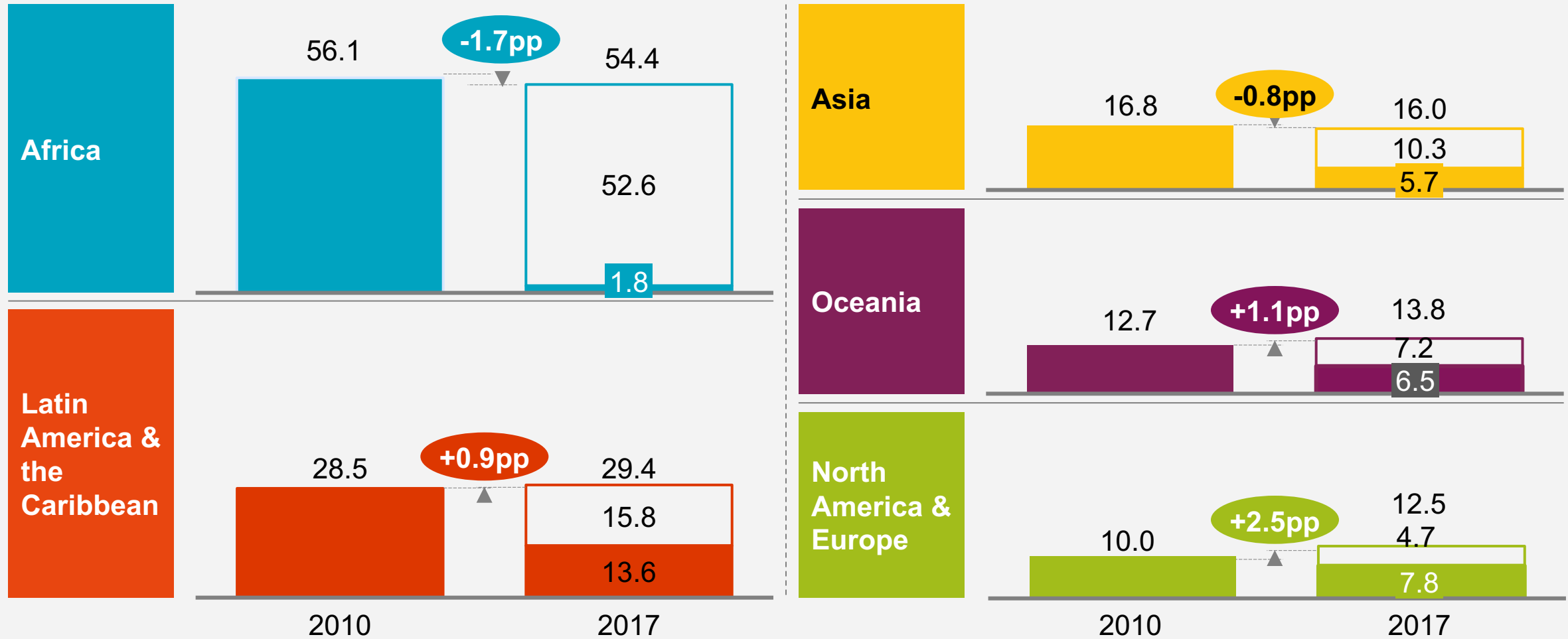
SOURCE: ESMAP Tracking SDG7 Database, 2020 and Tracking SDG& Report 2020



...with North America & Europe leading the improvements

Share of renewables in energy consumption, %

□ Solid Biofuel ■ Other renewables



NOTE: We use solid biofuels instead of “traditional uses of biomass.” Although “traditional uses of biomass” refers to the residential consumption of primary solid biofuels and charcoal in non-OECD countries, the current dataset does not distinguish such usage. In addition, the current dataset only shows total renewable share in 2010. Hence we only distinguish solid biofuel share in final energy consumption in 2017.

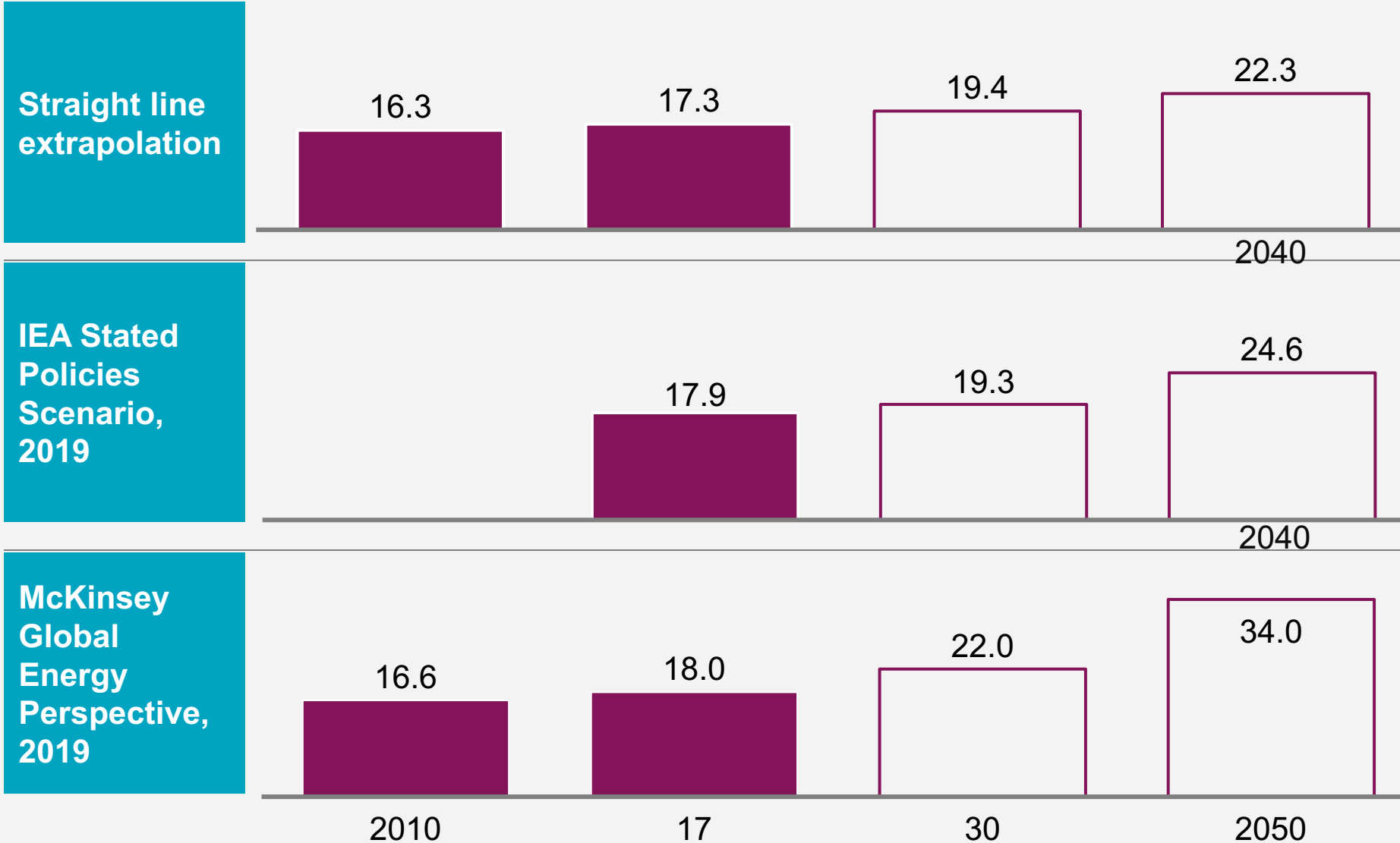
SOURCE: ESMAP Tracking SDG7 Database, 2020



Projections show that we could see moderate gains to 2030 and an escalation by 2040 and 2050

Share of renewables in energy consumption, %

□ Trend



- There is no quantitative target for SDG7.2
- Progress has been made towards improved share in renewables in energy consumption between 2010 and 2017 as renewables have become more economically competitive
- To ensure progress is sustained, most of the unconnected population should be connected to electricity via clean renewable energy

Executive summary

SDG7.1.1: Electricity access

SDG7.1.2: Clean cooking access

SDG7.2: Share of renewables in the energy mix

SDG7.3: Energy efficiency

SDG7.3 Energy efficiency

It currently takes 5.0 MJ (megajoules) of energy to generate USD 1 of economic activity

- Africa is the least efficient region with 5.7 MJ/USD GDP while Latin America & the Caribbean is the most efficient region with 3.7 MJ/USD GDP
- Half of the top 20 energy consuming countries are more efficient than the world average, with Italy, Turkey and the United Kingdom leading the way

Looking back, we see that energy intensity decreased from 5.9 MJ/USD GDP in 2010 to 5.0 MJ/USD GDP in 2017, corresponding to an average rate of improvement of 2.2 percent

Looking forward, based on current trends, an energy intensity improvement rate of at least 3 percent per year from now through to 2030 will be necessary to achieve SDG7.3

- Current data show that the average rate of improvement in energy intensity is less than the originally required 2.6 percent. To achieve SDG7.3, at least a 3 percent increase in energy efficiency will be necessary from now through 2030
- To ensure we get on track, organizations should prioritize and invest in efficiency, incentivize consumers to be more energy efficient and explore ways for industry to increase its energy efficiency

Description

Data Source

- The following data were gathered from ESMAP's Tracking SDG 7 database ([download link](#)) with data available between 1990 and 2017
 - Energy intensity of GDP per country
- The following data were gathered from Enerdata's Global Statistical Yearbook ([link](#)) with data between 1990 and 2018
 - Energy intensity of each segment in Europe
 - Share of total energy consumption by segment in Europe
- The following data were gathered from the IEA's *World Energy Outlook 2019* report ([link](#)) with data for 2010 and 2018
 - Sources and uses of energy for consumption

Derived values

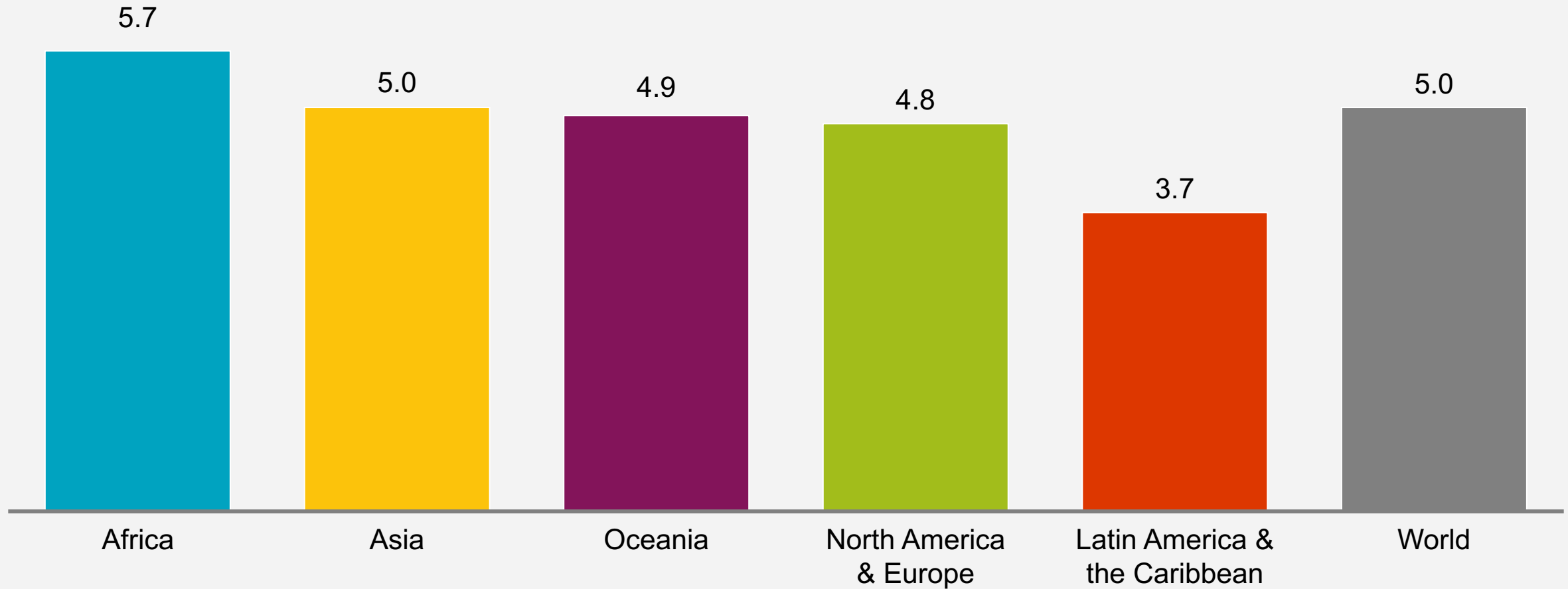
- The total energy intensity per region was calculated as follows
 - A weighted average of the energy intensities of all the countries in the region was calculated using the energy consumption of the country as the weight

Projections

- The straight-line extrapolation projection was made via the following process
 - The rate of change of the energy intensity of GDP (Compound Annual Growth Rate, CAGR) between 2010 and 2017 was calculated at a global level
 - The energy intensity of GDP was projected forward to 2030 (by 13 years) using the calculated CAGR as the growth rate
- IEA stated policies scenario, 2019 was taken from the IEA's *World Energy Outlook 2019* report
- McKinsey *Global Energy Perspective, 2019* was taken from McKinsey's *Global Energy Perspective 2019* report

Today, it takes 5.0 MJ of energy to generate USD 1 of economic activity

Energy intensity, MJ/USD 2011 ppp¹, 2017



¹ Unit is in megajoules per US dollar of GDP at 2011 purchasing power parity

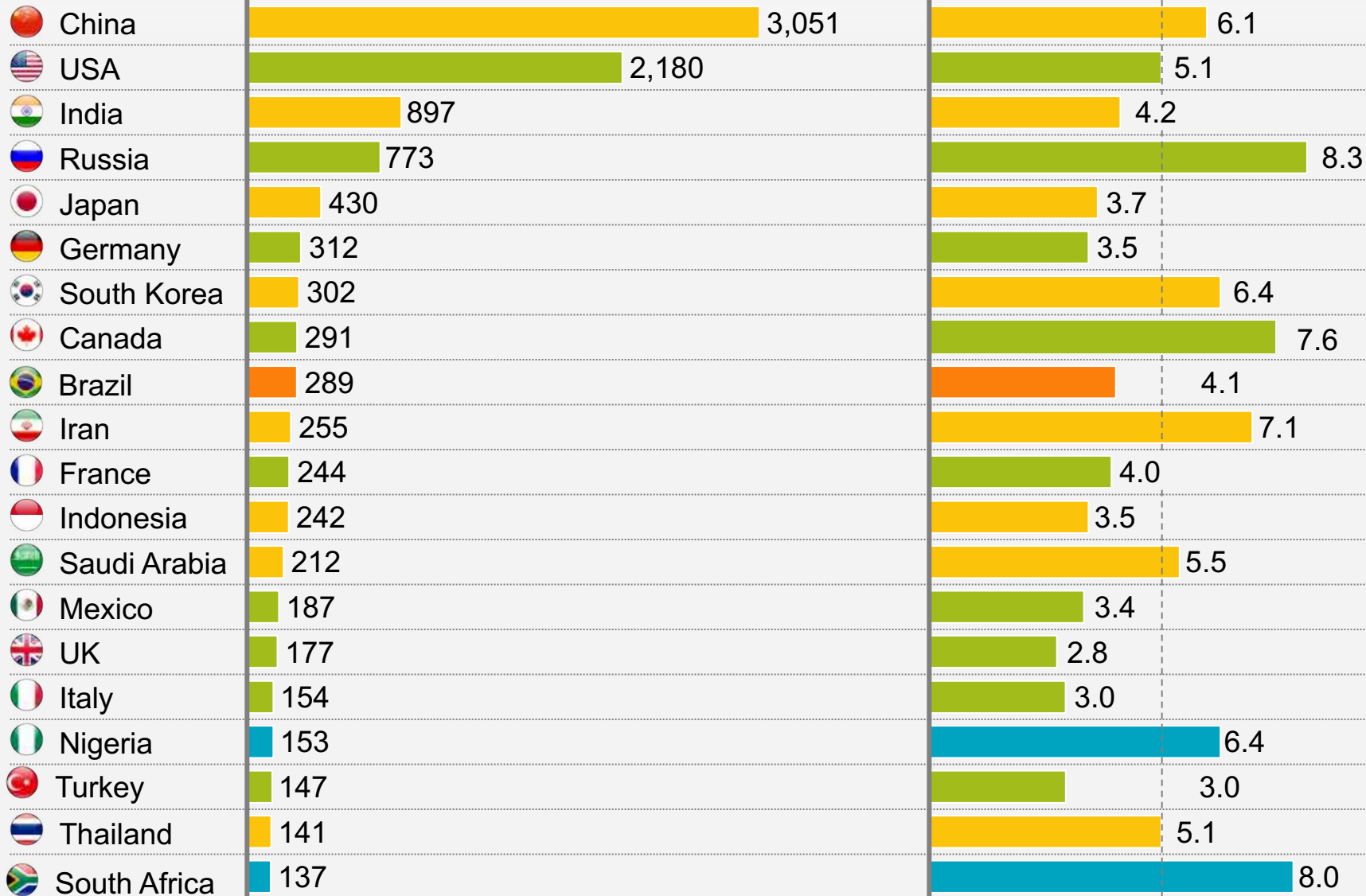
SOURCE: ESMAP Tracking SDG7 Database, 2020



The countries driving this are those that form the bulk of energy consumption

Energy consumption, Mtoe¹, 2017

Energy intensity, MJ/USD, 2017



- Africa
- Asia
- Oceania
- North America & Europe
- Latin America & The Caribbean

These 20 countries form the bulk (75%) of energy consumption in the world

¹ Mega tonne of oil equivalent

SOURCE: ESMAP Tracking SDG7 Database, 2020; Enerdata 's Global Statistical Yearbook

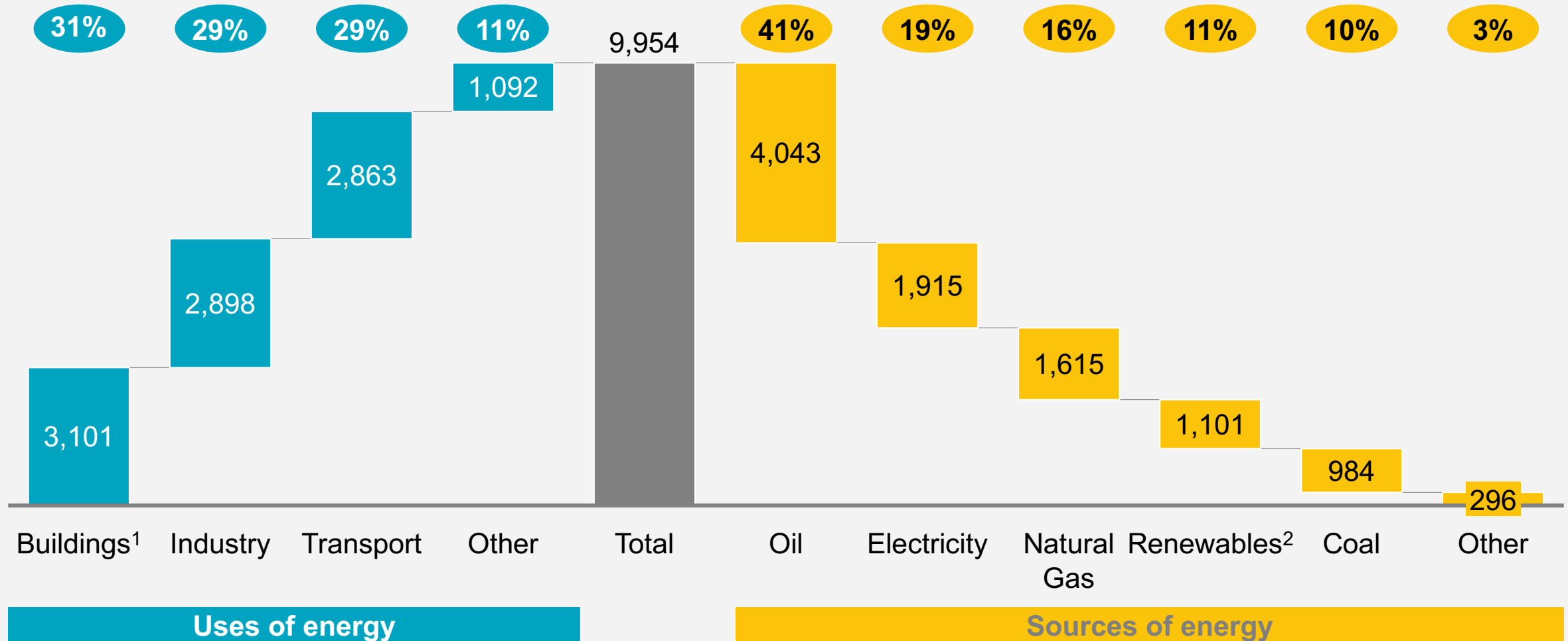
World: 5.0



Energy is mainly used in buildings, industry and transport with oil as the dominant source

Sources and uses of energy for consumption, Mtoe, 2018

x% Share of total energy consumption



¹ Both residential and services; ² Includes biomass

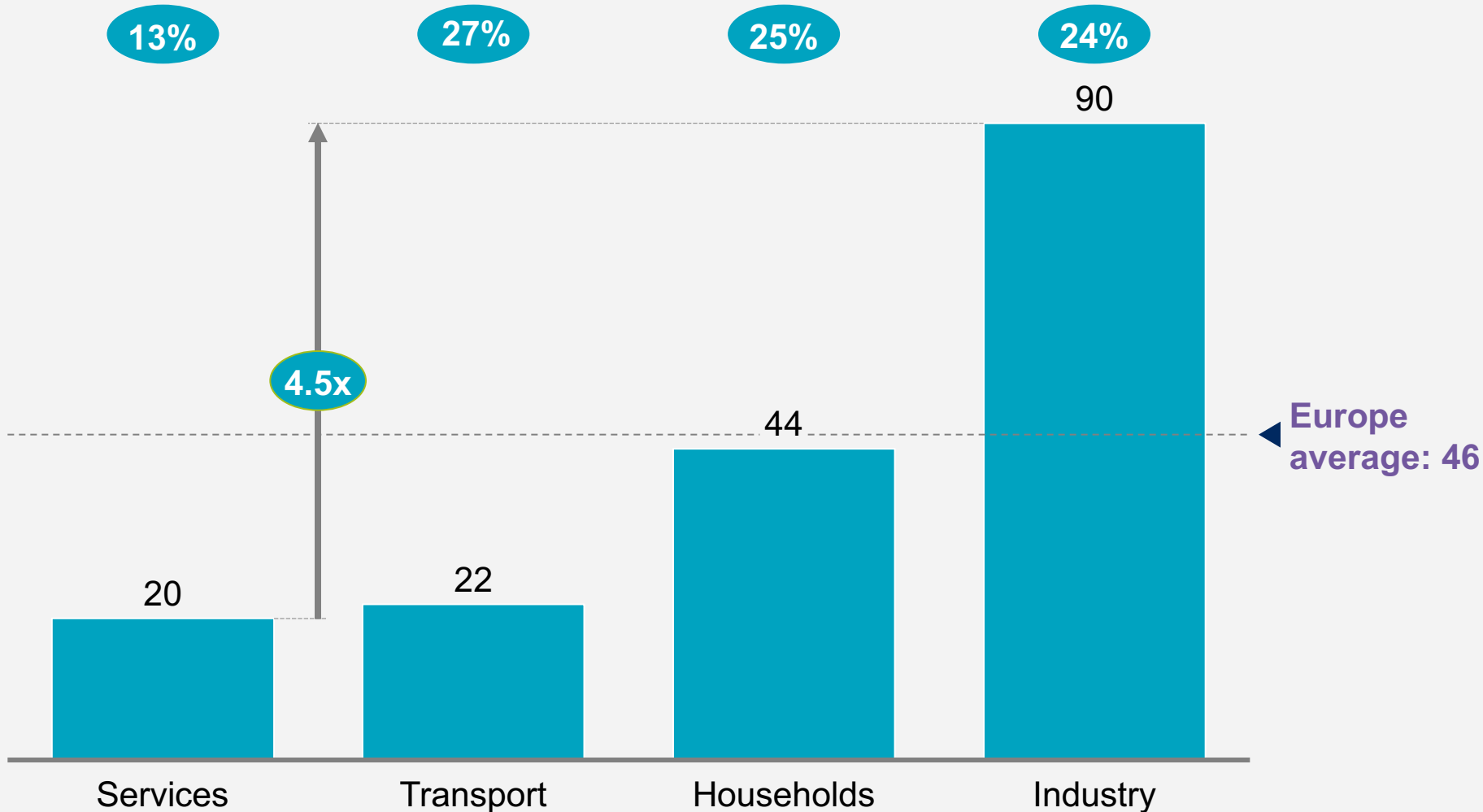
SOURCE: IEA World Energy Outlook, 2019



Energy intensity can be reduced through improved energy efficiency, particularly in industry and among households

Energy intensity of different economic segments in Europe¹, to per million \$ 2005, 2013

x% Share of total energy consumption

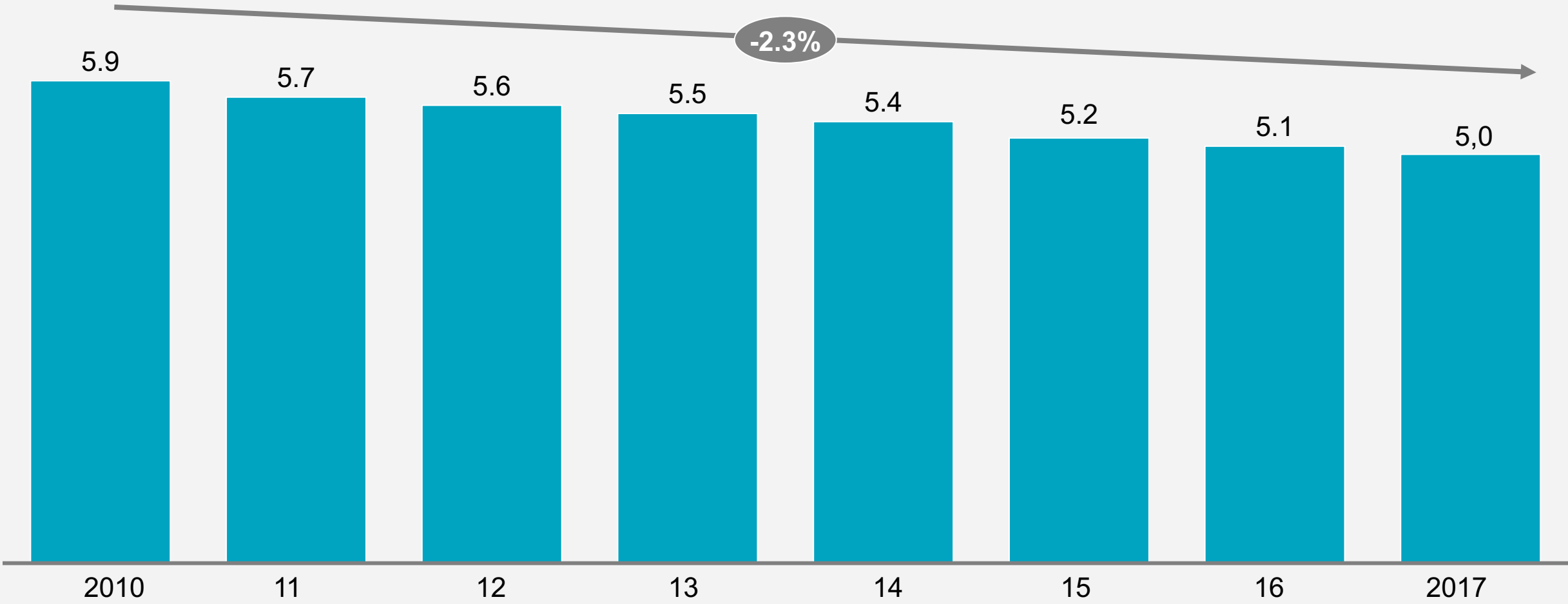


- Energy intensity can be reduced by
 - Transitioning from an industry-based economy to a services-based economy which is ~4.5x more energy efficient
 - Technological advancements especially in industrial and household segments
 - Incentivizing users to be more energy efficient by increasing the cost of energy

¹ Weighted average of 30 european countries
SOURCE: Enerdata; Eurostat; McKinsey Global Institute

There has been a ~1MJ/\$ improvement in energy efficiency over the past few years

Energy intensity, MJ/USD 2011 ppp, 2017



SOURCE: ESMAP Tracking SDG7 Database, 2020

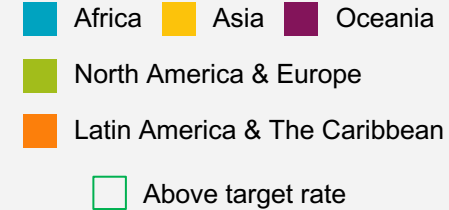
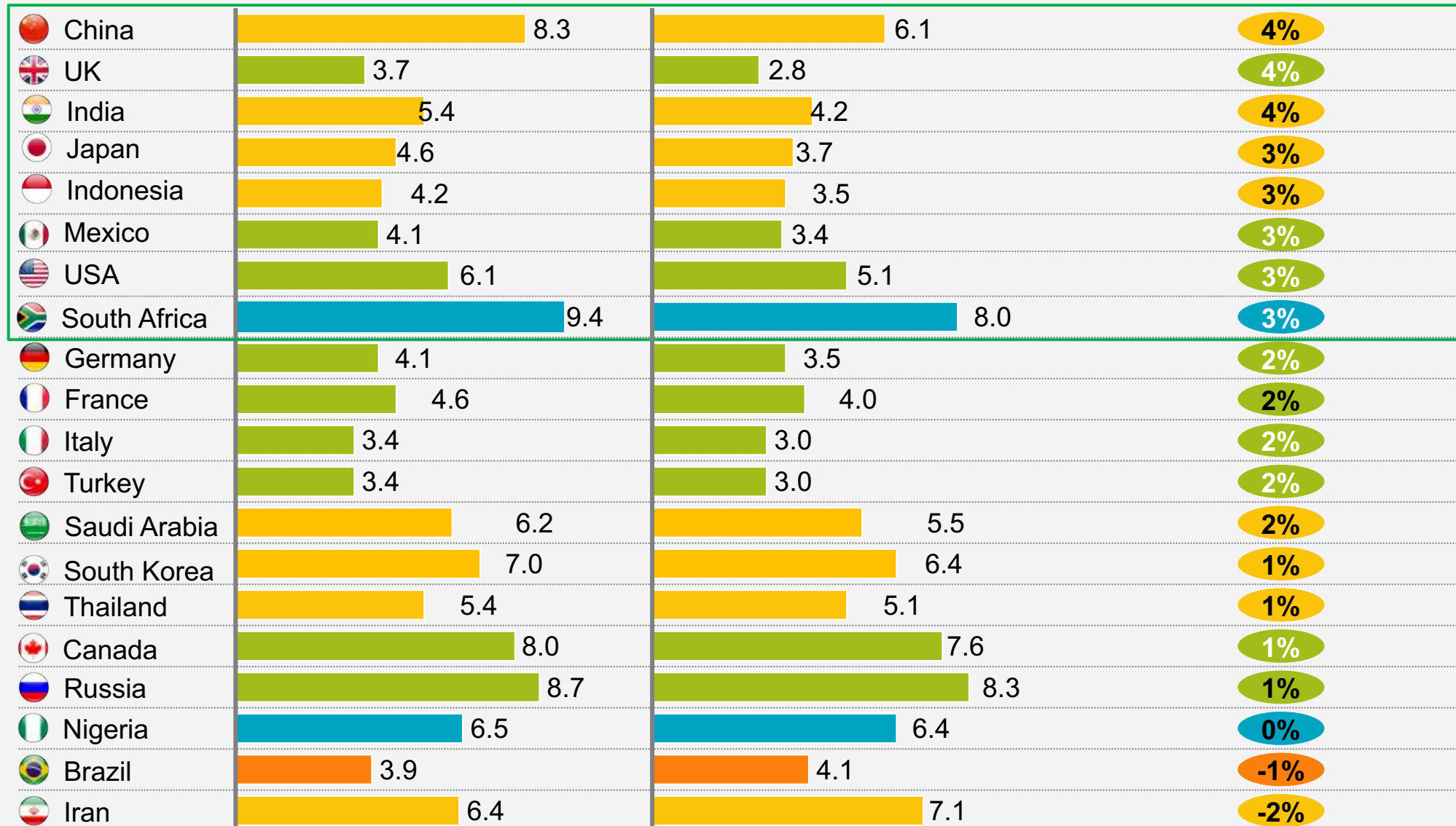


The countries driving this are those that form the bulk of energy consumption

Energy intensity, MJ/USD, 2010

Energy intensity, MJ/USD, 2017

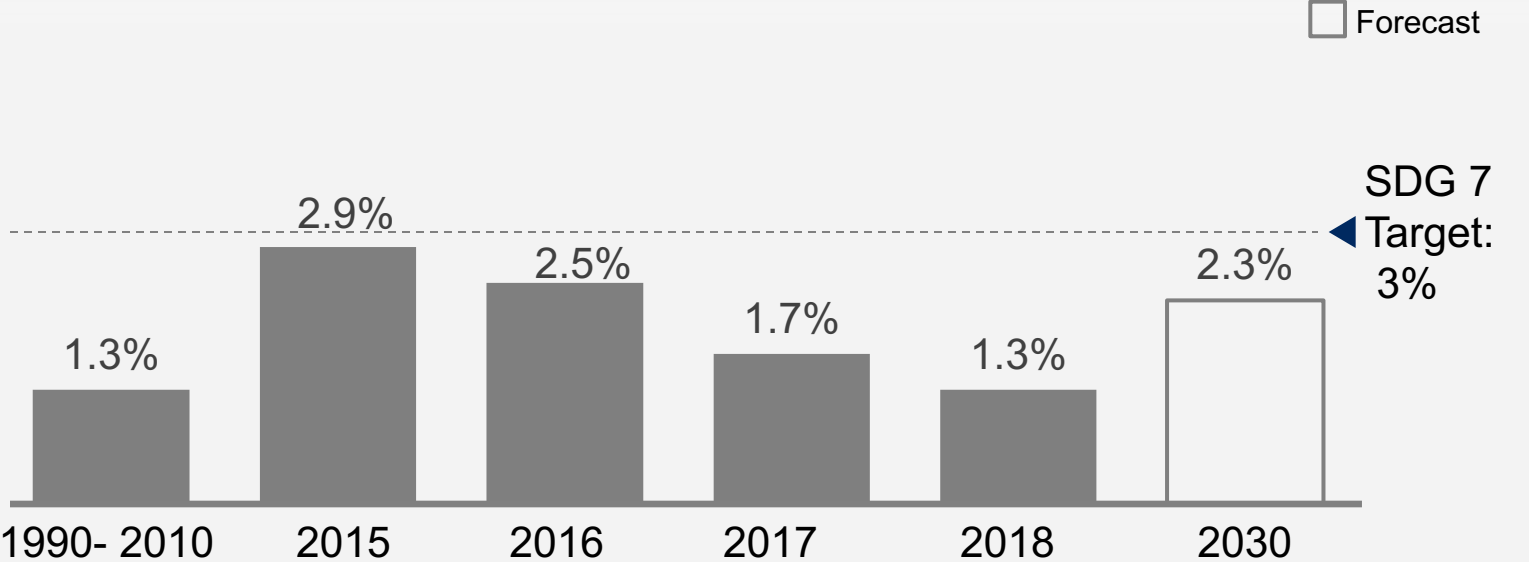
2010 – 2017 improvement, CAGR



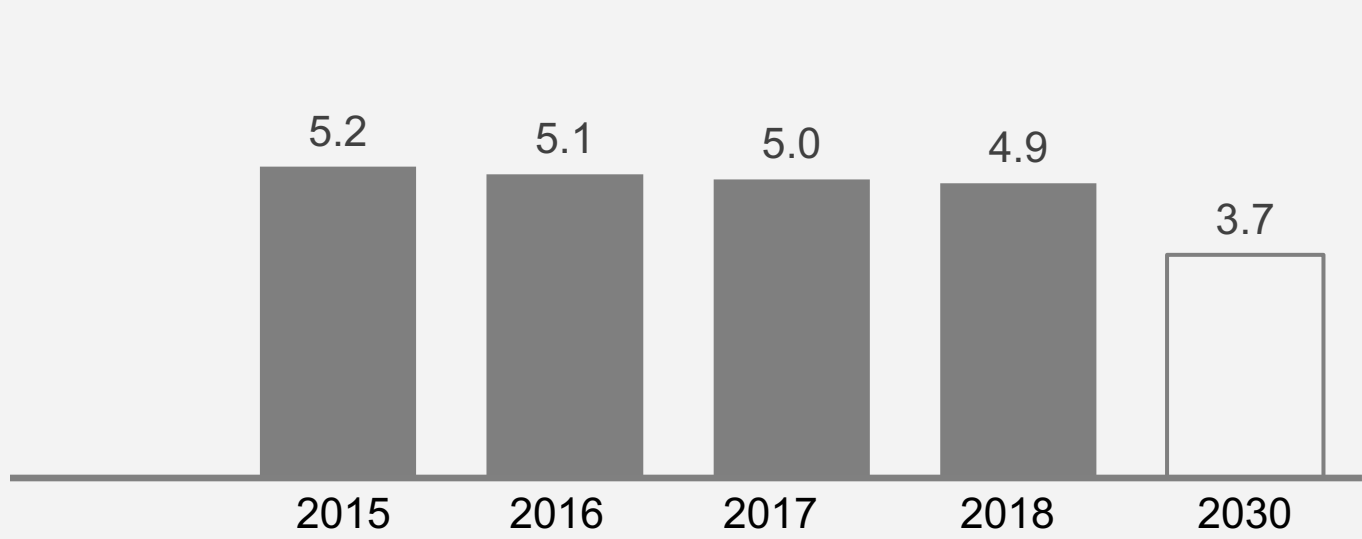
- Most of the top energy consuming countries have improved their energy efficiency over the last few years
- However only 8 have improved by more than the target rate of 2.6%

Data show that an energy efficiency improvement rate of at least 3 percent per year through 2030 will be needed to achieve SDG 7.3

IEA Stated Policies Scenario, 2019, Annual Primary Energy Intensity Improvement Rates



Energy Intensity, MJ/USD 2011 ppp



- Progress has been made towards improved energy efficiency between 2010 and 2017 driven by
 - Technological advancements
 - Global transition from manufacturing-based economies towards more service-based economies



Appendix



9 non-Africa/Asia countries would achieve universal access by 2030 based on current trends

Countries currently projected to achieve universal access by 2030

- Nauru
- Saint Lucia
- Tonga
- Belize
- Grenada
- Marshall Islands
- Fiji
- Colombia
- Jamaica

5 Asian countries would achieve universal access by 2030 based on current trends while 15 Asian countries would still have unelectrified populations

Countries expected to achieve universal access by 2030

- Afghanistan
- Iraq
- Mongolia
- Sri Lanka
- Laos

Countries expected to have any unelectrified population by 2030

- Pakistan
- Yemen
- Brunei
- Bangladesh
- Myanmar
- Cambodia
- India
- Indonesia
- Jordan
- DR Korea
- Nepal
- Philippines
- Syria
- Tajikistan
- Timor-Leste

12 African countries would still have significant unelectrified populations based on current trends

Countries expected to have ~10 million or more unelectrified population by 2030

- Angola
- Burkina Faso
- Burundi
- Chad
- DR Congo
- Ethiopia
- Madagascar
- Malawi
- Mozambique
- Niger
- Nigeria
- Tanzania



Statistics

Electrification program

- Electrification rate (2009)
 - Overall: 75%
 - Rural: 67%
 - Urban: 94%
- Number households without electricity
 - Overall: 288.8m (2009), ~57.8m households
- Electrification rate in 2000
 - Overall: 43%, ~115.8m households without access to electricity

Non-grid solutions

- 500,000 – 700,000 non-grid SHSs installed
- Service levels range from 35Wp to 70Wp systems
- ~619MW of non-grid generation capacity has been installed (<1% of total) (2011)

Electricity consumption

- Average electricity consumption per capita: 571 kWh/year (2009)



Description of model – Rajiv Gandhi Grameen Vidyutikaran Yojana (RGGVY) scheme and Remote Village Electrification (RVE) programmes

	Description
Planning	<ul style="list-style-type: none"> ▪ Ministry of Power (MoP) develops rural electrification policies and sanctions projects ▪ Central and state governments have joint responsibility for rural electrification and state government prepare rural electrification plans (including designating grid and non-grid) ▪ The Rural Electrification Corporation Limited (REC), under MoP, co-ordinates plans between state governments, state utilities and other agencies (and has the final decision on the grid/non-grid split)
Delivery	<ul style="list-style-type: none"> ▪ State governments, through their State Power Utilities, are responsible for implementing RGGVY in their territory ▪ Central Public Sector Undertakings, which has a memorandum of understanding with REC, can also assist with project formulation, planning and monitoring, and the provision of goods and services ▪ MoP monitors programme's progress ▪ Nodal agencies implement the RVE program
Funding	<ul style="list-style-type: none"> ▪ Under RGGVY, the MoP grants 90% of the cost of rural electrification project. ▪ States are responsible for funding the remaining 10% through their own funds, loans from REC or other institutions

Lessons

- Funds are released based on achievement of predetermined project milestones
- Funds released direct to contractors, to prevent fund mismanagement
- Three-tier monitoring system involving quality checks of materials and workmanship including pre-shipment checks and random evaluations



Non-grid case example – Bangladesh



Bangladesh

Electricity access

- 41% (2009)
 - 76% urban
 - 28% rural

Households with non-grid solutions

- 1 million non-grid systems installed

Non-grid service level

- Multiple service levels offered ranging from 10Wp to 80Wp systems

Funding

- SHS are financed through private operators with experience in micro-finance



Description

- Currently 56 percent of villages are covered through grid extensions
- Rural electrification programme is operated by independent, consumer-owned co-operatives
- Engineering and construction were standardized and there were approved specifications for equipment and materials
- Standardized procurement, delivery and after-sales processes are used throughout

Lessons

- Relies heavily on effective organizational structure (lead there by IDCOL)
- Involvement of private sector can improve effectiveness
- Micro-financing and credit can help with the propagation of SHS
- Standardization of processes and implementation can aid effectiveness of delivery
- Rural electrification can be done through local, consumer-owned co-operative structures successfully



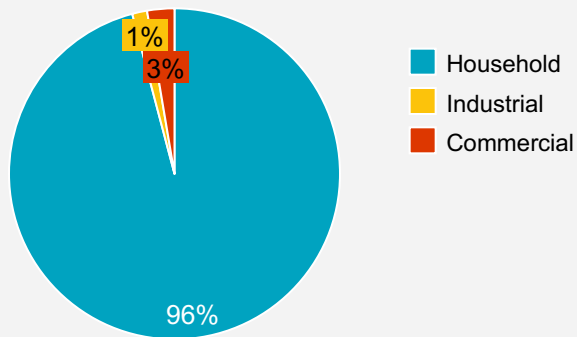


Indonesia's LPG consumption has grown by 15% p.a in the past 10 years, driven by Kerosene-to-LPG Conversion programme

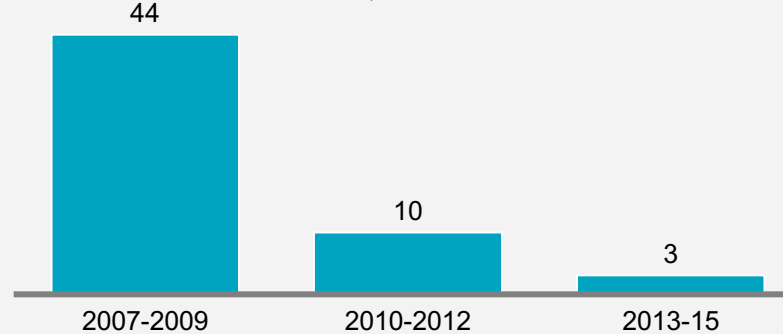
LPG conversion programme is part of government plan to reduce petroleum fuel subsidy

~96% of LPG is consumed for household driven by Kerosene-to-LPG conversion plan, introduced in 2007, which boosted number of new household customers

Demand of LPG in Indonesia, 2018



Number of free 3kg LPG packages given new household customers, millions



Key growth drivers

- Free initial 3kg LPG package for new household customers
- The 3kg LPG are subsidized at Rp 4,250
- The kerosene withdrawal has forced households to use LPG

Pertamina, 100% owned by govt, dominates the LPG supply chain from upstream to downstream. Private companies contribute less than 5% for each segment in supply chain.

SOE

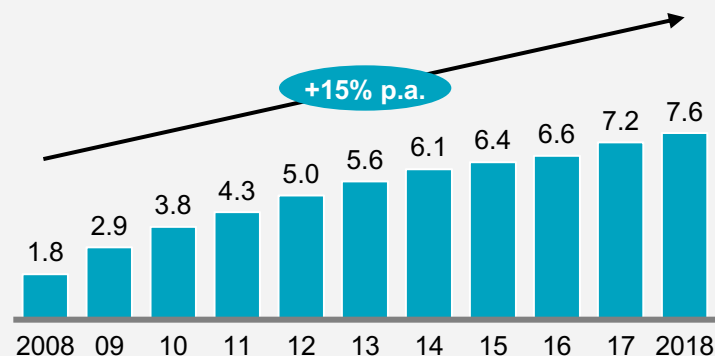
Pertamina

Private

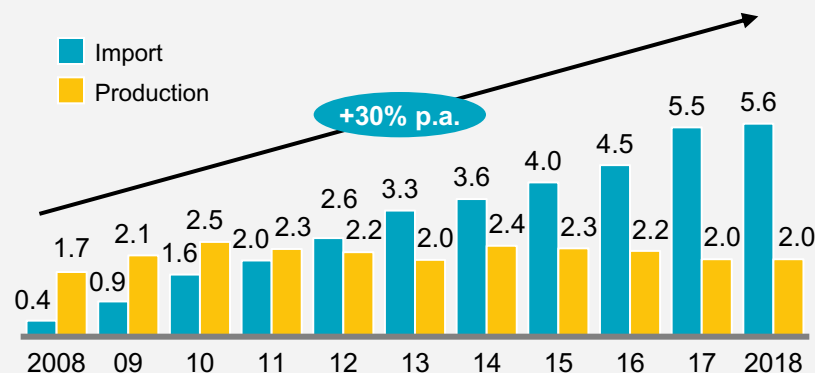
Chevron, Medco on upstream
SMEs on downstream

Having limited refining capacity, LPG Import have grown by 30% p.a, outpacing the consumption growth of 15% p.a and making the import contribution to be ~75% of LPG supply in 2018

LPG Consumption, million tonnes

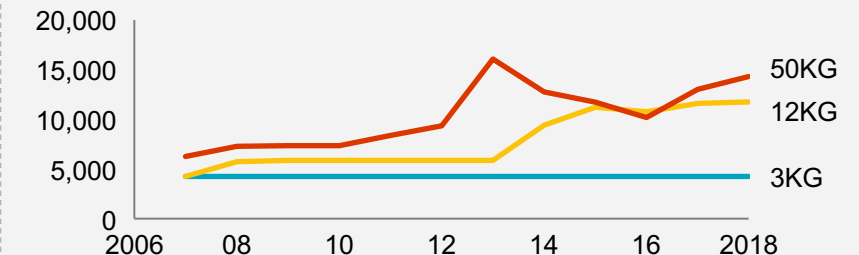


LPG Domestic Production and Imports, million tonnes



Domestic prices of 3kg LPG are subsidized and the price has been kept at IDR4,250/canister since 2007. The price of bigger ones, 12kg and 50kg, are following global oil market prices.

LPG Prices, IDR/canister

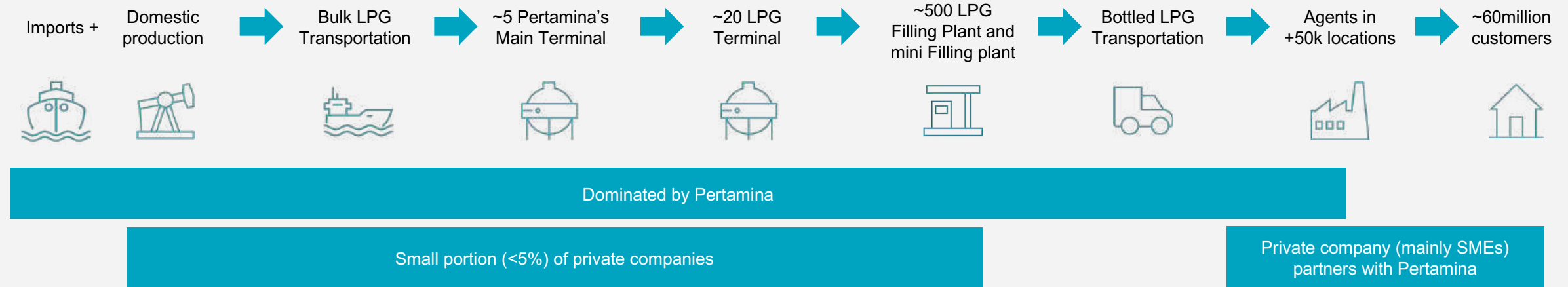




LPG market in Indonesia is managed through PSO by Pertamina, state-owned oil and gas, and prices are controlled by government

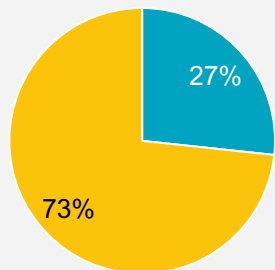
- Government exercises control over LPG distribution and pricing through Pertamina, state-owned oil and gas company, which are supervised by the Ministry of Energy and Mineral Resources.
- There are small contributions from private companies in LPG supply chain (<5% for each segment) from upstream (Chevron, Medco), midstream/refineries (Titis Sampurna), and downstream which are mainly SMEs as agents/sub-agents to distribute LPG to household customers.

Supply chain



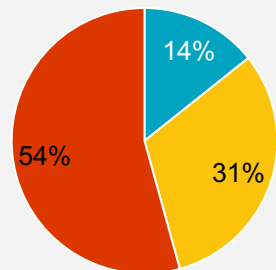
Source of LPG supply, 2018

Import (Yellow)
Production (Blue)

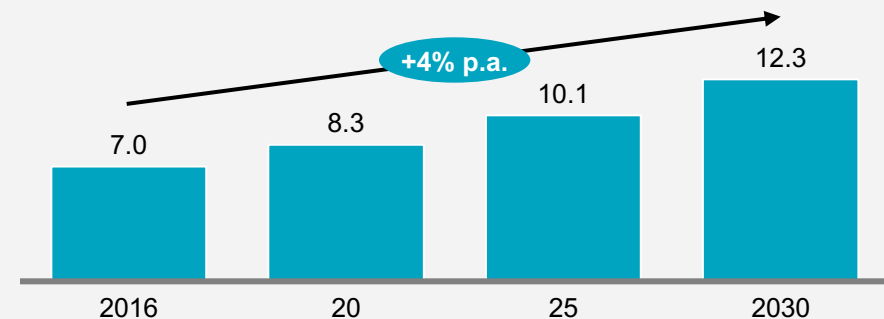


Domestic LPG Production, 2018

Private refinery (Blue)
Pertamina Refinery (Yellow)
Upstream refrigerated & mix (Red)



Pertamina's yearly LPG sales target, million tonnes



Indonesia's LPG conversion programme involving various government entities and policies to effectively convert >50 millions of customers



Key steps taken to increase LPG consumption five-fold in less than a decade

- The kerosene to LPG conversion programme, also known as the Zero Kero Programme, was initiated in 2007 based on Presidential Decree No. 104/2007. The Government of Indonesia (GoI) set up a taskforce for the programme that is coordinated by the Ministry of Energy and Mineral Resources and executed solely by Pertamina (right table). The conversion programme was meant to reduce the fossil-fuel subsidy. Details of the programme:
 - **Pilot project** conducted by Pertamina to 500, 25k, and 10k households in Jakarta in 2006 to check the acceptance and test the distribution model, which provided feedback for the programme: 1) Customers' concerns about supply, cost and safety, 2) Kerosene retailers' concerns about the margin and investment cost on switching to sell LPG.
 - **Free LPG initial package and kerosene withdrawal.** Free LPG starter packages were distributed to households and micro-businesses consisting of a 3kg filled cylinder (chosen for easy handling), a one-burner stove, a rubber hose and a regulator. The 3kg LPG was subsidized by GoI at price IDR 4,250/canister which has not changed until now. The kerosene withdrawal would be done under these conditions: 50 percent withdrawal of kerosene allocation in an area was carried if the conversion packages were distributed to 80 percent of the distribution targets in the area. This withdrawal amount would then increase by a minimum of 10 percent in the following weeks, until the total withdrawal was 100 percent.
 - **Stages of the programme.** As Indonesia consists of 34 provinces in 5 major islands and thousands of islands, the programme was divided into several stages depending on infrastructure readiness, ease of distribution and kerosene consumption. Consequently, the initial focus was on the capital region in Western Indonesia, which is highly populated (~50 percent of population live in Java island). In 2007-09, in eight provinces mainly in Java primarily in bigger cities and urban areas; 2009 for Java island and Sumatra; 2010-11 in most area in Sumatra, Kalimantan, and Sulawesi islands; 2012-15 wider coverage in aforementioned islands; and since 2016 for eastern part of Indonesia (Papua and Maluku.)
 - **The programme achieved more than the initial goal.** The programme converted 52 million customers in 2012 that is higher than the initial goal of 42 million. Pertamina's recent data as of 2016 suggests 57 millions of HH and SME was converted across 396 cities in 29 provinces.
 - **Five-fold LPG consumption growth.** During 2006-15, domestic kerosene consumption decreased by 92 percent, from 10 million kl to 0.8 million. In the same period, LPG household consumption increased by >5x from 1.1 million tonnes to 6.3 Mt.
- **The Kerosene-to-LPG Conversion programme achieved significant increase in tonnage of LPG consumed nationwide:**
 - **1998: 1 mn tonnes p.a.**
 - **2008: 1.8 mn tonnes p.a.**
 - **2018: 7.5 mn tonnes p.a.**

Government's team for LPG conversion programme

Ministries/related entity	Role
Ministry of Energy and Mineral Resources (MEMR)	Coordinator
Ministry of Finance	Budget
Ministry of Industry	Procurement of cylinders
Ministry of Small and Medium Enterprises	Procurement of stoves
Oil and Gas Regulatory Agency	Withdrawal of kerosene
Ministry of Social Affairs	Transfer of professions in kerosene trading business
Ministry of Women's Empowerment	Communication with public
Pertamina	Executor of the programme

Initial LPG free package (3 kg LPG, stove, and regulator set)





The key factors from Indonesia's LPG conversion program

- **Government had a strong incentive to conduct the LPG conversion.** At that time, the government acted in an urgent manner following the rapidly increasing kerosene subsidy. It was proposed that converting from kerosene to LPG would significantly reduce the fiscal burden on subsidy.
- **Solid government support and implementation.** The strong plan was supported by the establishment of the programme's legal basis and parliamentary approval. The government established a team consisting of various entities coordinated by the Ministry of Energy and Mineral Resources (MEMR) and executed solely by Pertamina.
- **Win-win to all stakeholders.** The conversion programme will not only benefit the government on lower subsidy, but also benefit retailers and end users. For retailers converting to sell LPG from kerosene, Pertamina provided incentives, consignment schemes and loan schemes. For the end users, compared to kerosene, LPG is cleaner, safer, more practical and, most importantly, cheaper.
- **Executed solely by a capable business entity, Pertamina.** Pertamina is the sole implementation entity for the programme which minimized a governmental bureaucratic role. As the biggest state-owned enterprise, Pertamina has the capability (infrastructure, manpower, expertise, network) and industry supply chain dominance from upstream to downstream that really helped the execution of the LPG conversion programme.

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