E M O 19

CLIMATESCOPE

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Emerging Markets Outlook 2019.

Energy transition in the world's fastest growing economies

UKaid
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BloombergNEF

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Section 1. Key findings

107GW

New clean energy capacity added in emerging markets in 2018

$133bn

New investment in clean energy capacity, down $36 billion from 2017

6,900TWh

2018 coal-fired generation, up 500TWh from 2017

A cool-down in China and several other major economies depressed 2018 clean energy investment across emerging nations and kept overall deployment rates flat year-on-year. Meanwhile, coal-fired generation surged in the 104 markets BloombergNEF assessed for its annual Climatescope survey. Both suggest that despite considerable recent progress, developing countries' power sector CO2 emissions are rising rapidly.

There were silver linings in 2018, of course. For the second year in a row, emerging nations built more clean than fossil-fueled power-generating capacity. Construction of new coal-fired power plants fell to its lowest level in a decade. Excluding China, clean energy installations grew by 21% year-on-year to hit a new record. And the number of emerging markets with three or more clean energy-friendly policy types on the books rose to 62 of those analyzed. All suggest policy-makers increasingly recognize that renewables are cost-competitive and worth backing.

Still, given the massive challenge of limiting global warming to 1.5 degrees Celsius, this year's Climatescope offers a stark reminder of the work ahead. Rapidly growing nations that today are just as rapidly expanding their carbon footprints must reach net zero emissions by 2050. To get there, those currently leading the energy transition must keep growing their clean energy sectors while dormant renewable energy markets must also emerge.

Below is a synopsis of Climatescope 2019's key findings by topic areas.

Capacity and generation

- **In 2018, developing nations added 201GW of new power-generating capacity to their grids with clean energy (non-large hydro renewables) accounting for just over half the total.** A total of 107GW of renewables were installed in emerging economies in 2018**.**
- **The majority of the generation that will come from the new plants commissioned in 2018 will not be clean, however.** Due to wind and solar's lower capacity factors than coal or gas, less than half the generation from these new plants will be zero-carbon.
- **Among the clean technologies, solar led the way with 66GW installed in 2018**, followed by wind with 29GW. Small hydro, biomass and geothermal combined saw 12GW added to emerging economies. Fossil fuel-fired capacity accounted for just a third of all new capacity added in developing nations in 2018. Large hydro and nuclear together account for 12% of the capacity installed.

- **China predominates. Two-thirds (71GW) of all developing nation clean energy capacity was installed in China in 2018.** Still, China clean energy capacity additions slipped 7% from the year prior.
- **India is one of the world's major clean energy players.** The country installed 14GW of wind and solar in 2018. While that was down from 15GW in 2017, India scored best on the Climatescope survey to finish top of the table for the first time.
- **New construction of coal-fired power plants fell to its lowest level in a decade in 2018.** After peaking at 84GW of new capacity added in 2015, coal commissionings plummeted to 39GW in 2018. China accounted for approximately two-thirds of this.
- **Still, generation from burning coal in developing nations has jumped 54% since the start of this decade.** From 2017 to 2018 alone, it spiked 7%, the highest increase since 2013. In 2018, coal accounted for 47% of all power produced in developing economies.
- **Excluding China, new clean energy installations in emerging markets grew 21% and reached a new record, with 36GW commissioned in 2018, up from 30GW in 2017.** This is twice the clean energy capacity added in 2015 and three times the capacity installed in 2013.
- **Despite progress, the transition is not moving nearly fast enough to address the climate challenge.** In the 102 non-China/India economies surveyed by Climatescope, just 38% of new 2018 capacity added was clean. In almost half the 83 markets that recorded capacity growth in 2018, fossil fuels represented the main technology type deployed.

Figure 1: Emerging markets annual power-generating capacity additions, by technology

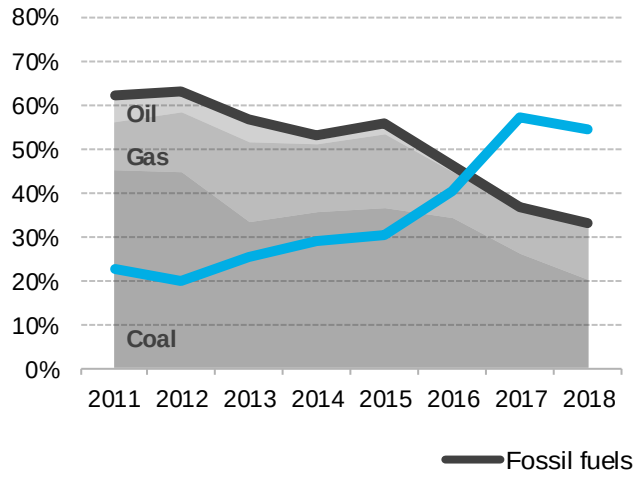
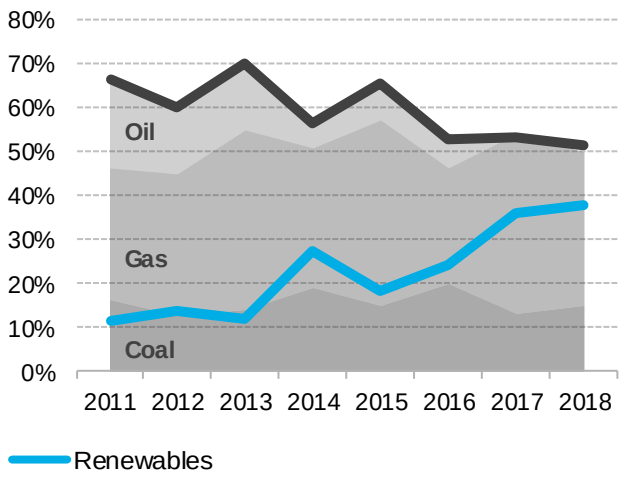


Figure 2: Emerging markets (excluding China/India) annual power-generating capacity additions, by technology



Fossil fuels Renewables

Source: BloombergNEF, Climatescope. Note: renewables include small hydro, biomass and waste, geothermal, wind and solar. It does not include large hydro (above 50MW) and nuclear.

Investment

Capital inflows in support of clean energy power-generating projects tell a similar story. Like capacity additions, investment has been concentrated in traditional markets which saw significant drops in 2018. Meanwhile, a slew of new nations saw clean energy boomlets in 2018 and set new records for investment.

- **In 2018, new clean energy financing for emerging markets totalled $133 billion, down from the peak of $169 billion in 2017**. China accounted for over two-thirds of the emerging

markets total and was also responsible for the majority of the 2017-2018 dip in the headline figure. In all, $36 billion less flowed into China clean energy asset finance than in 2017.

- **Other major markets also saw steep clean energy investment drops**. India and Brazil, for instance, contributed to this global contraction by declining $2.4 and $2.7 billion, respectively from the previous year.
- **Clean energy investment is spiking in many less traditional clean energy markets**. When excluding the three biggest markets (China, India and Brazil), clean energy investment jumped to $34 billion in 2018 from $30 billion in 2017. Most notably, Vietnam, South Africa, Mexico and Morocco led the rankings with a combined investment of $16 billion in 2018.
- **The vast majority of clean energy capital deployed in emerging markets continues to come from local sources.** This is largely due to the heavy influence of domestic development banks and credit agencies in China and Brazil.
- **Foreign direct investment (FDI) supporting clean energy set a new record in 2018.** It jumped from $22.4 billion in 2017 to $24.4 billion in 2018. EU-based organizations remain the key foreign capital provider.
- **Development banks represent the largest single foreign investor group and deployed a record volume of capital for clean energy in 2018.** These institutions, which include the World Bank and others, invested $6.5 billion, up from $4.5 billion in 2017.
- **Italian utility Enel remains the top overall provider of capital to clean energy assets in developing countries with $7.6 billion invested to date.** The World Bank, Germany's KfW and the U.S. Overseas Private Investment Corporation remain familiar names in the top ranks of clean energy investors between 2009 and 2018.

Figure 3: New-build clean energy asset finance in emerging markets, by country

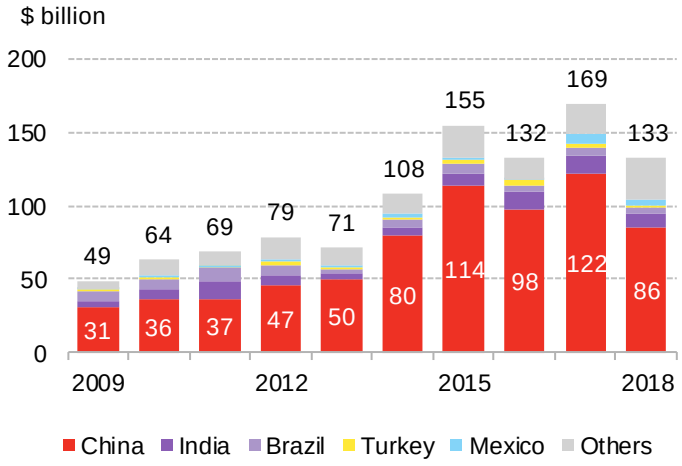
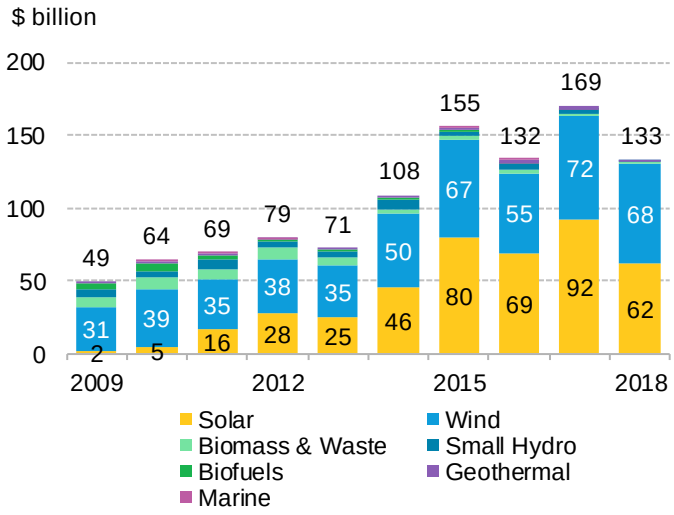


Figure 4: New-build clean energy asset finance in emerging markets, by technology



Source: BloombergNEF. Note: Includes 101 non-OECD nations, plus Chile, Mexico and Turkey. Excludes large hydro. Numbers are subject to change.

Growth drivers

What has dictated the pace of clean energy build and investment? Certainly, subsidies remain important drivers and markets have historically expanded or contracted as renewables-friendly

policies have been rolled out or scaled back. How policies have influenced activity is discussed for specific countries in Section 5.

Subsidies are only part of the story, however. Today, two-thirds of the world's population live in a country where onshore wind, utility-scale PV, or both, are the cheapest option for new bulk generation. In those nations, wind, solar, and other projects are being built because they represent the cheapest option for the next marginal megawatt of capacity.

Still, this is not the case everywhere. In Turkey and in the nations of Southeast Asia, for instance, coal remains a low-cost option. That country and that region combined have built 35GW of coal since 2014. In many markets, the moment when building and operating a new renewable energy plant should, in theory, trigger the retirement of an existing fossil-fueled plant could take decades to arrive. Fast-forwarding to that juncture will be critical to limiting power sector emissions from these countries.

- **The cost-competitiveness of renewables in developing countries has historically been hampered by higher-priced domestic capital**. As renewable power projects are capital-intensive, the cost of finance available to project developers has historically resulted in segregation between wealthy and less developed nations. In OECD countries, the benchmark weighted average cost of capital (WACC) BloombergNEF (BNEF) tracked for wind and PV projects in 2017-18 ranged from 2.0-7.1%. In emerging economies, the benchmark ranged from 4.4-15%.

Figure 5: Financing cost impacts on levelized costs of energy, utility-scale PV

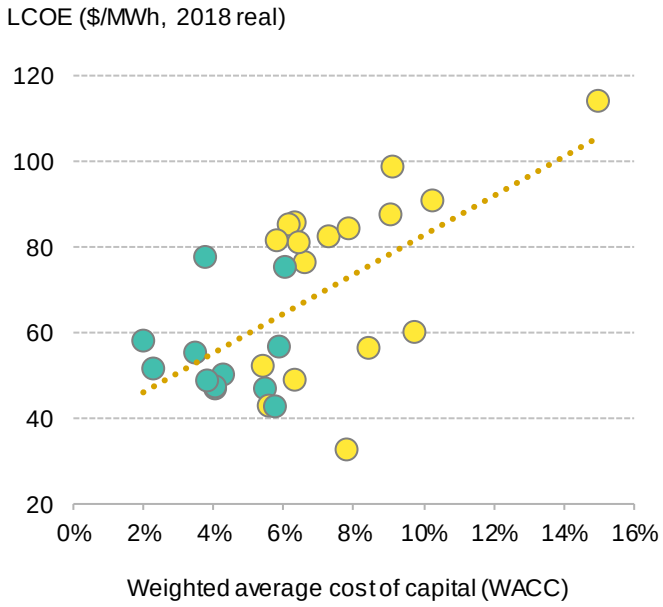
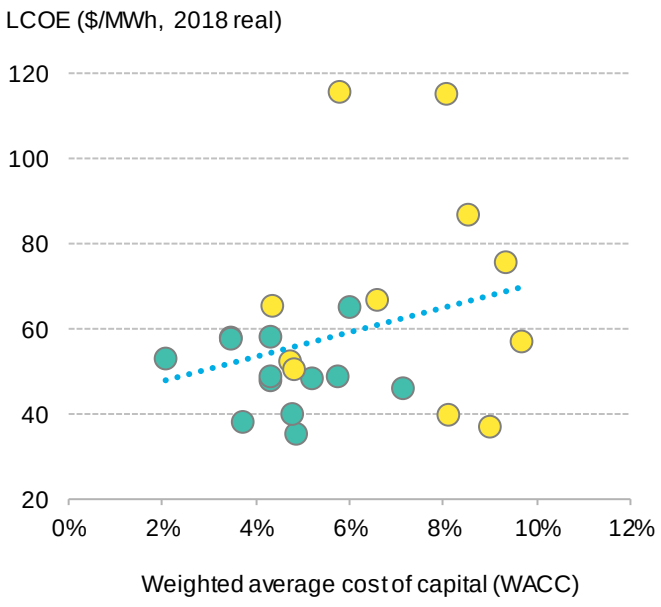


Figure 6: Financing cost impacts on levelized costs of energy, onshore wind



OECD Non-OECD

Source: BloombergNEF. Note: Korea and Japan are excluded from this correlation because subsidies in those nations (recent feed-in tariffs and renewable energy certificates) combined with land and labor scarcity have created exceptionally inflationary environments for capex.

- **Lowering the cost of capital is one of the most effective ways to accelerate the crossover points between clean energy and fossil fuel-fired plants.** BNEF has identified

that subsidized capital has the potential to substantially speed the transition from fossil-fueled power generation to renewable energy in developing economies.

- **Policy action will be required in markets where newly built clean energy plants cannot yet undercut the economics of existing fossil plants on an levelized cost of electricity (LCOE) basis.** So far, Chile is the only emerging market where the government and utilities have made serious commitments to phasing out coal generation.
- **An unbundled power market open to private sector participation is the first step to attract clean energy investment.** Countries where power generation is managed separately from power transmission and distribution have attracted 94% of clean energy project investment into emerging markets over the past five years.
- **Strong clean energy policies are also fundamental to facilitating renewable energy investment flows to emerging markets.** Auctions are the mechanism of choice to secure power contracts in nearly half of the emerging markets surveyed. Over the past ten years, these nations have awarded over 133GW of clean energy capacity in power purchase agreements (PPAs) via competitive auctions. One fourth of this was contracted in 2018 alone.

Climatescope rankings

This year's Climatescope Emerging Market Outlook represents the collective effort of 45 BloombergNEF analysts who made 23 country visits to collect data and conduct interviews. Once again, the study has been graciously supported by the U.K. Department for International Development.

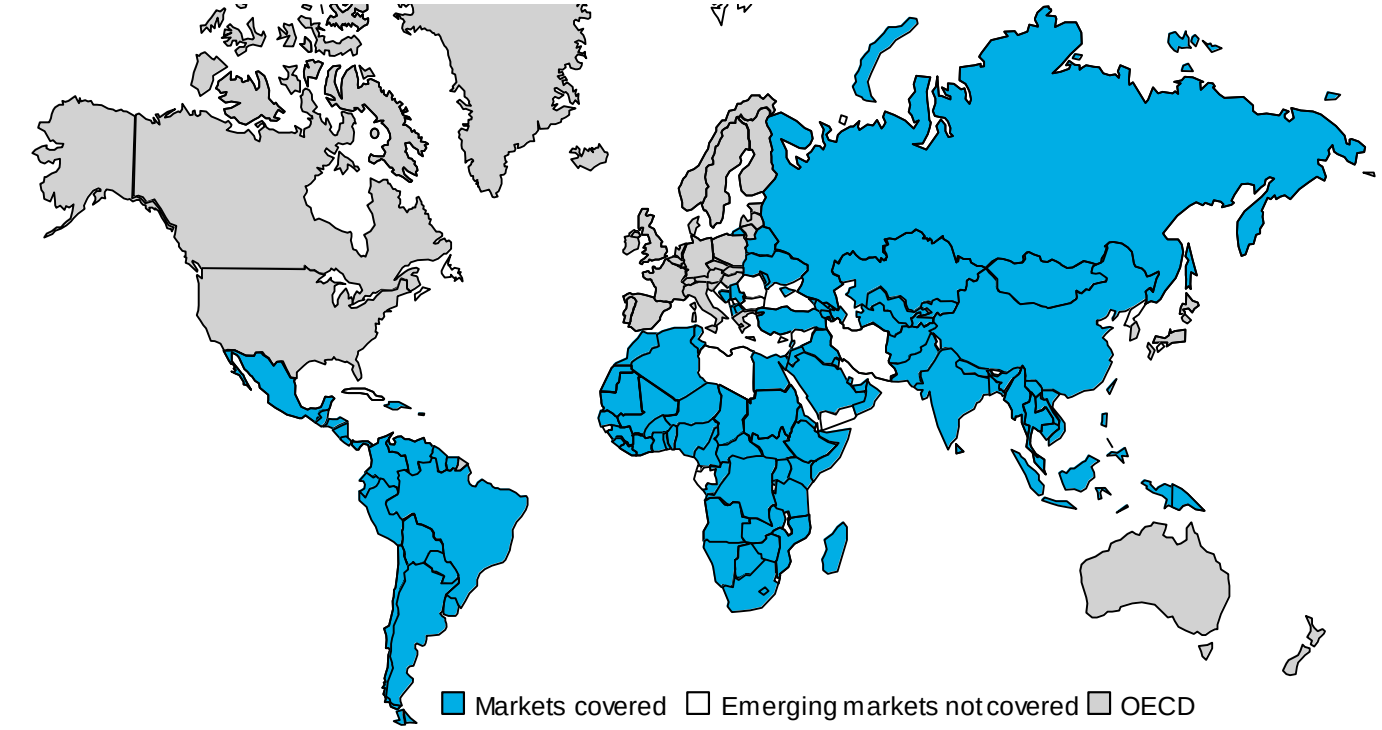
As in past years, Climatescope scored and ranked individual nations. While many of the countries that have appeared near the top of the survey's leader board in past years are there again this year, there have been some notable changes:

- **India is the top scorer in this year’s Climatescope survey.** The Asian nation’s aggressive policy framework and copious capacity expansions propelled it to first place in 2019, from second in 2018. The Indian market is home to one of the world's most ambitious renewable energy targets and has held the largest ever auction for clean power generation.
- **Chile dropped to second but scored higher than in the prior year.** Through strong clean energy policies and its commitment to phase out coal generation, Chile remains determined to transition to a cleaner matrix. In 2018, the country had 2.3GW of solar and 1.5GW of wind capacity online, representing 16% of total installed capacity.
- **Brazil rose to third from fourth last year.** Brazil has pioneered competitive auctions to contract clean energy, which led to over 28GW of renewable energy contracted 2009-2018. With the worst of its economic crisis now behind it and four auctions expected over the next two years, clean energy appears poised for renewed growth.
- **China ranks fourth in Climatescope, though the pace of clean energy investment growth there slowed dramatically in 2018.** A major policy revamp slowed wind and solar installations. Nonetheless, the country still scores highest of all Climatescope countries in terms of future clean energy development opportunities.
- **Kenya appears for the first time in the Climatescope top five.** The country is gradually increasing its share of non-large hydro renewables by adding solar, wind and geothermal. In 2018, Kenya recorded its highest ever clean energy investment with $1.4 billion. Kenya also accounted for over a third of all 2018 foreign investment into sub-Saharan Africa.

Section 2. Scope

Climatescope 2019 encompasses 104 emerging markets, or virtually all non-OECD economies with over 2 million inhabitants, plus Chile, Mexico and Turkey, which are defined as OECD countries but are among the most attractive emerging markets for clean energy (Figure 7). Cuba, Iran, North Korea, Yemen and Libya are not in the coverage due to local conflicts or international sanctions that make them particularly challenging to research.

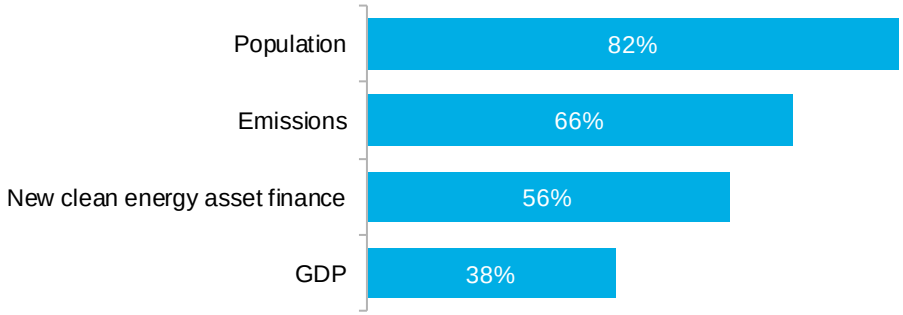
Figure 7: Countries covered in Climatescope 2019



Source: BloombergNEF, Climatescope

Climatescope nations account for 82% of the global population and produce about two-thirds of global CO2 emissions. In addition, 56% of financing for clean energy projects occurred in these markets in 2018. Still, these nations represent just 38% of global GDP (Figure 8).

Figure 8: Markets studied for Climatescope 2019 as a percentage of global totals



Source: World Bank, World Resources Institute, BloombergNEF, IMF. Note: Clean energy asset finance is for 2018.

Driven by rapid economic growth and improved electricity access, emerging markets are where power demand is expected to grow most in coming years. BloombergNEF's New Energy Outlook 2019 estimates that global power demand will reach around 42,400TWh by 2050, up 62%, or 16,200TWh, from 2018. In OECD markets, demand expands just 13% between 2018 and 2050 while in non-OECD countries it will double over that period. By 2050, emerging economies will account for 70% of global power demand (Figure 9).

These countries will also remain the source of no less than -three-quarters of power sector emissions over the next three decades and are expected to see their power matrixes decarbonize at a much slower pace than wealthier countries. BNEF projects that emerging markets power sector emissions will drop just 21% from 2018 through 2050, compared to a 69% decline in OECD economies (Figure 10).

Figure 9: Projected global power demand

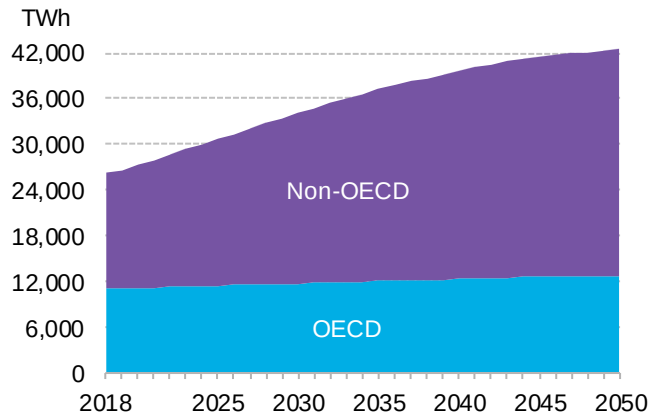
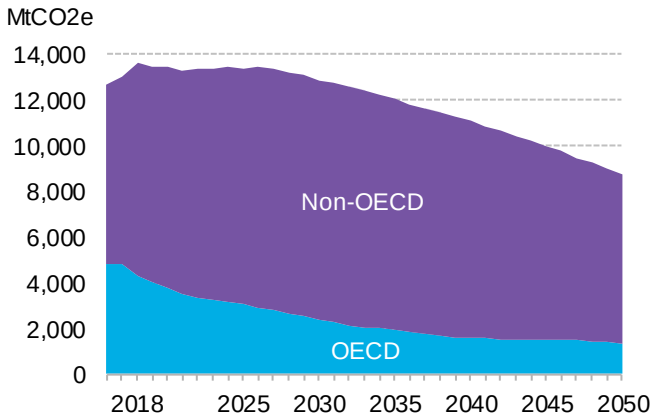


Figure 10: Projected power sector CO2 emissions



Source: BloombergNEF 2019 New Energy Outlook

This year's Climatescope Emerging Market Outlook begins in earnest in Section 3 by examining new clean power capacity added in developing nations through 2018, then exploring how such countries can potentially accelerate the transition to lower-carbon grids, particularly through the deployment of low-cost capital. Section 4 analyzes trends in clean energy investment. Section 5 examines how properly structured markets and policies can help emerging economies flourish with well-designed enabling environments. Section 6 explains at a high level the Climatescope study methodology. Finally, Section 7 presents country-level Climatescope scores and rankings.

This Outlook represents the culmination of BNEF's annual Climatescope project, which involves 45 of our analysts compiling detailed data on 104 developing nations, including making visits to 23 countries in the first half of 2019. Readers are encouraged to explore complete datasets and profiles of each nation on the Climatescope website to leverage fully this deep-dive into how the world's fastest growing economies are driving the energy transition.

Section 3. Power systems

Total power-generating capacity in emerging markets has jumped 69% since 2010, from 2.3TW to 3.8TW at year-end 2018. Coal still accounts for the lion's share with 1.5TW installed, and its share of total capacity has only marginally slipped, from 42% in 2010, to 39% in 2018 (Figure 11).

In terms of actual power produced, annual generation from coal in these countries has jumped 54% since the start of the decade, from 4,467TWh in 2010 to 6,863TWh in 2018 as power sector CO2 emissions have surged. From 2017 to 2018 alone, coal generation spiked 7%, marking the biggest year-on-year jump since 2012-2013. In 2018, coal accounted for 47% of all power produced in developing economies (Figure 12).

Figure 11: Cumulative capacity by technology in emerging markets

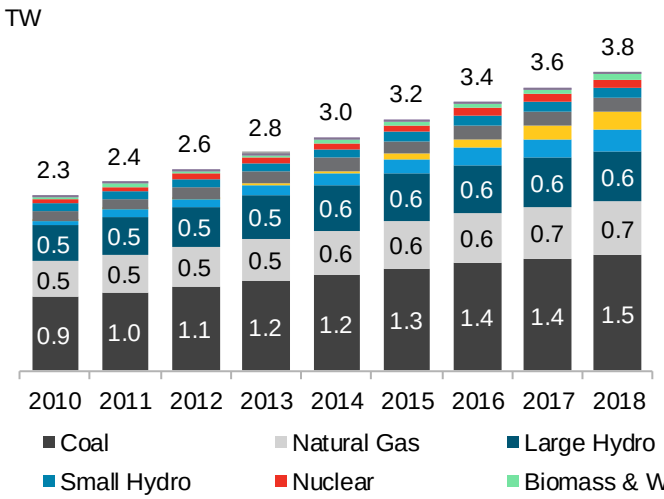
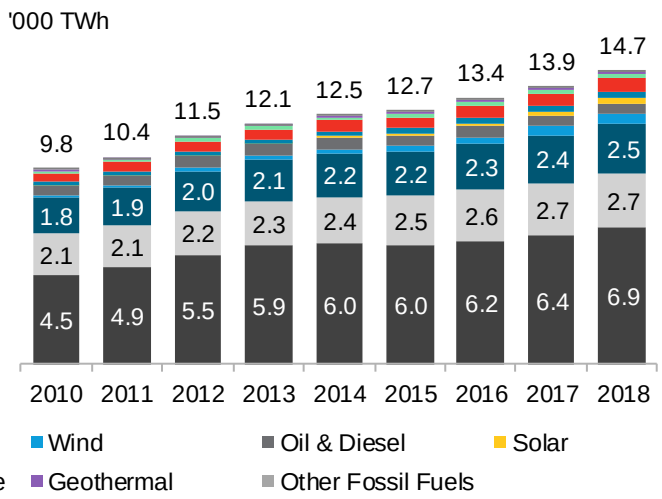


Figure 12: Annual generation by technology in emerging markets

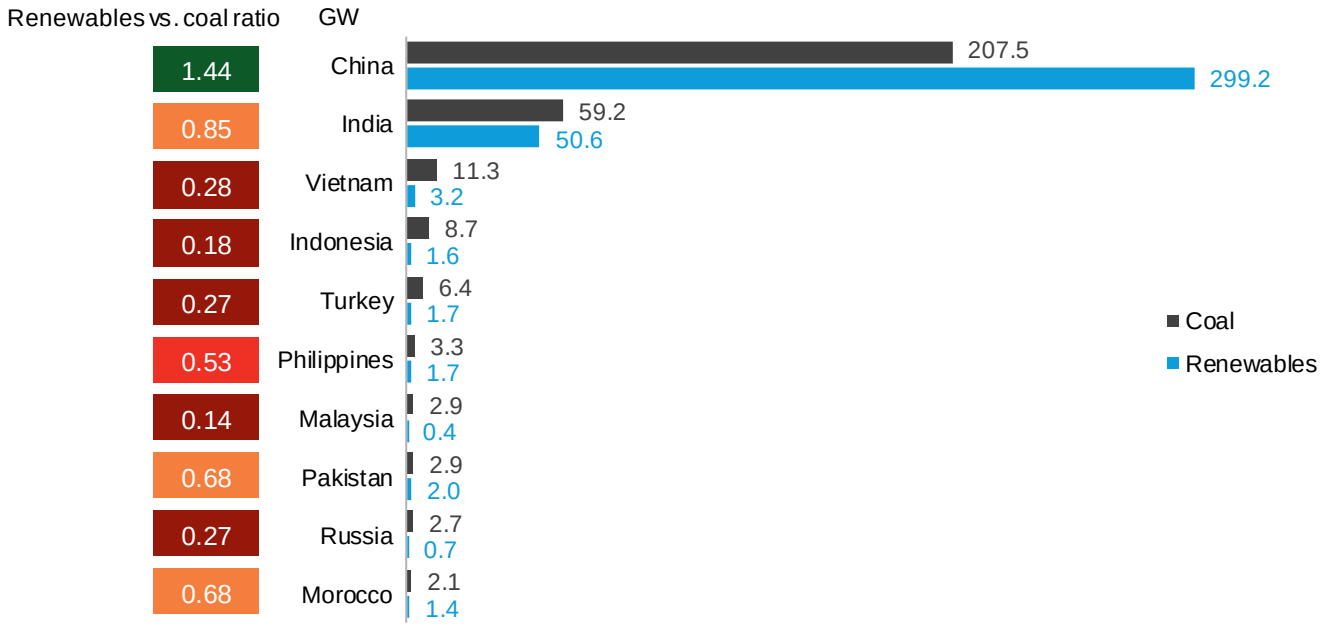


Source: BloombergNEF, Climatescope

From 2014 through 2018, emerging markets added a combined 319GW of new coal capacity to their grids – equivalent to the total combined installed capacity in the U.K., Spain, and Italy. China accounts for 65% of the total, but it is the only market that added more renewables than coal capacity over the period, with 1.44GW built for every gigawatt of coal added (Figure 13).

India is the second biggest builder of coal. The country added 59GW from 2014 through 2018, accounting for 19% of the total across all developing countries.

Figure 13: Top 10 developing countries for coal capacity additions, 2014-2018



Source: BloombergNEF, Climatescope. Note: numbers may include estimates. It does not include Taiwan.

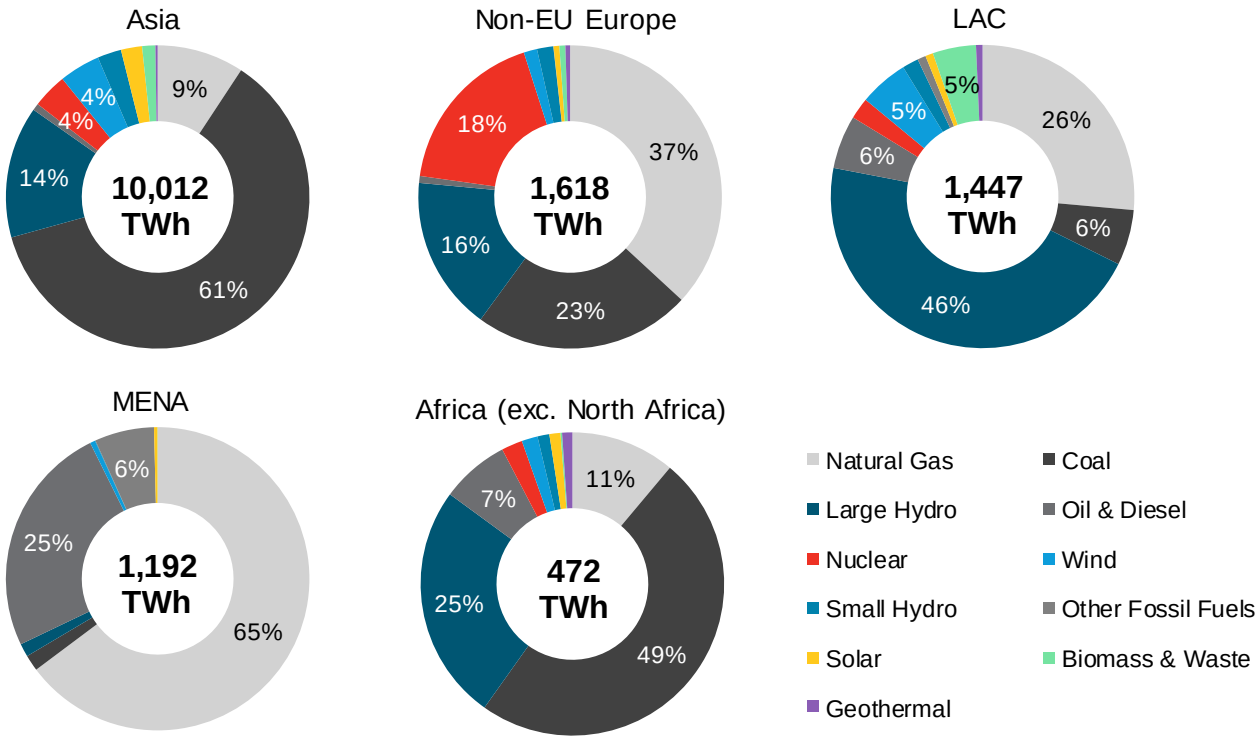
The main source of baseload generation varies significantly by region across developing nations. In Africa (mainly due to South Africa) and Asia, coal is the primary power provider, accounting for 69% and 49% of total power generation in 2018, respectively. Over a third of the power in non-EU European nations is supplied by gas, followed by coal with 23%, nuclear with 18% and large hydro with 16%. In Middle East and North Africa (MENA), gas represents two-thirds generation while and oil and diesel plants account for 25% (Figure 14).

In Latin America and the Caribbean (LAC), the cleanest emerging markets region, fossil fuels represent less than 60% of total generation. Large hydro is the main power provider to Latin American countries, accounting for 46% of all power produced in 2018, followed by gas with 26% (Figure 14).

China's progress on energy transition

Although coal still dominates China's power system, accounting for 54% of capacity and 65% of generation in 2018, both figures are down nearly 10 percentage points from 2012, demonstrating the speed of change. Wind and solar together now account for 20% of capacity and almost 8% of generation in China, up from just 3% and 13%, respectively, in 2014. Generation from renewables continues to grow, not only due to growth in capacity, but because curtailment of production from existing plants has declined. China's grid companies have employed multiple approaches to incorporate more renewables, including implementing generation rights trading, expanding inter-regional power transfers, improving thermal generator flexibility retrofits and reducing spinning reserves. The result is historically low national average curtailment rates of 7.2% for wind and 3.0% for solar in 2018.

Figure 14: Share of generation by technology, 2018



Source: BloombergNEF, Climatescope. Note: MENA is Middle East and North Africa, LAC is Latin America and the Caribbean.

3.1. Capacity additions

In 2018, emerging markets added 201GW of new power-generating capacity of all kinds to their grids, 6% more than in the prior year (Figure 15). Solar led the way with 66GW built in 2018, but its participation fell from 37% of the total in 2017 to 33% in 2018 (Figure 16). With 29GW added in 2018, wind remained flat from the prior year and represented 14% of the total installed.

Completions of coal-fired power plants have been dropping since 2015 and touched their lowest level in a decade in 2018, with 39GW commissioned. This was mainly due to China, which saw coal build drop to 25GW in 2018, from 37GW in 2017 and 46GW in 2016 (Figure 15). Still, coal was the second most popular technology for new build in 2018 and accounted for 20% of all capacity added in the year. Gas additions inflated from 13% of new capacity added in 2017 to 15% in 2018. New large hydro installations jumped from 4% to 8% of the total 2017-2018 (Figure 16).

Figure 15: Total annual net capacity additions by technology in emerging markets

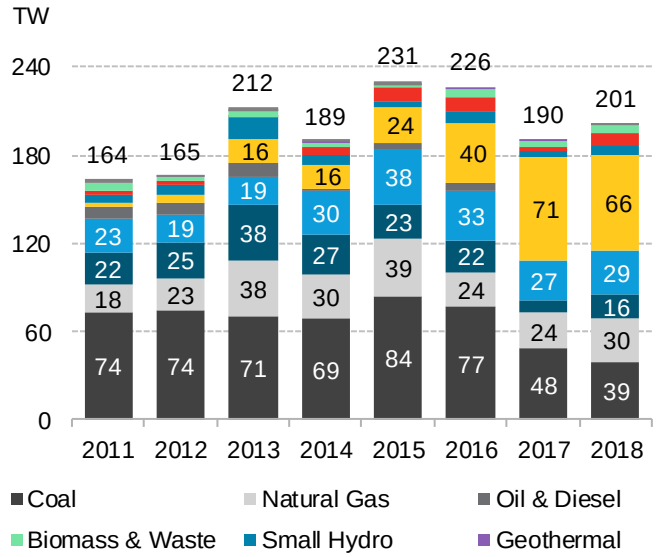
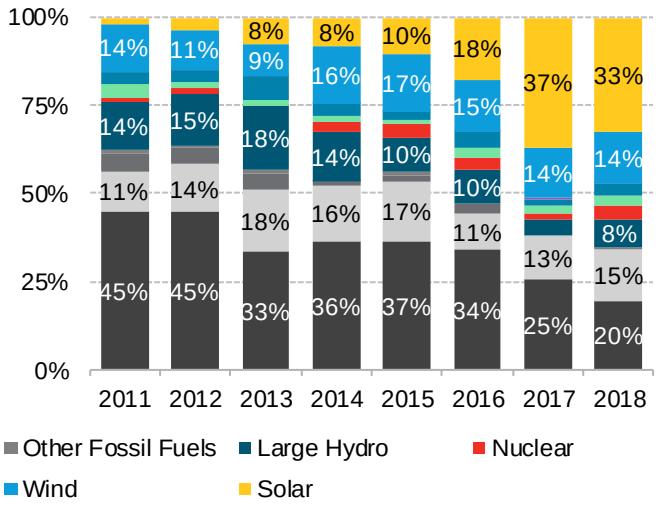


Figure 16: Share of annual capacity additions by technology in emerging markets



Source: BloombergNEF, Climatescope

In absolute volume terms, clean energy capacity additions in emerging markets remained basically flat year-on-year, with just a 1% increase compared to 2017. Such installations continue to be quite concentrated among just a few countries. China accounted for two-thirds of the total with 71GW commissioned in 2018. However, clean energy capacity additions in China fell 7% compared to 2017. India followed with 13% of total new renewable energy capacity added in 2018 (Figure 17).

Figure 17: Emerging markets clean energy capacity additions, by country

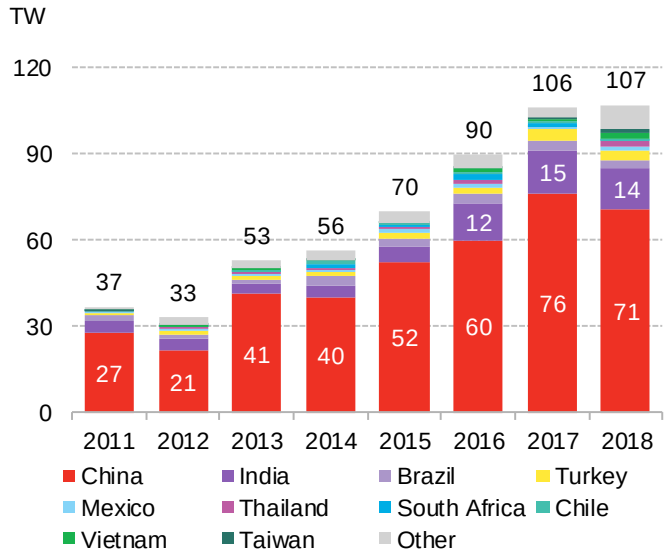
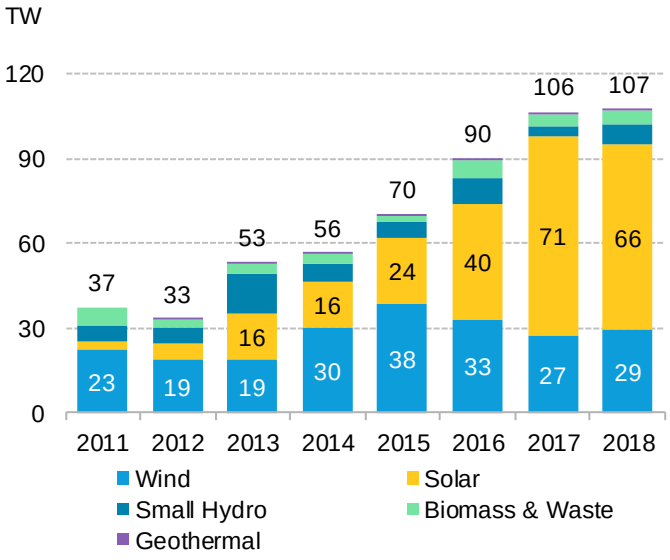


Figure 18: Emerging markets clean energy capacity additions, by technology



Source: BloombergNEF, Climatescope

Figure 19: Emerging markets (excluding China) clean energy capacity additions, by country

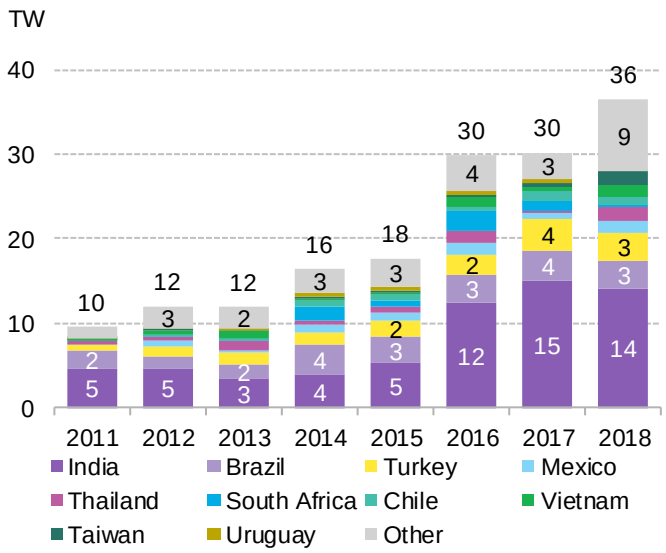
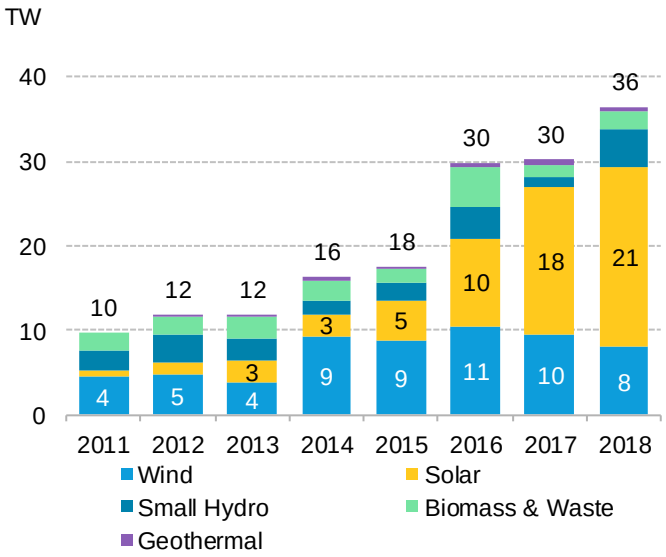


Figure 20: Emerging markets (excluding China) clean energy capacity additions, by technology



Source: BloombergNEF, Climatescope

Excluding China, new clean energy installations in emerging markets jumped 21% to reach a record 36GW in 2018, up from 30GW in 2017. This is twice the clean energy capacity added in 2015 and three times the capacity installed in 2013 (Figure 19). The steep drop in the price of PV modules has prompted a shift from wind to solar build in recent years and that continued in 2018. In 2014 and 2015, wind was over half renewable energy capacity added. By 2018, solar was 58% of new capacity build (Figure 20).

In China, along with the other largest emerging markets, clean energy installation volumes sank 2017-2018. India's clean capacity additions slipped 5% year-on-year. In Brazil and Turkey, they dropped 14% and 11%, respectively. In South Africa and Chile, they plummeted 82% and 34%, respectively.

Other, somewhat newer markets thrived in 2018, however. Thailand, Vietnam, Ukraine, Morocco, and Argentina all experienced boomlets, achieving record new capacity additions.

The number of markets that add some meaningful volume of clean energy capacity each calendar year has fluctuated only somewhat since 2013. In 2018, 70 of 104 markets surveyed added some clean capacity, up from 68 in 2017, but down from a peak of 73 in 2016 (Figure 21).

Average clean capacity added per developing nation rose every year from 2014-2017, reaching a peak of 1.6GW last year. In 2018, this figure dropped slightly to 1.5GW, but it is still 1.7 times higher than the 2012 average (Figure 21). The spike has been mostly driven by China and India. Excluding the two countries, the figure has grown at a slower pace.

Figure 21: Emerging markets that built utility-scale clean energy and average capacity by year

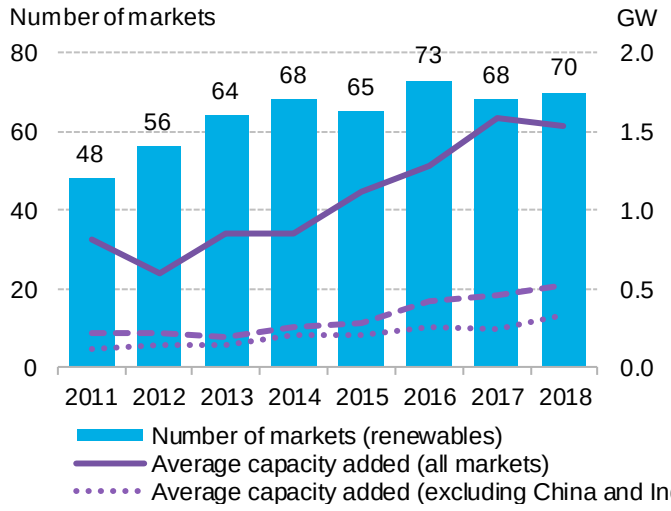
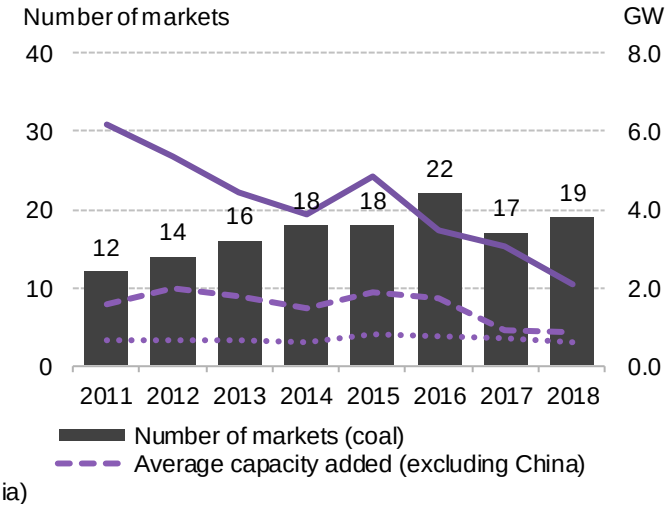


Figure 22: Emerging markets that added coal-fired power plants and average capacity by year

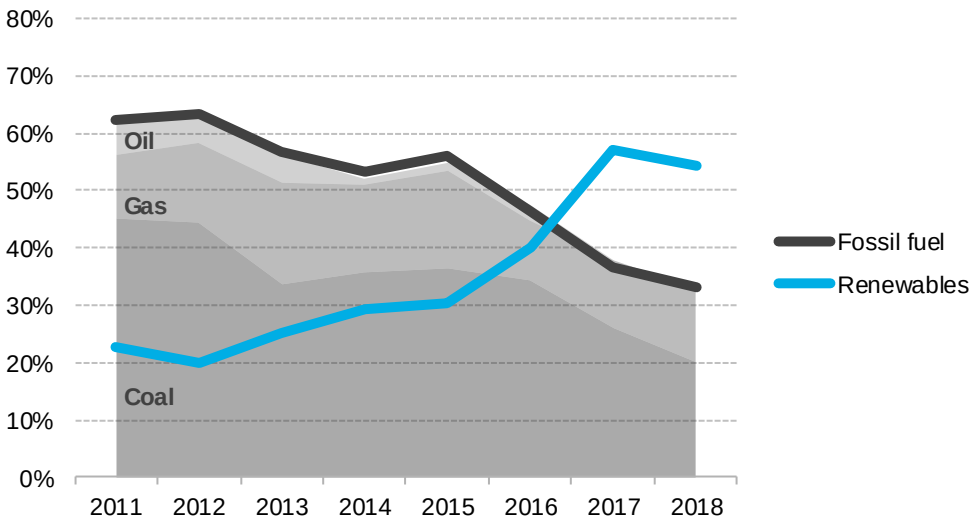


Source: BloombergNEF, Climatescope

In 2018, 19 developing countries commissioned new coal-fired power plants. Average coal capacity added per country plummeted 66% 2011-2018, from a peak of 6.2GW in 2011 to 2.1GW in 2018. Over the past five years, installations have sunk 46%. Once again, the decline has been driven by China and, more recently, by India. Excluding the two, average coal additions followed the opposite trend and grew 5% 2014-2018 (Figure 22).

In 2018, the 104 emerging markets surveyed by Climatescope continued to add more clean energy than fossil fuel capacity to their grids. However, after years of consistent growth, the speed of the transition appears to be flagging. In 2017, renewables represented 57% of capacity added in developing economies. In 2018, that figure dropped to 54% (Figure 23). Large hydro and nuclear account for the remaining 12%

Figure 23: Emerging markets annual power-generating capacity additions, by technology



Source: BloombergNEF, Climatescope. Note: renewables include small hydro, biomass and waste, geothermal, wind and solar. It does not include large hydro (above 50MW) and nuclear.

The picture is less rosy when China is not included. Renewables accounted for just under half of new build in 2018 in developing countries, excluding China. This is about the same level as in 2017. Meanwhile, fossil fuel installations as a percentage of the total rose to 48% in 2018 (Figure 24). Large hydro and nuclear account for the balance (9%).

When both China *and* India are taken out of the equation, renewables accounted for 38% of new capacity added, while fossil fuels represented 51% (Figure 25). Large hydro and nuclear accounted for 11% of new capacity added last year. In addition, in almost half the 83 markets that recorded growth in capacity last year, fossil-fuel fired plants were the main type of technology installed.

In light of the climate challenge, this suggests far more must be done if the world is to stand a chance at limiting global warming to 1.5 degrees or achieving net-zero emissions by 2050. Given that the vast majority of future power demand growth is expected to come from emerging economies, adding cost-competitive de-carbonized power-generating capacity will be critical.

Figure 24: Emerging markets (excluding China) annual power-generating capacity additions, by technology

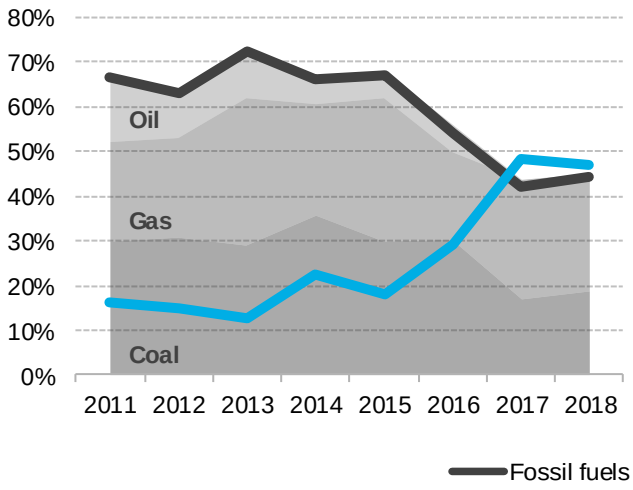
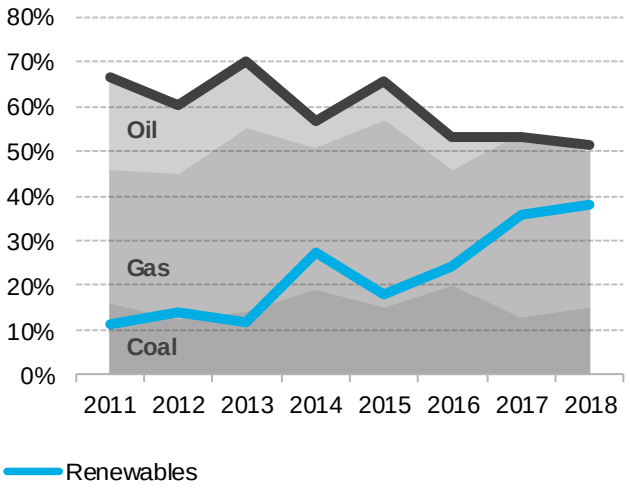


Figure 25: Emerging markets (excluding China/India) annual power-generating capacity additions, by technology



Source: BloombergNEF, Climatescope. Note: renewables include small hydro, biomass and waste, geothermal, wind and solar. It does not include large hydro (above 50MW) and nuclear.

3.2. Accelerating decarbonization

When it comes to the long-term competition between clean and fossil-fired power generation, BNEF has identified two key "tipping points." The first comes when building and operating a new clean power plant is more cost-efficient than doing the same for a fossil plant. The second comes when a newly built clean energy plant can undercut the economics of an existing fossil plant on a levelized cost of electricity (LCOE) basis. In other words, the point when building and operating a new renewable energy plant should, in theory, trigger the *retirement* of an existing fossil-fueled plant. In most markets we examined, coal is the cheapest thermal source of generation.

We estimate that two-thirds of the world's population today lives in a country where onshore wind, utility-scale PV, or both represent the cheapest option for new bulk generation. This means that, to meet a rising electricity demand in these countries, it is cheaper to build and operate a new solar or wind farm than to install and operate a fossil-fueled plant. Among emerging markets, this is the case, for example, in Brazil, Chile, India, China, South Africa, and others.

Still, in many developing economics, fossil plants, particularly those that burn coal, are cheaper to build and operate than wind and solar. This is the case of Southeast Asian countries and Turkey, which is where 11% of the emerging market's coal capacity was built over the past five years.

Cost competitiveness for renewables is coming to these nations. Given BNEF's projections for wind and solar costs, we estimate these technologies could undercut coal by around 2025[1]. In the interim, however, substantial additional coal could get added to the grid. According to BNEF's New Energy Outlook projections, Southeast Asian nations will build over 18GW of new coal through 2025. This is concerning as the average lifetime of a coal plant typically exceeds 30 years. Once built, these projects could operate – and emit – for decades.

The impact of financing costs on the economics of renewables[2]

The cost of capital – interest rates associated with debt and expected return rates associated with equity – are critical to the economics of clean energy plants. Such projects have virtually no operating costs and typically sell most or all their power under long-term contracts at fixed prices. As a result, the profitability of most wind or solar plants can be reasonably forecast when they start operating.

Virtually all costs associated with renewables projects relate to capex and consist of two basic components: the cost of buying and erecting the equipment; and the costs associated with financing that effort. These are both amortized over the life of the project to help determine the LCOE. BNEF estimates that financing costs typically amount to 40-55% of the LCOE of a utility-scale PV or onshore wind project. Not surprisingly, accessing cheap financing is a top priority for developers across the world.

In the developing country context, the cost-competitiveness of renewables has historically been hampered by comparatively high-priced capital available in these nations. As renewable power projects are capital-intensive, the cost of finance available to project developers has historically resulted in a segregation between wealthy and less developed nations. Thanks to central banks keeping interest rates low, developers in OECD countries have been able to access relatively low-cost capital. In those wealthier countries, the benchmark weighted average cost of capital (WACC)[3] we tracked for 2017-18 ranged from 2-7.1%. By contrast, in emerging economies, the benchmarks were 4.4-15%(Figure 26 and Figure 27).

This difference in financing terms translates directly to a discrepancy in the total levelized cost. As a result, developing economies have tended to be home to some of the highest LCOEs in the world.

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1 In most of these markets renewables are already cheaper than gas plants.

2 Section from the BNEF report The Clean Technology Fund and Concessional Finance

3 WACC: weighted average cost of capital.

Figure 26: Financing cost impacts on levelized costs of energy, utility-scale PV

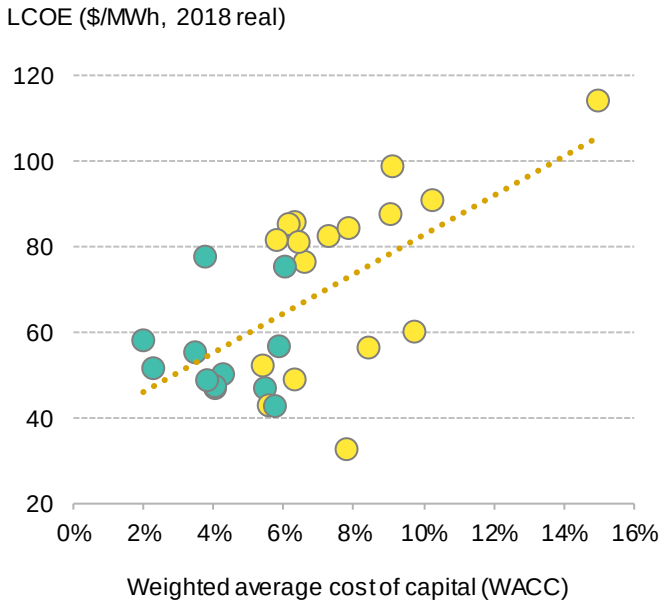
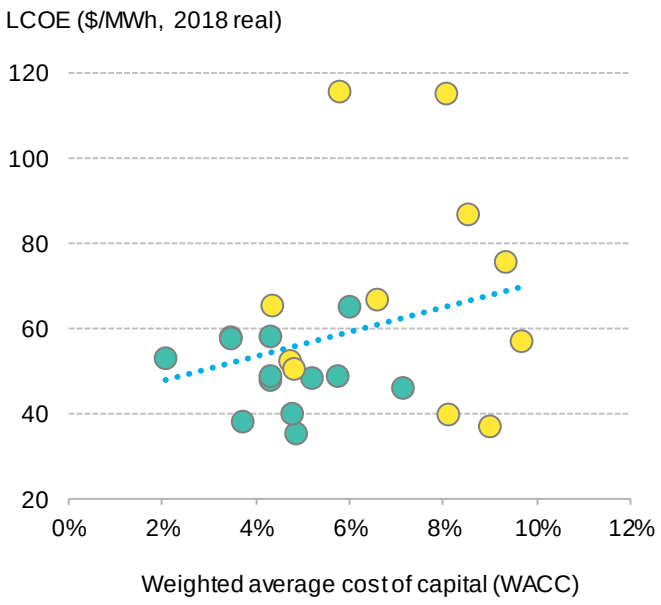


Figure 27: Financing cost impacts on levelized costs of energy, onshore wind



Source: BloombergNEF. Note: We exclude Korea and Japan from this correlation as subsidies (recent feed-in tariffs and renewable energy certificates) combined with land and labor scarcity create an exceptionally inflationary environment for capex.

There is a direct relationship between the cost of capital that developers can access in a country and the benchmark levelized costs for renewable generation (Figure 26 and Figure 27). Specifically, for each percentage point rise in the weighted average cost of capital, levelized costs rise on average $4.6/MWh for utility-scale PV plants and $2.9/MWh for onshore wind farms[4]. Such boosts can be enough to push clean energy projects "out of the money" in countries where coal is available and cheap.

Clean energy projects can overcome high financing costs in some contexts, however. If the necessary equipment is particularly accessible or the natural resource exceptionally strong, financing costs become somewhat less critical. One example of this is India, which despite its relatively high weighted average costs of capital for renewables features some of the lowest LCOEs for solar and wind, at around $34/MWh and $42/MWh, respectively. A mix of ambitious clean energy policies, fierce competition and a strong domestic value chain have allowed India to achieve comparatively low capex and opex by global standards.

Accelerating renewables build

New renewables achieve cost-competitiveness in markets when their LCOE successfully falls below the LCOE for new fossil plants. As mentioned above, BNEF has identified for individual nations specific future years when this juncture will be reached. The question then is what can be done to get to these tipping points faster?

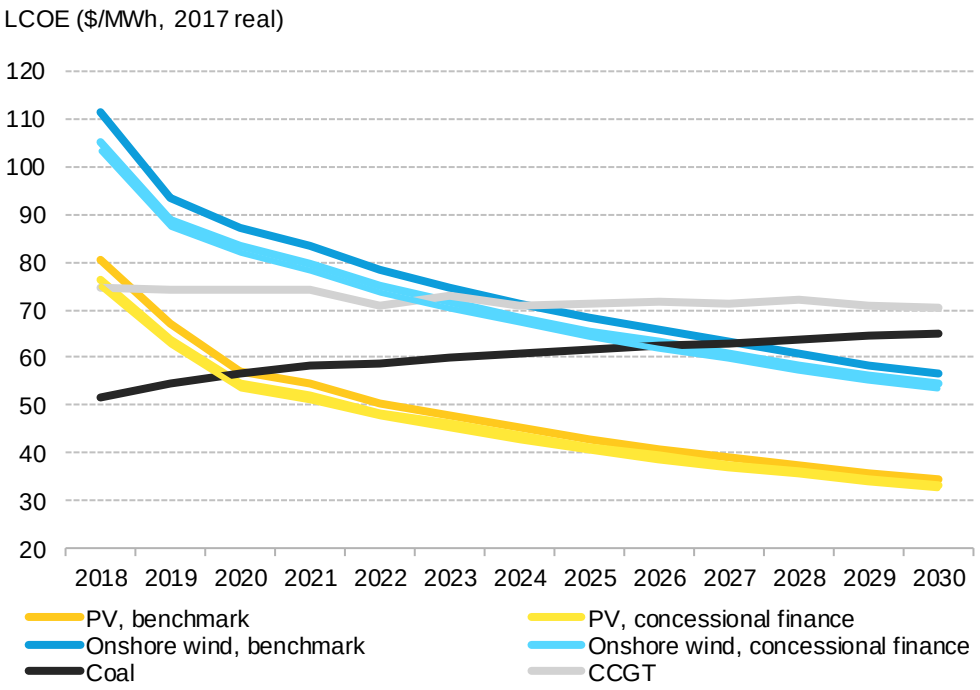
[4] We exclude Korea and Japan from this correlation as subsidies (last rounds of feed-in tariffs and renewable energy certificates) combined with land and labor scarcity create an exceptionally inflationary environment for capex.

Improving efficiencies around project development is one potential solution. Reducing equipment costs is another. But both of these potential solutions are difficult to achieve and will largely be driven by economies of scale.

Reducing the cost of available capital is a challenge that has the potential to be addressed on a much more immediate basis, potentially through innovative financial instruments. In the report Clean Technology Fund and Concessional Finance: Lessons Learned and Strategies Moving Forward, commissioned by the Climate Investment Funds and produced by BloombergNEF, we identified concessional finance[5] as having the potential to substantially speed the transition from fossil-fueled power generation to renewable energy in developing economies.

In Thailand, for example, concessional finance has the potential to reduce clean energy costs by five to seven percent, which would accelerate that country's tipping point by two years and prevent substantial fossil-fired capacity from being built (Figure 28).

Figure 28: Levelized costs of new renewables vs. new fossil fuels, Thailand



Source: BloombergNEF. Note: For more details, see report Clean Technology Fund and Concessional Finance: Lessons Learned and Strategies Moving Forward

The role of development finance institutions (DFIs) in accelerating renewables build in emerging markets goes beyond the provision of subsidized capital. By often being the first to invest in a country, DFIs can be instrumental in kick-starting renewable energy markets and can "crowd-in" private finance to help countries scale up their clean energy sectors.

[5] Development finance can be broadly defined as the use of public sector resources to facilitate investment in low- and middle-income countries where the commercial or political risks are too high to attract purely private capital, and where the investment is expected to have a positive developmental impact on the host country. Concessional finance is a subset of development finance; concessional finance instruments including loans, grants, and guarantees are offered at below market-rate terms, such as through longer repayment times, low interest rates, or both. Development finance institutions often use concessional finance to de-risk or encourage certain investments.

In addition, in countries with weak policies and power sector structures, DFIs can play a crucial role in providing technical assistance to create new clean energy policies and support power sector reform. For example, a technical assistance by IFC, EBRD and CTF supported the kick-off of Kazakhstan's renewable energy sector. The advice provided by these organizations to the government was reflected in the country's 2013 renewable energy law, which introduced feed-in tariffs for renewable energy projects and established the purchase obligations for all power produced by renewable energy plants for 15 years.

Other DFI instruments are critical to countries in unconventional circumstances. In emerging markets facing macroeconomics crises, for example, guarantees from development institutions can be key to boosting investor confidence. In Argentina, the Renewable Trust Fund FODER backed by the World Bank, provided guarantees of PPA payments for auction-winning projects. The new mechanism boosted confidence among foreign debt providers and helped the country attract $5.1 billion for wind and solar since 2017.

Replacing coal

BloombergNEF's New Energy Outlook (NEO) 2019[6] estimates that while OECD countries' power sector emissions will plummet 72% between 2012 and 2050, from 4,850MtCO2e to 1,345MtCO2e, in non-OECD nations emissions are expected to contract by just 6% over the period (Figure 29 and Figure 30).

Figure 29: Projected power sector emissions, OECD markets

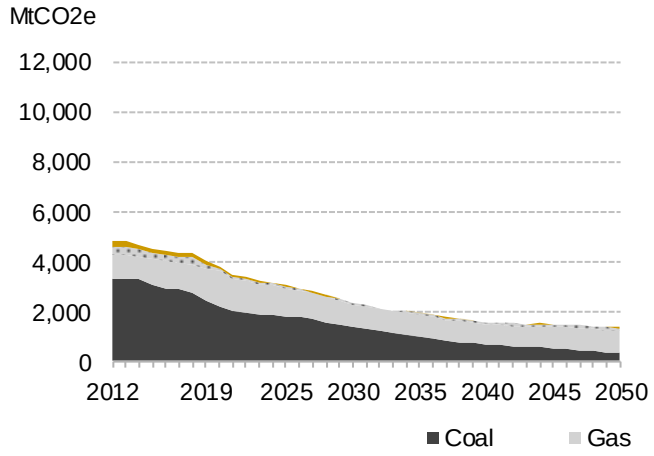
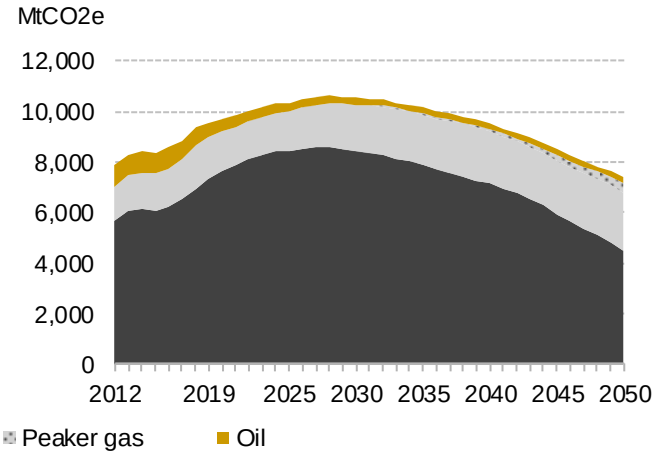


Figure 30: Projected power sector emissions, non-OECD markets



Source: BloombergNEF 2019 New Energy Outlook

Therefore, in the longer term, to address climate change, the dirtiest sources of power will need to be replaced, particularly in emerging economies. However, BNEF projects that in some key countries it will take years to arrive at *tipping point 2* when clean energy is sufficiently low-cost to displace existing fossil generation.

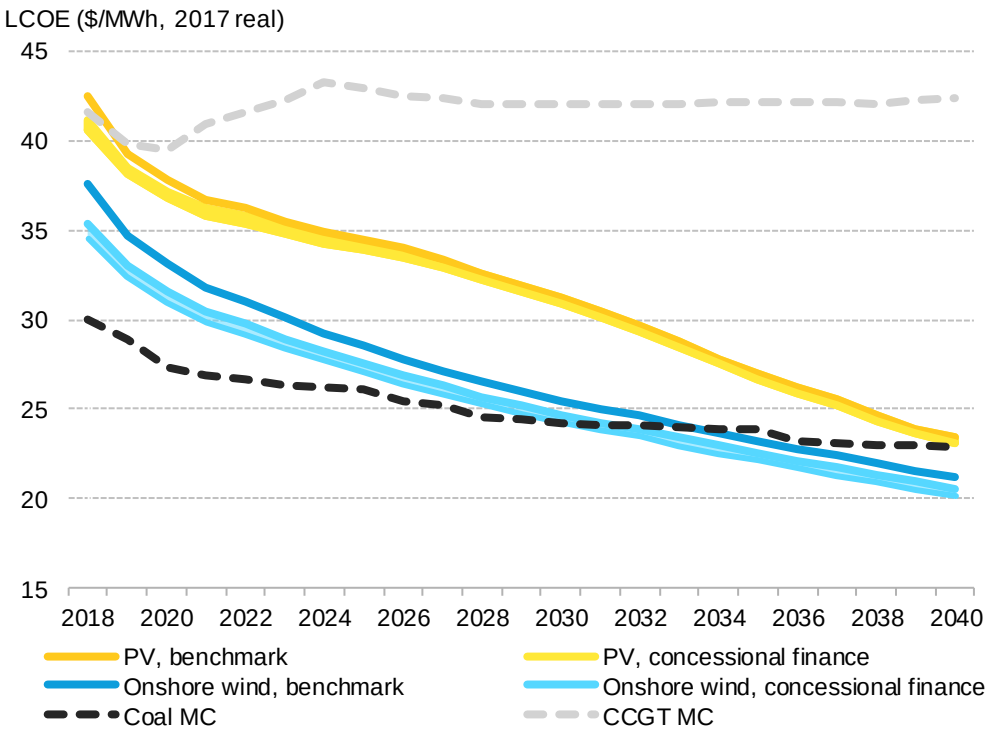
In India, for example, new-build onshore wind and utility-scale PV are already competitive on a LCOE basis with new-build coal- or gas-fired power plants. However, BNEF projects the

[6] BloombergNEF's New Energy Outlook is a least-cost optimization exercise. Results are, driven by the cost of building different power generation technologies to meet projected peak and total demand, taking into account seasonal weather extremes, country by country.

crossover for new-build clean energy vs. *existing* coal will not occur for 15 years if traditional financing structures are used. In our benchmark scenario we expect new wind capacity to start competing with the marginal cost of a coal plant only by the mid-2030s. For new solar power plants, the competition with coal does not heat up until the 2040s.

Concessional financing has the potential to pull forward the crossover point for new onshore wind vs. existing coal by four years[7]. This shift can be fundamental given that India installed nearly 100GW of coal from 2012-2018. For solar, we expect the gap between commercial financing and the concessional finance scenarios to be much narrower as both financing conditions seem already to be very close (Figure 31). This is likely to be a consequence of two elements: the very competitive environment for both renewable developers and financing institutions, which has pushed down commercial financing cost in India recently, as well as the high premium required to hedge against the fluctuations of the Indian rupee compared to the U.S. dollar.

Figure 31: Cost of new onshore wind and utility-scale PV vs. existing coal and gas, India



Source: BloombergNEF. Note: MC stands for short-run marginal costs. For more details, see the report Clean Technology Fund and Concessional Finance: Lessons Learned and Strategies Moving Forward

The role of policy makers

In markets where the second tipping point is not expected for years, stronger action from power sector stakeholders will be required to foster de-carbonization. Policy-makers in certain wealthy countries have addressed coal's disproportionate contribution to CO2 emissions and, in some cases, have implemented policies explicitly to phase out the use of the fuel.

[7] For more details on assumptions and capitalization structure, see report Clean Technology Fund and Concessional Finance: Lessons Learned and Strategies Moving Forward

In the developing country context, so far only Chile has committed to retiring its coal fleet. This marks an important step as under BNEF's projections, the country is not on course to arrive at tipping point two anytime before 2040. Under the first phase of the government's plan, announced in June 2019, utilities Engie, Enel and AES all committed to retire 1,043MW of coal assets by 2024. While this is equivalent to 20% of Chile's coal fleet, 20 plants will remain operational in the country after the first wave of retirements. The government plans to unveil an updated retirement schedule every five years. Chile's President Sebastian Piñera has declared the country will retire 100% of its coal fleet by 2040, but has not unveiled specific policy mechanisms to achieve that goal.

Section 4. Investment

4.1. Global trends

Investment for new clean energy projects in developing nations dropped to $133 billion in 2018, far from the record $169 billion in 2017 (Figure 32). After predominantly increasing through 2015, capital flows have fluctuated year to year. Solar and wind together are responsible for nearly all investment in clean energy emerging markets (Figure 33). However, after three years of solar dominance, wind accounted for 51% of the total in 2018 compared to 47% for solar.

China is key to understanding overall investment trends as it accounts for such a massive share of the overall investment total. As such, China accounted for the majority of the 2018 dip as the country accrued $36 billion less in clean asset finance than in 2017. China was not alone in driving the 2018 decrease in investment, however. India and Brazil saw year-on-year declines of $2.4 and $2.7 billion, respectively.

Figure 32: New-build clean energy asset finance in emerging markets, by major country

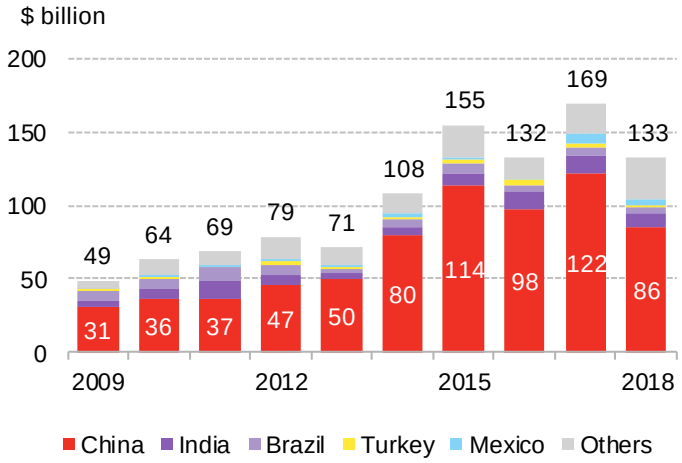
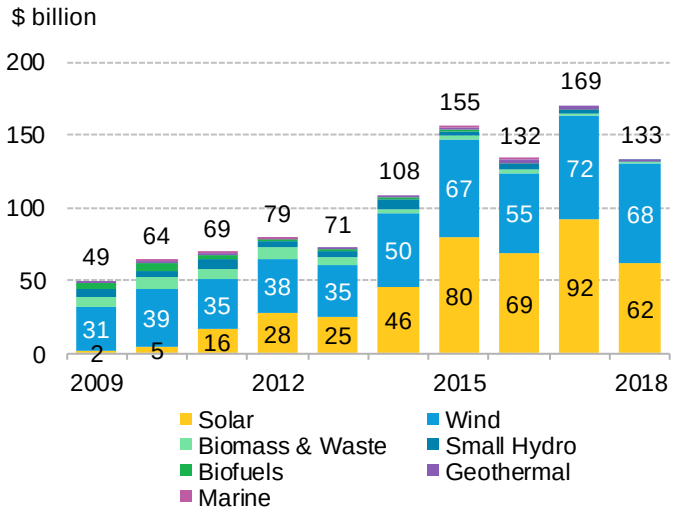


Figure 33: New-build clean energy asset finance in emerging markets, by technology



Source: BloombergNEF. Note: Includes 101 non-OECD nations, plus Chile, Mexico and Turkey. Excludes large hydro. Numbers are subject to change.

Excluding China, India, and Brazil, however, clean energy investment actually rose in 2018 to a record $34 billion (Figure 34). In this sub-set of countries, solar and wind each saw record levels of investment with solar garnering $19 billion, up from just $5 billion five years previously. This solidified its role as the most popular technology in non-China/India/Brazil emerging markets. Similarly, wind received $13 billion, a more than two-fold increase from 2013 (Figure 35).

Annual investment levels in individual nations can fluctuate dramatically year-to-year as the planning of a single large-scale project can boost capital inflows virtually overnight. However, investment across the 101 non-China/India/Brazil developing nations has generally trended up over the past decade. Mexico, Turkey, South Africa, Chile and Thailand have all been particularly noteworthy locations for investment. In 2018, it was Vietnam, South Africa, Mexico and Morocco that saw the highest levels of finance for new clean energy plants. Vietnam is of particular

interest, having received the third most total clean asset finance globally among all emerging market nations, trailing only China and India. The $5.9 billion Vietnam attracted in 2018 marked a ten-fold increase from what the country received in 2017.

Figure 34: New-build clean energy asset finance in emerging markets excluding China/India/Brazil, by country

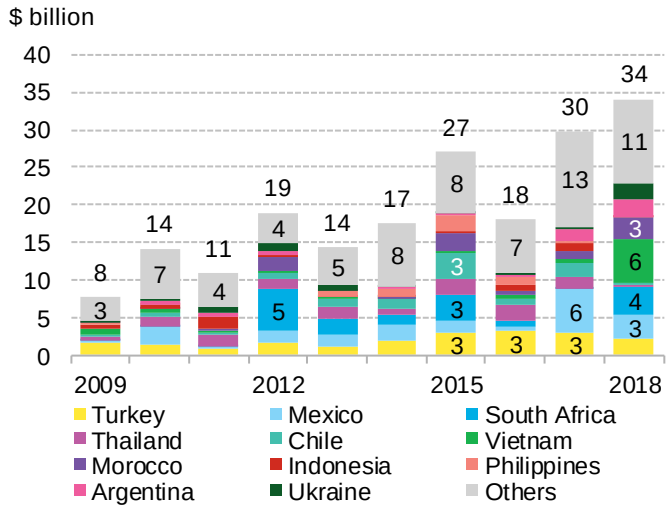
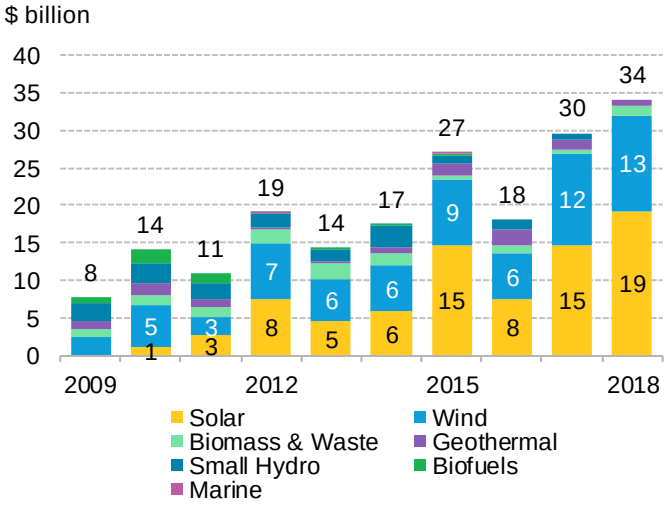


Figure 35: New-build clean energy asset finance in emerging markets excluding China/India/Brazil, by technology



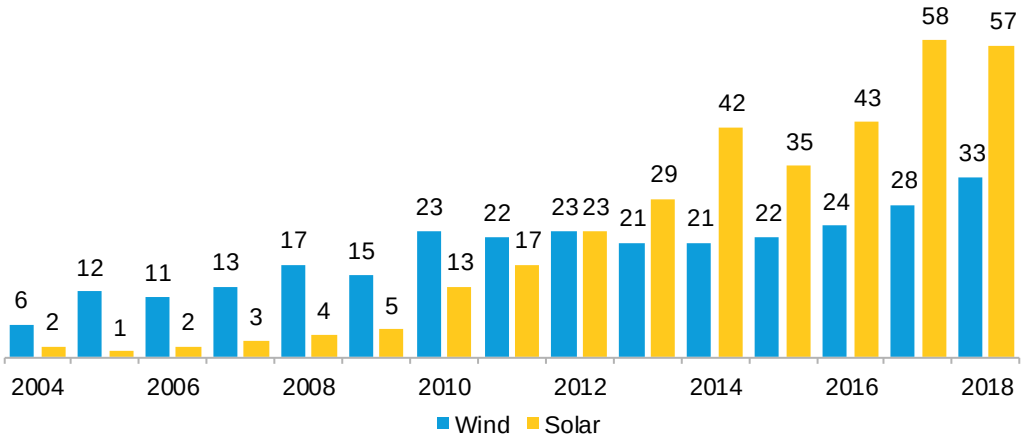
Source: BloombergNEF. Note: Includes 101 non-OECD nations, plus Chile, Mexico and Turkey. Excludes large hydro. Numbers are subject to change.

Not only are specific, less traditional markets receiving more money, but clean energy investment is going to more countries overall. No less than 65 of the total 104 markets in the Climatescope survey attracted financing for at least one substantial wind/solar project in 2018 (Figure 36). This is up from 28 in 2010 and six in 2004.

In terms of technology, in 2018 33 emerging markets received at least one investment for a utility-scale wind project, a new record for the sector. While Latin America and Asia both led the way with nine markets in each region receiving such financings, the other three regions experienced higher expansion rates. The number of markets receiving wind plant finance has doubled in the Middle East, non-EU Europe and Africa in the past five years.

In contrast, after two years of consecutive records, the number of markets receiving finance for new utility-scale solar projects stagnated at 57 in 2018 vs. 58 in 2018. Of these 57, 18 were in sub-Saharan Africa. Asia has also seen the number of countries receiving utility-scale solar finance nearly double, from nine in 2013 to 17 in 2018.

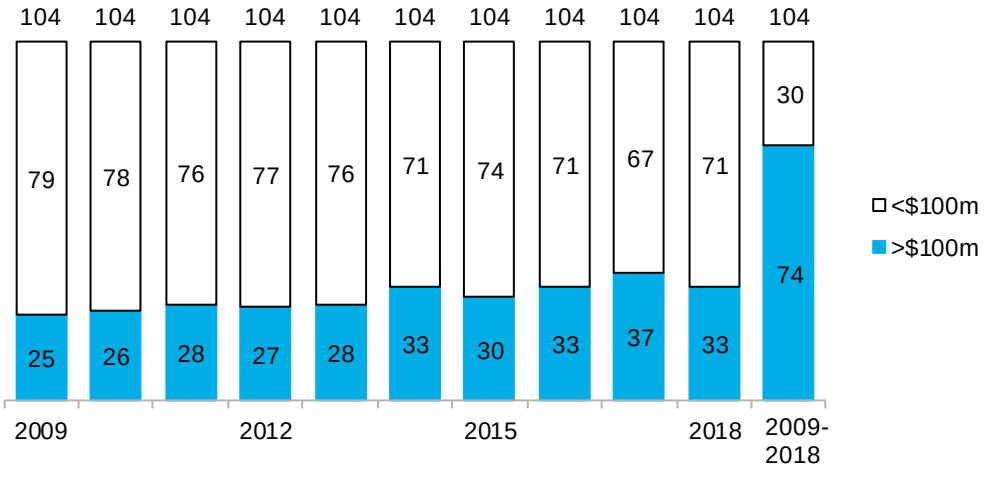
Figure 36: Number of emerging markets securing at least one utility-scale solar/wind clean energy financing in a calendar year, 2004-2018



Source: BloombergNEF. Note: Utility-scale projects are typically larger than 1.5MW. Includes 101 non-OECD nations, plus Chile, Mexico and Turkey.

While the number of countries getting into the clean energy game is clearly rising, the capital volumes many are attracting are less than spectacular. The number of markets that secure over $100 million in clean energy asset finance in a given year has essentially remained stable over the past five calendar years. In 2018, just 33 of the 104 markets analyzed attracted a total of over $100 million, down from the peak of 37 in 2017 (Figure 37). That represents enough to finance just one major solar or wind plant and is far below the levels needed to significantly accelerate the energy transition. Over the past decade, only 74 countries have received this sum at least once. The majority of countries which did not receive this level of investment is located in Africa.

Figure 37: Number of developing markets recording $100 million+ in clean energy asset finance



Source: BloombergNEF. Note: Includes 101 non-OECD nations, plus Chile, Mexico and Turkey.

Leading markets

China has been the defining market for new clean energy asset finance over the last decade, attracting a gargantuan $700 billion. This represents over two-thirds of all new clean energy asset finance for emerging markets tracked by BNEF from 2009-2018 (Figure 38). India and Brazil followed with $79.9 billion and $56.3 billion, respectively (Figure 38). Turkey ($20 billion) and Mexico ($19.5 billion) followed well behind, trailed by South Africa ($17.2 billion), Thailand ($12.7 billion), and Chile ($11.5 billion). These are the only eight developing nations that attracted double-digit billion dollar clean energy investment from 2009-2018.

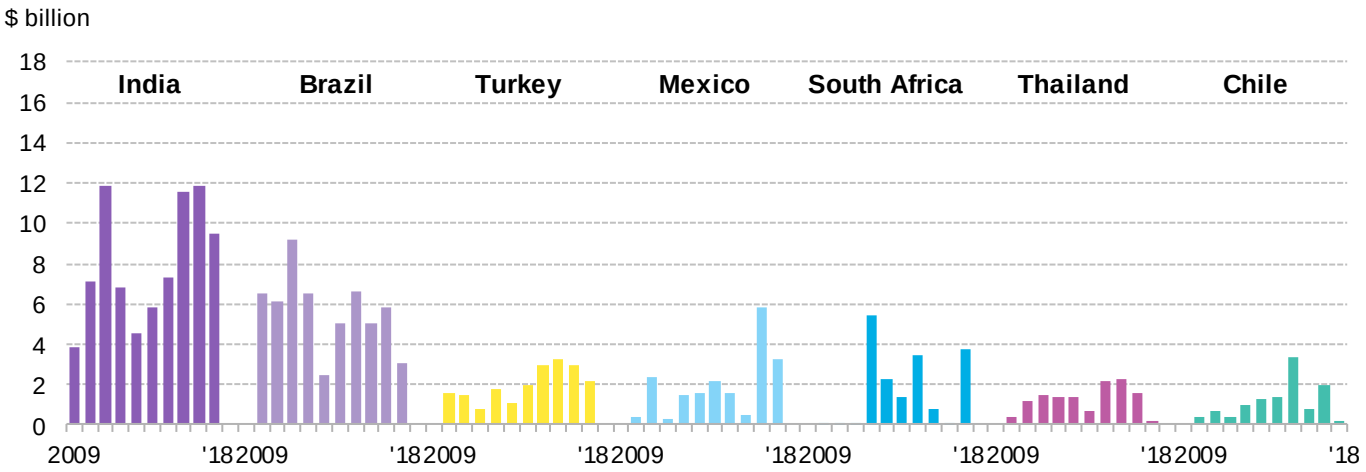
Among this group, only South Africa saw its annual investment level rise in 2018, to $3.8 billion, largely due to the success of an auction program for new clean energy delivery contracts. In April 2018, the government signed power purchase agreements with 27 projects that had won contracts under auction rounds after three years of delays. The move helped restore some confidence in the South African market among investors.

Mexico received its second-highest level of clean energy asset finance to date at $3.3 billion in 2018, yet we expect investment into the country has peaked, at least for now. The cancellation of Mexico's fourth long-term clean power auction in January 2019 has created substantial market uncertainty.

Turkey had experienced remarkably steady investment levels across the past decade with generous feed-in tariffs incentivizing solar and wind. Most recently, however, policy uncertainty, currency fluctuations and a general economic slowdown have caused investment to stagnate. The country's total clean energy investment dipped somewhat in 2018, to $2.1 billion.

Like Turkey, Thailand and Chile have seen relatively steady inflows of clean energy capital over the last decade. In Thailand, this can predominantly be ascribed to the market's generous feed-in premium and tariffs programs. In Chile, a series of successful tenders for clean power delivery contracts has driven investment.

Figure 38: The top developing countries for attracting clean energy asset finance (excluding China for scale), 2009-2018

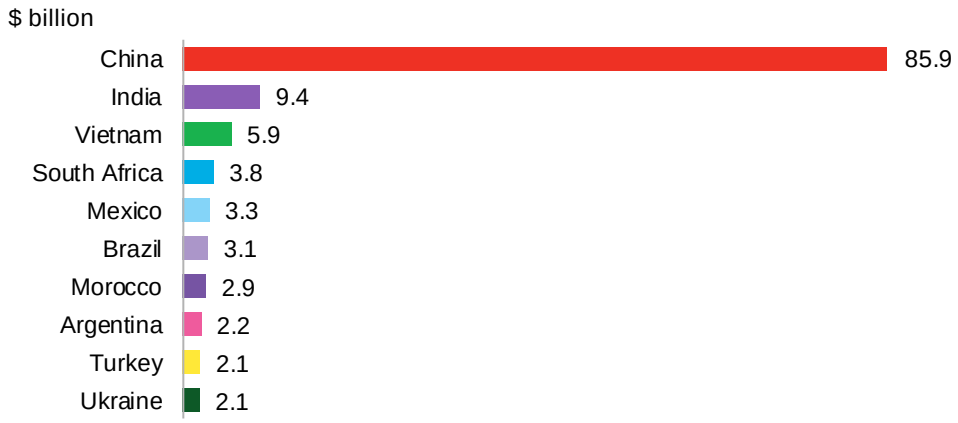


Source: BloombergNEF. Note: Only includes disclosed investment for new build asset finance. Numbers are subject to change.

The 2018 top 10

China remained the dominant developing country for clean energy investment in 2018, claiming 65% of all 2018 clean asset finance (Figure 39). Three Asian nations – China, India, and Vietnam – topped the leader board for 2018 investment. Vietnam entered the top 10 nations aside more established markets South Africa, Mexico and Brazil by securing $5.9 billion. This was primarily due to a sudden surge of capital for solar projects following the introduction of a feed-in tariff.

Figure 39: The top 10 developing nations for clean energy asset finance, 2018



Source: BloombergNEF. Note: Only includes disclosed investment for new-build asset finance. Numbers are subject to change.

2018 also saw peak investment levels for Morocco, Argentina and Ukraine. In Morocco, renewable energy has benefitted from strong state support, which has in turn attracted commercial investors. Guarantees for renewable tenders in combination with a series of auctions and general power market liberalization were key drivers of foreign clean energy investment in Argentina. In Ukraine, power sector reforms, an attractive feed-in tariff and tax incentives kicked off foreign investment.

4.2. Direct foreign investment providers

Despite disappointing headline figures for total investment, 2018 set a new record for direct foreign investment in support of clean energy projects. The $24.4 billion received by developing economies in 2018 was up $2 billion from the year prior – and was more than double the 2016 total (Figure 40).

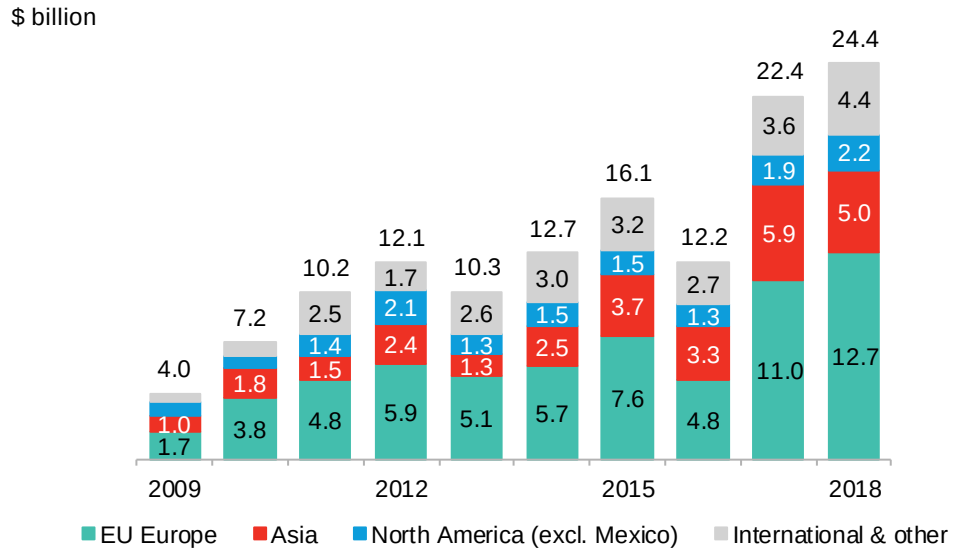
Regions of origin

EU-based institutions and companies continue to be key providers of foreign capital as investment from that region hit $12.7 billion in 2018. This represented over half of all direct foreign investment received by developing nations and a 165% jump from just two years earlier. Main European investors consisted of major utilities Enel, Engie and Iberdrola, development and commercial banks KfW, EBRD, EIB and Santander, and private equity firm Actis.

Outflows from Asia slipped to $5 billion from $5.9 billion, but Asia-based investors remain important international clean energy financiers. Unlike in the EU, in Asia most investing and lending has come from explicitly financial institutions. Heavy-hitters in 2018 included commercial

and development banks Sumitomo, Mitsubishi or JICA, the Asian Development Bank, the China Export-Import Bank and Singapore private equity group Equis.

Figure 40: Direct foreign investment backing clean energy in developing markets, by region

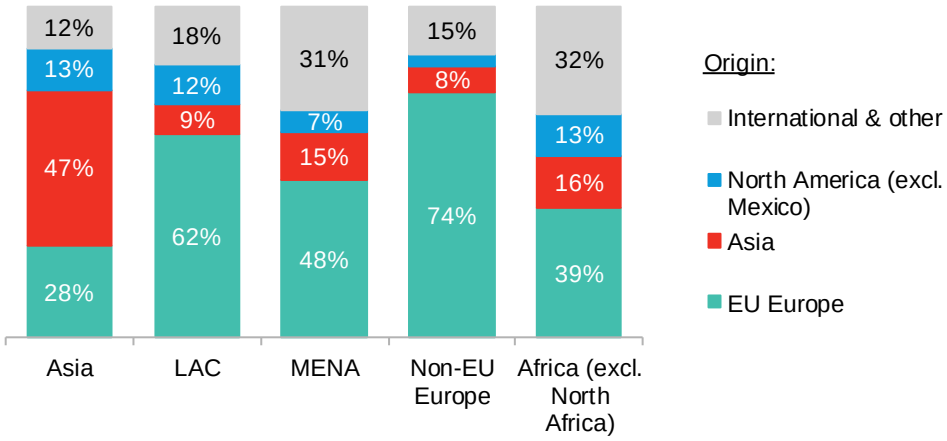


Source: BloombergNEF. Note: Includes 101 non-OECD nations, plus Chile, Mexico and Turkey. Only includes disclosed investment, does not count investments from Hong Kong to China as international. "International & other" includes finance from LAC, MENA, non-EU Europe, Oceania, Africa (excl. North Africa) as well as multinational organizations. Numbers are subject to change.

2018 constituted a record year for finance from international organizations ($1.6 billion) as well as outflows from the Middle East and North Africa ($1.7 billion). In the past five years, clean energy foreign investment from the Middle East and North Africa grew at six times the rate of that from Asia, EU Europe or international finance.

Over the past decade, investors from EU Europe dominated in all analyzed regions apart from in Asia. Asian investors were most active in Asia, where they accounted for 47% of all foreign investment provided (Figure 41), but also had a significant presence in Africa (16%) and MENA (15%). North American investors have a balanced representation between Africa, Asia and Latin America and Caribbean.

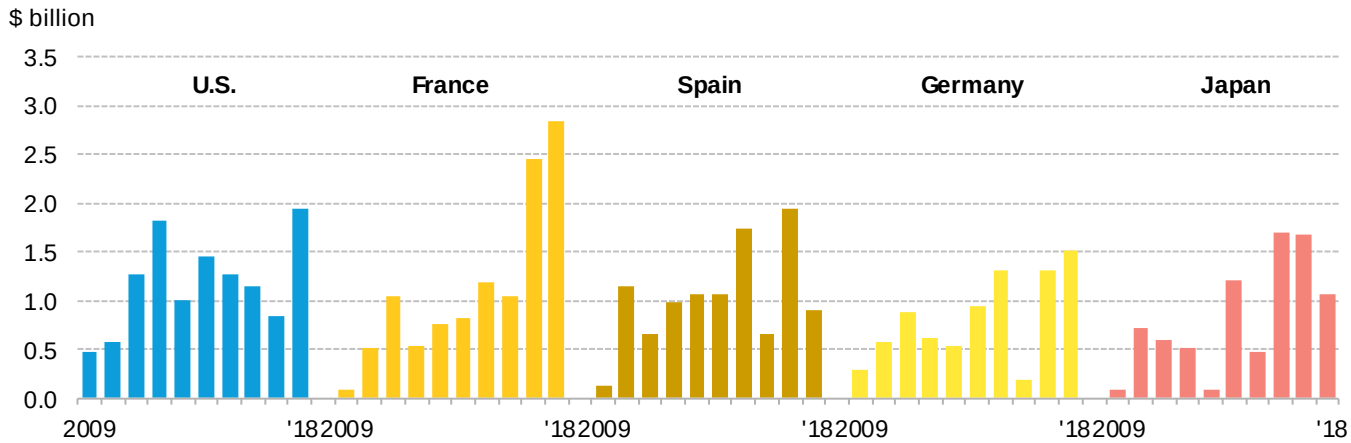
Figure 41: Emerging market foreign direct investment by region of origin, 2009-2018

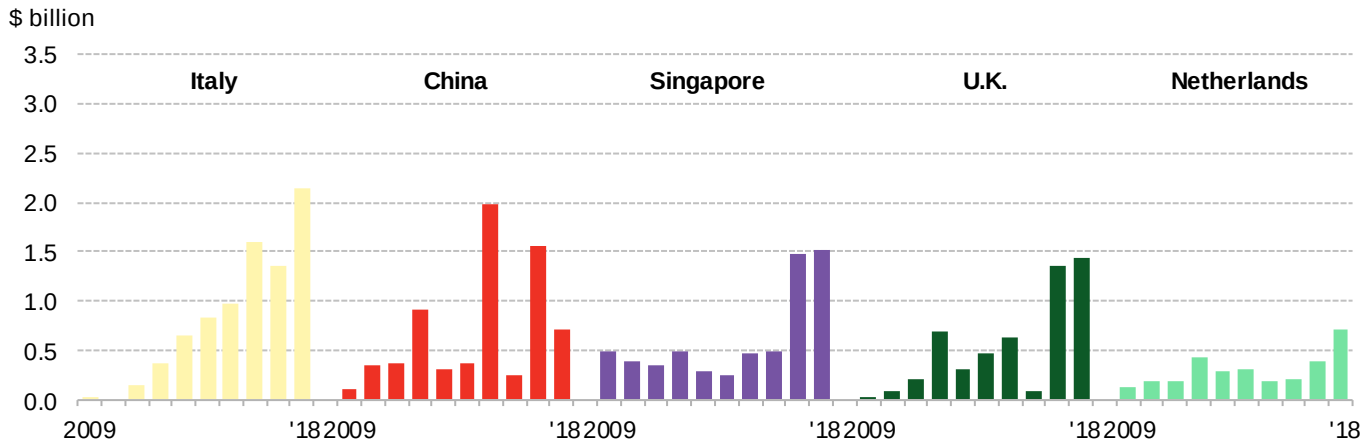


Source: BloombergNEF. Note: LAC refers to Latin America and Caribbean, MENA refers to Middle East and North Africa. Figures include 101 non-OECD nations, plus Chile, Mexico and Turkey. Only includes disclosed investment, does not count investments from Hong Kong to China as international. "International & other" includes finance from LAC, MENA, non-EU Europe, Oceania, Africa (excl. North Africa) as well as international finance.

A mere ten nations were responsible for 60% of total clean energy foreign investment to emerging markets in the past decade, with all but two being OECD countries (Figure 42). The U.S. leads the foreign clean energy investment providers ranking, with $11.9 billion deployed over the past decade, accounting for nearly all of North America's contribution. (Fundings from the World Bank and the Inter-American Development Bank, both based in Washington, are included in the "international/other" regional classification).

Figure 42: Ten largest providers of foreign clean energy investment to developing nations, 2009-2018



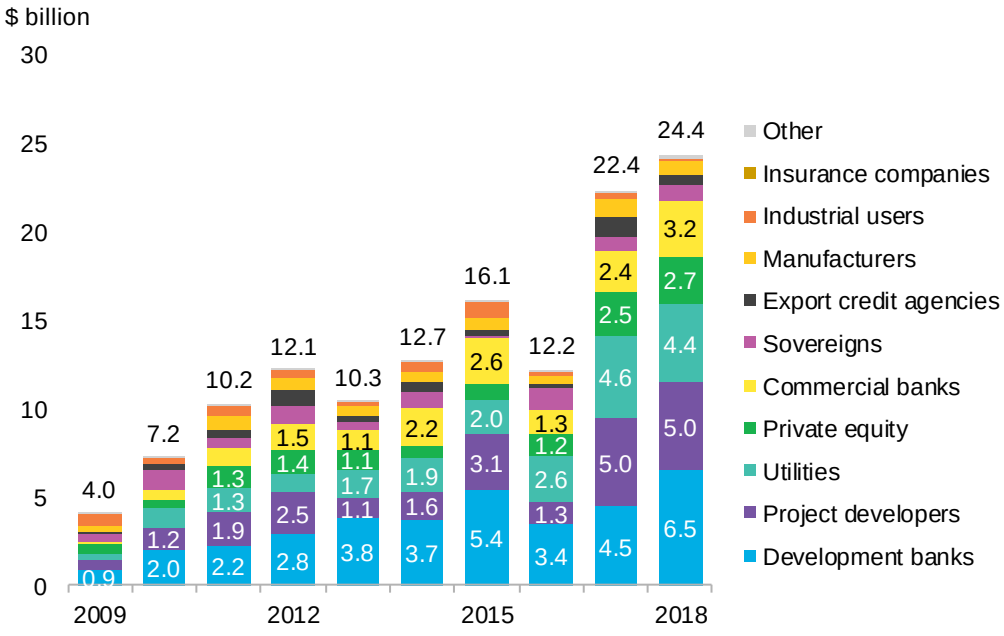


Source: BloombergNEF. Note: Only includes disclosed investment, includes foreign clean energy investment from Hong Kong in China indicator. Figures do not include multinational organizations. Numbers are subject to change.

Sector of origin

2018 saw a reverting back to the trend of development banks once again providing the single largest chunk of clean energy finance to emerging markets at $6.5 billion (Figure 43). In 2017, however, project developers accounted for the largest share. In 2018, they fell to second place at $5 billion. Nonetheless, their investment remained level in absolute terms. While utilities' contribution shrank slightly, 2018 still marked their second-largest year to date with $4.4 billion deployed. 2018 was also a record for commercial banks and private equity at $3.2 billion and $2.7 billion, respectively.

Figure 43: Emerging market foreign direct investment by investor group

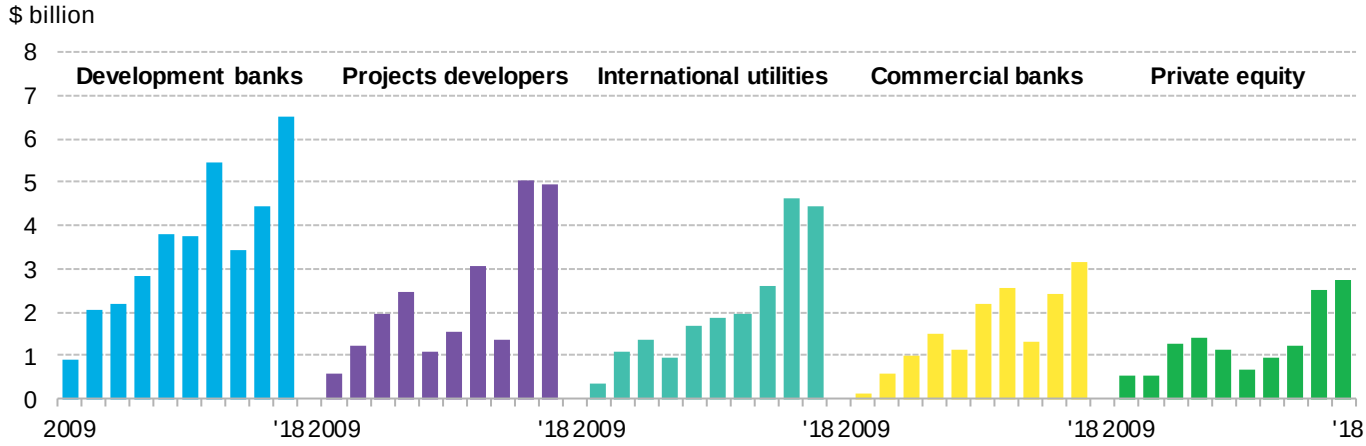


Source: BloombergNEF. Note: Includes 101 non-OECD nations, plus Chile, Mexico and Turkey. Only includes disclosed investment, does not count investments from Hong Kong to China as international. Numbers are subject to change.

Zooming out to examine the decadal trend, development banks have been by far the largest direct foreign investors 2009-2018 at 27% of total investment. Project developers and utilities are continuously covering more ground, however, especially in the last two years with their joint share in total investment standing at 43% in 2017 and 38% in 2018.

The growing importance of private finance in international clean energy flows has also been notable in recent years. Commercial banks' clean energy investment into emerging markets has nearly tripled in the past three years and private equity activity has risen 2.5-fold (Figure 44). These top five investor groups accounted for over 80% of total foreign clean energy investment to emerging markets 2009-2018, with investment levels generally rising.

Figure 44: Top foreign direct investor volumes into emerging markets, by type

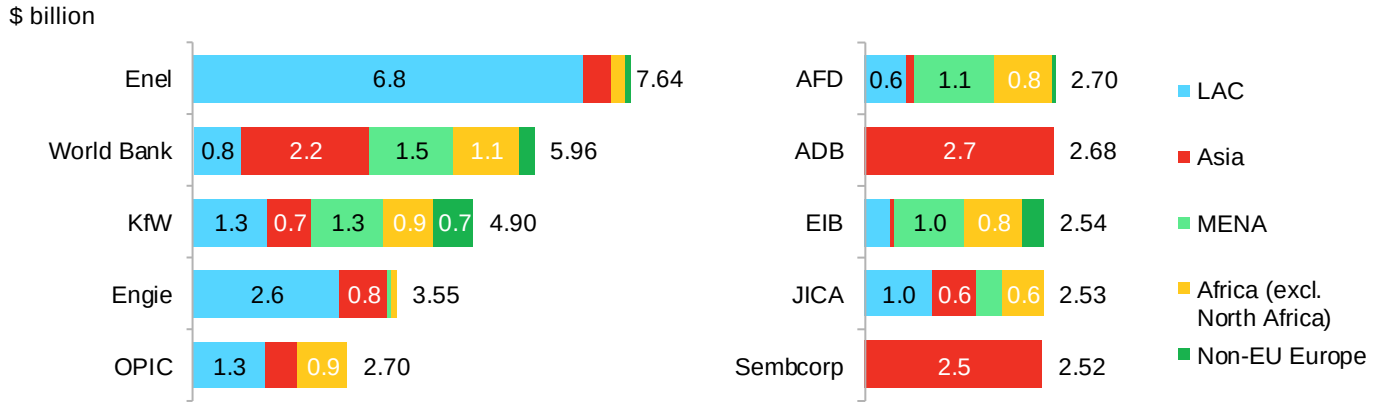


Source: BloombergNEF. Note: Includes 101 non-OECD nations, plus Chile, Mexico and Turkey. Only includes disclosed investment, does not count investments from Hong Kong to China as international. Numbers are subject to change.

In terms of individual investors, Italian utility Enel remains the top company in the past decade by a clear margin at $7.6 billion (Figure 45). While its portfolio has traditionally focused on Latin America, the company has also backed projects in Asia and non-EU Europe in 2018 for the first time in the decade. Development finance entities such as the World Bank, Germany's KfW and the U.S. Overseas Private Investment Corporation remain familiar names in the top ranks, boasting investments in all five regions. Utilities and project developers are, however, increasingly taking up more space in this list traditionally dominated by companies and banks providing development finance.

Thanks to ample investment into Asia and Latin America in 2017 and 2018, French utility Engie has propelled itself into the top four investor companies of the decade. Similarly, Singaporean developer Sembcorp is now on the decade's top ten direct foreign investors list through extensive investments in Asia in 2018. Across the decade, 39% of total investment provided by the top ten companies targeted Latin America, while 29% was directed at Asia.

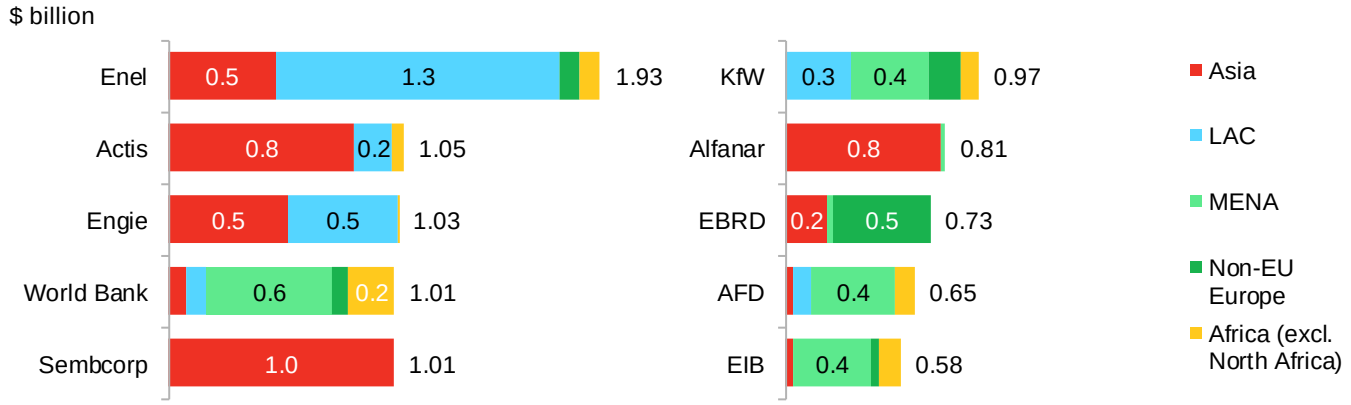
Figure 45: Top 10 emerging market clean energy foreign investors 2009-2018 and region of investment



Source: BloombergNEF. Note: KfW = Kreditanstalt für Wiederaufbau, OPIC = Overseas Private Investment Corporation, AFD = Agence Française de Développement, ADB = Asian Development Bank, EIB = European Investment Bank, JICA = Japan International Cooperation Agency. Includes 101 non-OECD nations, plus Chile, Mexico and Turkey. Only includes disclosed investment. Numbers are subject to change.

Isolating the top ten investor companies in 2018, the picture changes slightly (Figure 46). Contrary to the decade's trend of major flows to Latin America, the top ten companies in 2018 directed 41% of total finance to Asia – the highest share that any of the five regions analyzed received in that year. Fewer development finance entities were included in 2018's top ten investor companies, paving the way for British private equity company Actis and Saudi Arabian developer Alfanar, with a cumulative $1.6 billion investment into India alone. Compared to 2017, the top ten investor companies directed 40% less finance to Latin America, but doubled investment into Asia. They also upped investment into MENA 1.5-fold, into non-EU Europe over 7.5-fold and doubled flows to Africa.

Figure 46: Top 10 emerging market clean energy foreign investors, 2018



Source: BloombergNEF. Note: KfW = Kreditanstalt für Wiederaufbau, EBRD = European Bank for Reconstruction and Development, AFD = Agence Française de Développement, EIB = European Investment Bank. Includes 101 non-OECD nations, plus Chile, Mexico and Turkey. Only includes disclosed investment. Numbers are subject to change.

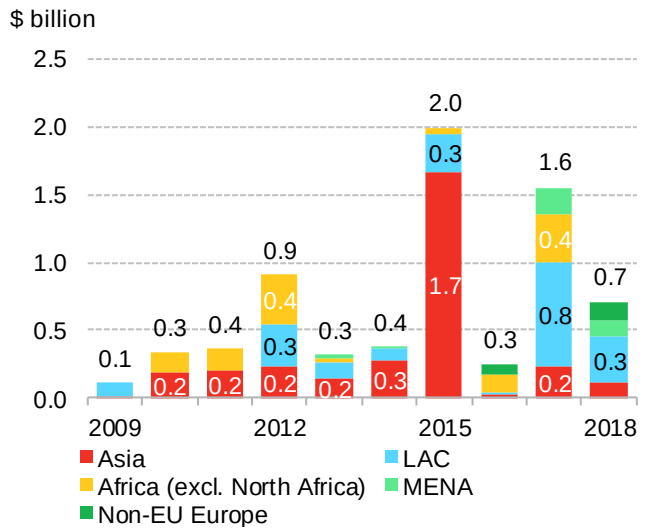
China's Belt-and-Road initiative

Given China's dominance in large-scale investments into emerging markets, this report would be incomplete without examining the country's role in clean energy investment outflows. Officially launched in 2013, China's Belt and Road initiative has been the driver behind large-scale infrastructure projects in a wide array of Asian, Middle Eastern, African and European markets. Countries well outside the historical definition of the belt/road have also received Chinese infrastructure investment, including Latin American nations.

According to the World Bank, some $575 billion have been dispensed in the context of the initiative to date, with the lion's share of investment, 46%, targeting the energy sector.[8] Many of these investments flow to large-scale fossil-based power projects, but also include large-scale hydropower plants and dams.

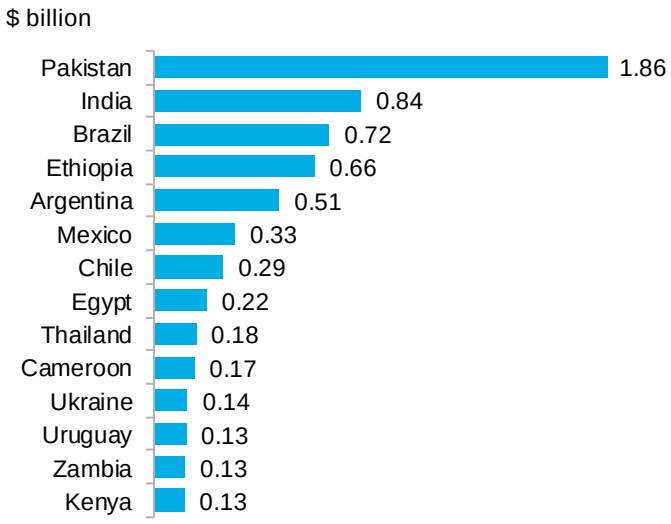
However, with just $6.9 billion directed to non-hydro clean energy projects over the past decade[9], China is a long way from becoming the primary capital provider for renewable energy in emerging markets (Figure 47).

Figure 47: Chinese foreign investment in clean energy in emerging markets, 2009-2018



Source: BloombergNEF. Note: Includes 101 non-OECD nations, plus Chile, Mexico and Turkey. Includes Hong Kong foreign investments and only includes disclosed investments. Numbers are subject to change. A fifth of these investments stem from the Export-Import Bank of China, yet a variety of commercial banks, utilities, project developers and manufacturers feature prominently in this list.

Figure 48: Primary emerging market recipients of Chinese direct foreign investment in clean energy, 2009-2018



Source: BloombergNEF. Note: Includes Hong Kong foreign investments and only includes disclosed investments. Numbers are subject to change.

China's direct foreign investment in support of clean energy has fluctuated substantially over the past five years. The $0.7 billion invested in 2018 represented less than half the funds deployed in 2017. In terms of regions, 45% of Chinese funds over the last decade have flowed to Asia. Latin

[8] World Bank Group (2019) Belt and Road Economics

[9] This figure refers to new-build clean energy asset finance only.

America received just under a third and Africa just under a fifth. In 2018, however, Latin America was the region to receive the lion's share of Chinese clean energy finance at $341 million.

Breaking China's overseas investment for 2009-2018 down by country, Pakistan has received by far the largest share with a quarter of total capital deployed (Figure 48). In addition to investment into PV and wind projects, China has also backed large hydro, gas and coal projects in Pakistan (not reflected in these numbers). Other noteworthy recipient countries from 2009-2018 are India, Brazil, Ethiopia and Argentina. Argentina and Mexico received 48% of China's total 2018 clean energy investment.

In addition to clean energy investment received, many emerging markets are experiencing Chinese power project acquisitions, which are not reflected in the above numbers. For example, purchases of wind and solar portfolios by large Chinese companies are changing Latin America's renewables landscape. Two of the five largest clean-energy project owners in the region are now China-based, up from none in 2017.

4.3. Direct foreign investment recipient regions

While total direct investment in clean energy hit a record in 2018, the funds were hardly disbursed equally across emerging markets regions. Markets in Asia, non-EU Europe and Africa (excluding North Africa) experienced record years, but Latin America, Middle Eastern and north African nations saw less activity than in 2017.

Asia

Among the major regions, Asia won the most foreign clean energy investment in 2018 at $8.8 billion (Figure 49) accounting for a third of the total. Still, foreign investment represents just 8% of total clean energy asset finance the region received in 2018 and 4% of the total attracted over the last decade.

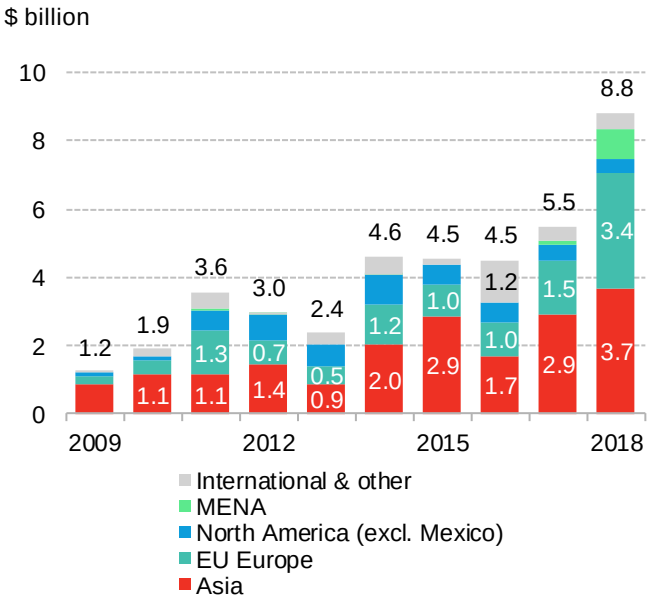
After four years of stagnation, foreign financing increased over 1.5-fold from 2017, making 2018 the highest year to date. This was mainly due to a spike of investment into India, which claimed 60% of Asia's 2018 clean energy inflows as a result of the market's auction program for clean energy delivery contracts.

While capital outflows from EU investors more than doubled between 2017 and 2018, Asian players retained their position as top foreign investors in the region at a record $3.7 billion. Another occurrence worth noting is the commencement of finance originating from the Middle East and North Africa as of 2017. This can largely be attributed to investment from Saudi Arabian developer Alfanar into India.

In terms of type of investors, project developers recorded their highest year to date in 2018, providing a third of all foreign clean energy investment to emerging markets in Asia (Figure 50). Commercial banks, international utilities and private equity firms all recorded their highest year to date as well, with foreign finance provided growing rapidly in the past three years.

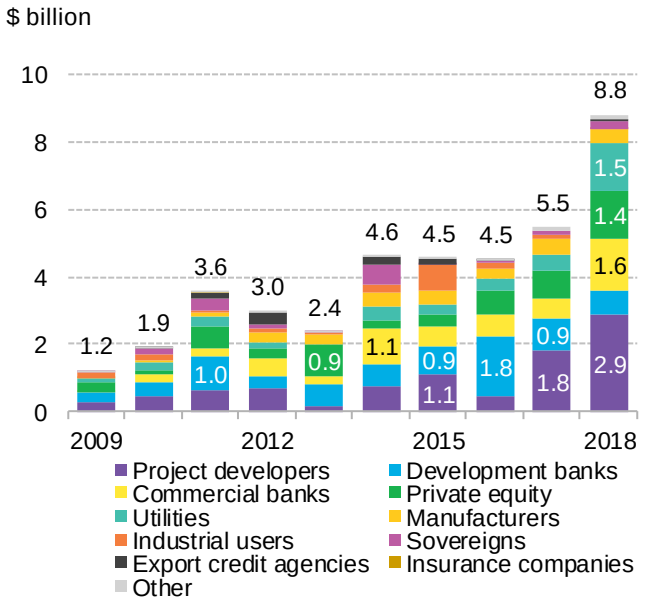
While development banks were the second largest type of clean energy investor throughout the decade, they are gradually being eclipsed by private finance as Asian power markets mature. The region is the only one in which development banks have shown consistently negative growth rates in the past three years.

Figure 49: Foreign investment inflows to Asia by region of origin



Source: BloombergNEF. Note: "International & other" includes finance from LAC, Africa (excl. North Africa), non-EU Europe and Oceania as well as international finance. Only includes disclosed investments. Numbers are subject to change.

Figure 50: Foreign investment inflows to Asia by type of investor



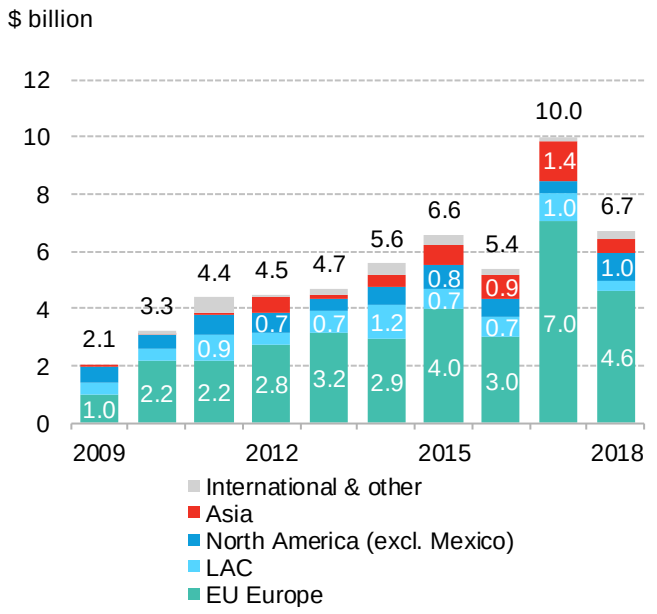
Source: BloombergNEF. Only includes disclosed investments. Numbers are subject to change.

Latin America and Caribbean

Latin America and the Caribbean saw its second-highest year ever of foreign clean energy investment inflows in 2018 at $6.7 billion, but that was a far cry from the $10 billion the region attracted in 2017 (Figure 51). Overall, however, the region has attracted the lion's share (40%) of total direct foreign clean energy flows from 2009-2018. EU-based investors once again asserted their dominance in the market in 2018, boasting over two-thirds of total investment.

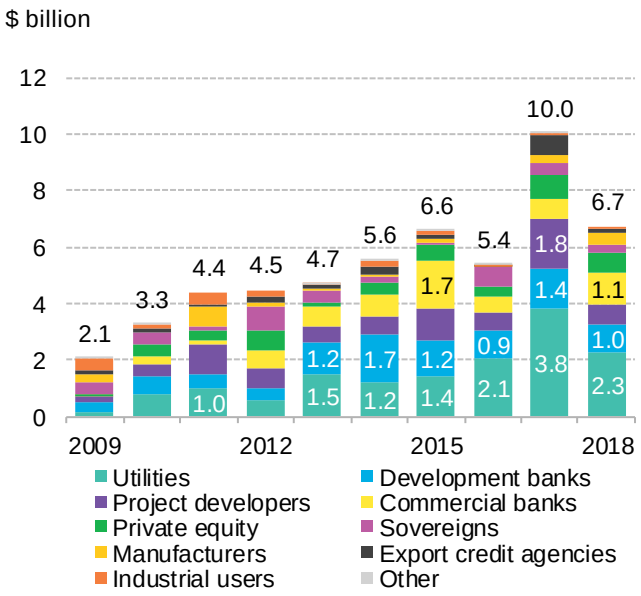
Both historically and in 2018, the dominance of EU-based investors can be attributed to the role European utilities such as Enel play in the market. Such firms account for over a quarter of the decade's investment into the region (Figure 52). As more Latin American markets have developed attractive clean energy policies, including well-structured auctions, public fundings from development bank capital has been somewhat less important as private capital has taken a greater role. Foreign investment represented 36% of total clean energy asset finance the region received 2009-2018 and 68% of the 2018 total.

Figure 51: Foreign investment inflows to Latin America by region of origin



Source: BloombergNEF. Note: "International & other" includes finance from MENA, non-EU Europe and Oceania as well as international finance. Only includes disclosed investment. Numbers are subject to change.

Figure 52: Foreign investment inflows to Latin America by type of investor



Source: BloombergNEF. Note: Only includes disclosed investment. Numbers are subject to change.

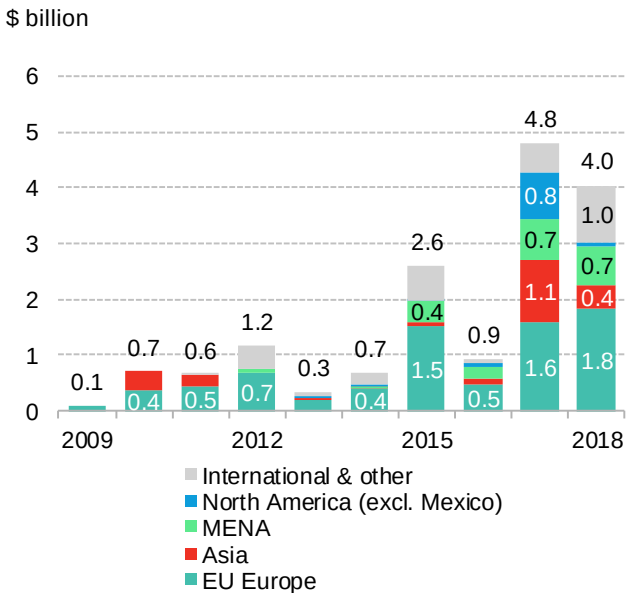
Middle East and North Africa

The Middle East and North Africa region recorded its second-highest year of clean energy inflows to date in 2018 with $4 billion, compared to a peak of $4.8 billion in 2017 (Figure 53). EU-based clean energy investors dwarfed all others, accounting for 45% of 2018 inflows and 48% of the region's investment over the decade. Since 2015, the region has seen the origins of capital become more diverse with institutions in the MENA region itself now playing a much bigger role.

European-based investors into MENA consist almost exclusively of development banks who between them provided $2.6 billion in 2018 to set a record (Figure 54). In fact, development banks have accounted for half of clean energy inflows to MENA in the past decade.

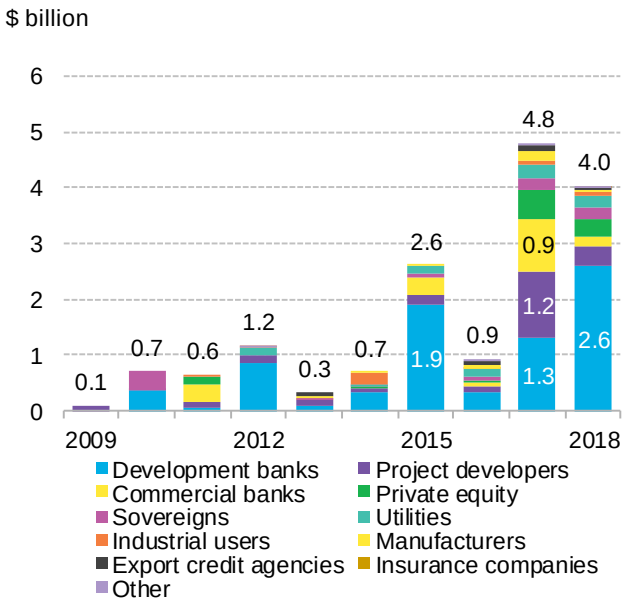
While still marginal in absolute investment terms, the array investor types supporting clean energy in MENA has become greatly diversified in recent years. In 2012, only five types of clean energy investors provided capital with development banks accounting for the vast majority. In 2018, 11 investor types participated in MENA but with development banks still making up 64% of foreign investment. Foreign investment represented 60% of total clean energy asset finance the region received 2009-2018 and 69% of 2018 investment.

Figure 53: Foreign investment inflows to MENA by region of origin



Source: BloombergNEF. Note: "International & other" includes finance from LAC, non-EU Europe and Oceania as well as international finance. Only includes disclosed investment. Numbers are subject to change.

Figure 54: Foreign investment inflows to MENA by type of investor



Source: BloombergNEF. Note: Only includes disclosed investment. Numbers are subject to change

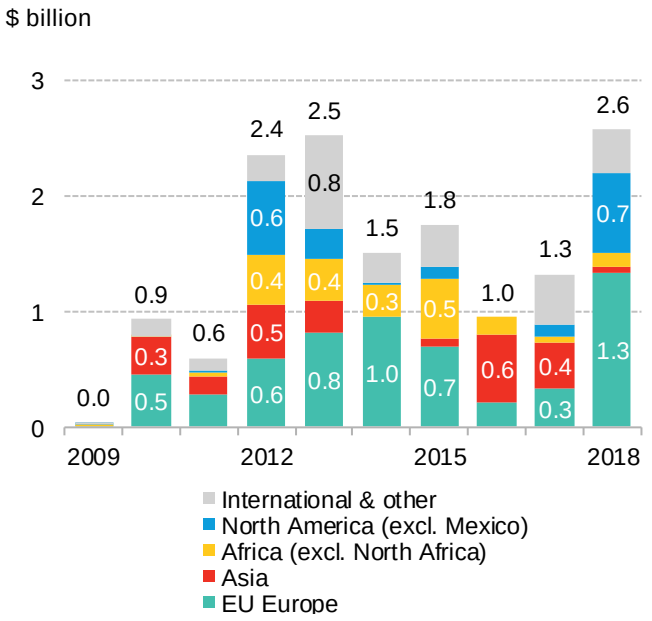
Africa (excluding North Africa)

In absolute numbers, sub-Saharan Africa experienced a record year of clean energy inflows in 2018 at $2.6 billion but the figure was quite similar to totals in 2012 and 2013 (Figure 55). Kenya and to a lesser extent South Africa were primarily responsible, accounting for just under two-thirds of the 2018 total. Africa has received just over one-tenth of total foreign flows from 2019-2018.

EU-based investors accounted for half of 2018 flows to Africa, their most to date, but Asian, North American and African investors have also participated over the last decade. Flows from North America hit their highest level in 2018, but there was notably less support from Asian and African investors than in previous years.

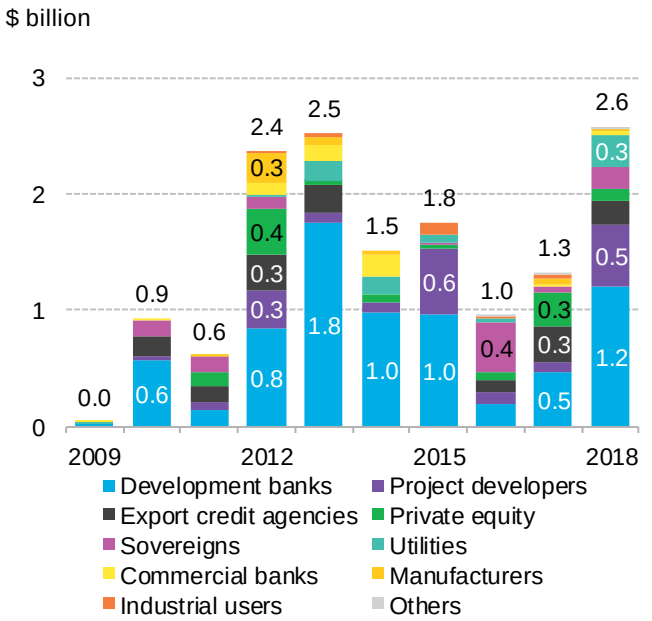
As African nations are perceived to be less mature and riskier to investors than Asian and Latin American markets, development banks account for just under half of 2018 and the decade's clean energy flows received (Figure 56). Other types of investors have fluctuated significantly 2009-2018, but in 2018 project developers and utilities were the next largest investors after development finance, with utilities marking their largest year to date. Compared to other regions, both investor type and investment volumes are much more volatile in sub-Saharan Africa. Development finance has proven the main constant over the past decade and this seems unlikely to change in the near future. Foreign investment accounted for 47% of total clean energy asset finance that the region received 2009-2018 and 44% of the 2018 total.

Figure 55: Foreign investment inflows to sub-Saharan Africa by region of origin



Source: BloombergNEF. Note: "International & other" includes finance from MENA and non-EU Europe as well as international finance. Only includes disclosed investment. Numbers are subject to change.

Figure 56: Foreign investment inflows to sub-Saharan Africa by type of investor



Source: BloombergNEF. Note: Only includes disclosed investment. Numbers are subject to change.

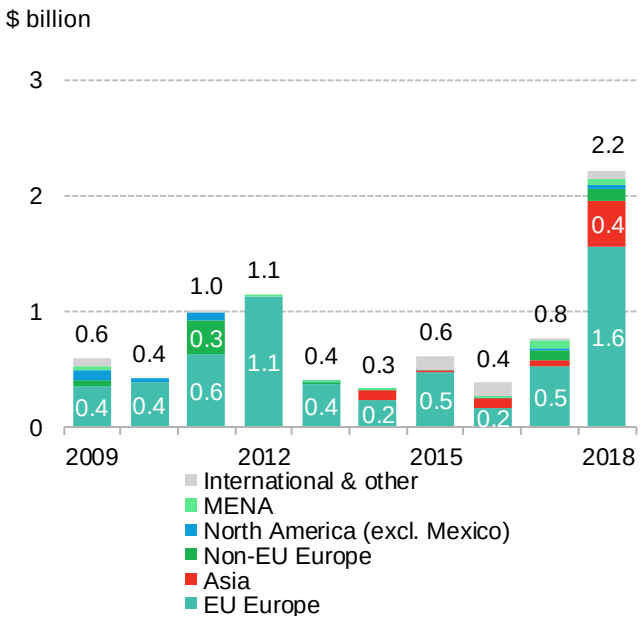
Non-EU Europe

In 2018, non-EU Europe set a record for clean energy investment attracted at $2.2 billion. The 2018 sum represented over a quarter of the region's total in the past decade (Figure 57). The spike was mainly due to a huge jump in flows to Ukraine, which took in $801 million in 2018 compared to $46 million in 2017. Turkey, Russia and Serbia each also saw big gains. Over the past decade, non-EU Europe has received just 6% of total clean energy capital invested in emerging markets – the least by far of the five regions analyzed in Climatescope.

EU-based investors have traditionally been the biggest supporters of non-EU European clean energy investment and in 2018 they tripled their prior year's commitment to $1.6 billion. While they are set to remain the dominant source of financing for some time, Asia-based investors have also been active in the region since 2014 and played a bigger role in 2018.

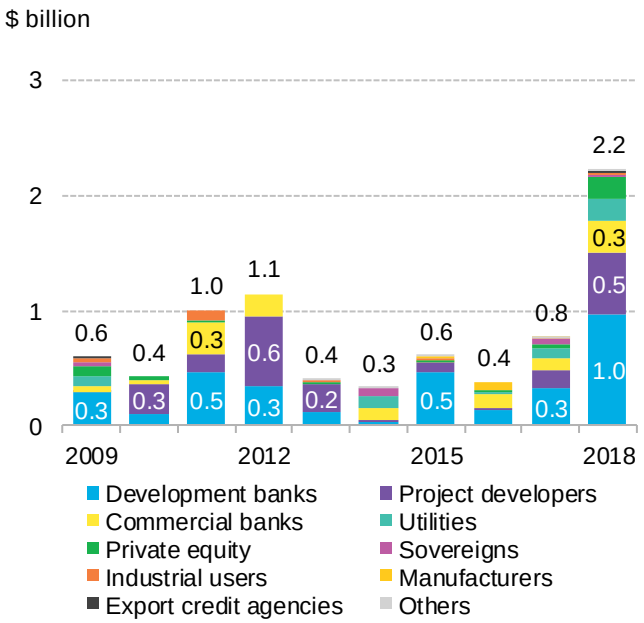
Development banks represent the only type of investor to have consistently made sizeable annual clean energy investments into the region in the past decade, accounting for 41% of flows. In 2018, these institutions set an annual record by deploying just under $1 billion (Figure 58). The European Bank for Reconstruction and Development and Germany's KfW accounted for a quarter of 2009-2018 fundings. Developers were next in line, with Austria's Activ Solar and France's Akuo Energy responsible for just under half of investment in the period. The past three years have seen an increase in clean energy finance from utilities, commercial banks and private equity players, with 2018 marking a record year for all three. Foreign investment represented 22% of clean energy asset finance the region received 2009-2018 and 32% of the 2018 total.

Figure 57: Foreign clean energy investment inflows to non-EU Europe by region of origin



Source: BloombergNEF. Note: "International & other" includes finance from LAC and Oceania as well as international finance. Only includes disclosed investment. Numbers are subject to change.

Figure 58: Foreign clean energy investment inflows to non-EU Europe by type of investor



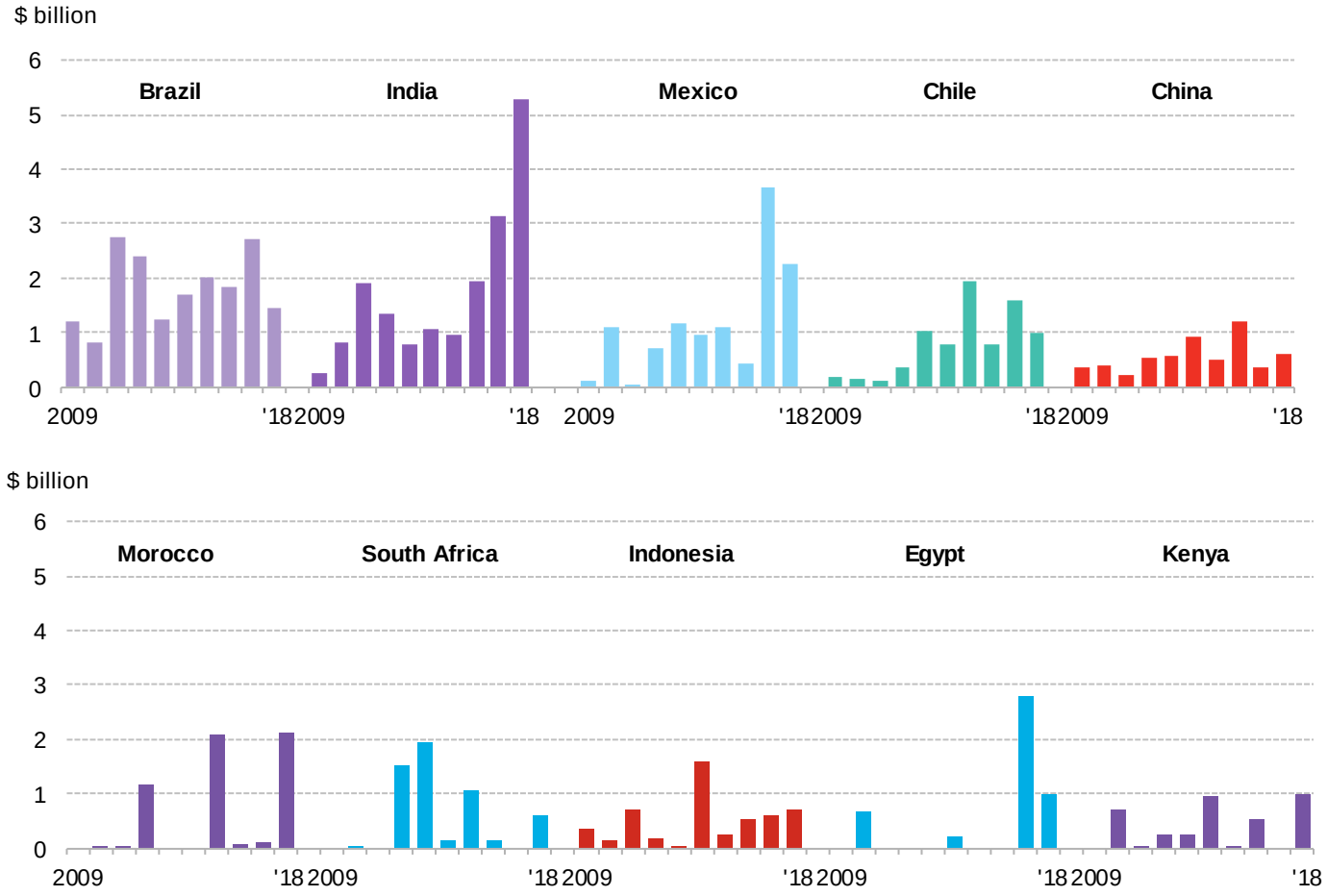
Source: BloombergNEF. Note: Only includes disclosed investment. Numbers are subject to change.

Top markets

Shifting from the regional to the country-level view, the top ten recipient markets of clean energy inflows from abroad over the past decade all had a somewhat muted 2018 (Figure 59). Brazil remains the top recipient of clean energy foreign investment, yet is set to be eclipsed by India in the near future. All Latin American markets in the ranking marked a significant drop in investment, while all Asian markets on the list enjoyed an increase, particularly India.

Morocco and Kenya both set records in 2018 for annual investment but barely topped previous peaks. While contracting significantly compared to 2017, clean energy flows to Mexico and Egypt were nonetheless the second-highest recorded in the past decade due to successful auction programs.

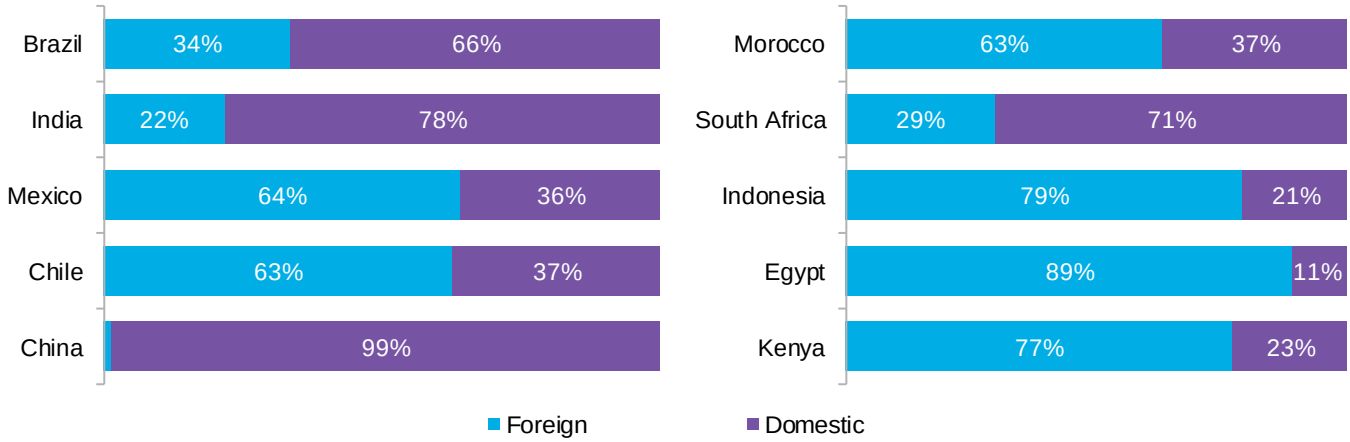
Figure 59: Top 10 emerging markets for international clean energy investment, 2009-2018



Source: BloombergNEF. Only includes disclosed investment, includes Hong Kong's foreign clean energy investment in China indicator. Numbers are subject to change.

The role foreign capital plays in clean energy markets varies greatly by country (Figure 60). Across the top 10 countries for total investment 2009-2018, about half of all investment has come from abroad with the rest provided domestically. That said, in Brazil and India, the top two markets in absolute terms for receiving foreign investment, the volume of capital provided locally has dwarfed foreign inflows. In China, the largest market overall by far for clean energy financings, the vast majority of the capital has been domestic.

Figure 60: Share of disclosed foreign asset finance in select emerging markets, 2009-2018



Source: BloombergNEF. Only includes disclosed investment, counts investment between Hong Kong and China as national.

Other markets, such as Indonesia, Egypt and Kenya rely predominantly on foreign finance. Over a third of Indonesia's foreign inflows over the last decade have originated from commercial banks, while development banks and sovereigns have contributed roughly a fifth. In Egypt, development banks and project developers are the main foreign investors, at 37% and 25% of 2009-2018 foreign clean energy inflows. Well over half of Kenya's inflows stem from development banks, with sovereigns and project developers contributing 15% and 11%, respectively.

Section 5. Enabling environment

Clean energy investment tends to flourish in countries with well-constructed enabling environments. What does that mean? Typically, markets with liberalized power markets and policies supporting renewables that are clear, consistent and sufficiently funded. Here we examine factors that allow clean energy to thrive and which countries have most effectively established these.

5.1. Power markets

As discussed earlier, renewables in many markets today can provide the grid with the least-cost megawatt-hour of generation thanks to lower equipment costs and higher capacity factors. For clean energy developers, this cost advantage can be most easily exploited in markets where wind and solar can compete as directly as possible with fossil sources of generation.

Climatescope's survey of 104 developing countries reveals the clear correlation between a country's power market structure and the amount of investment it attracts. An "unbundled", non-monopolized power sector open for private generation has historically proven more welcoming of renewable energy investment. The table below illustrates power sector details for the 10 emerging markets that top our five-year clean energy investment ranking and the share of foreign investment each received (Figure 61).

Figure 61: Power sector details and investment in top developing countries for clean energy asset finance, 2014-2018

Market	5-year clean energy investment ($ billion)	Share of foreign investment	Power sector details			
			Utility unbundled	Generation open for private investment	PPA available in U.S. dollars or Euros	PPAs above 15 years
China	500	1%	Yes	Yes	No	No
India	45.9	27%	Yes	Yes	No	Yes
Brazil	25.5	38%	Yes	Yes	No	Yes
Mexico	13.2	64%	Somewhat	Yes	Yes	Yes
Turkey	13.2	11%	Yes	Yes	Yes	No
South Africa	9.4	21%	No	Yes	No	Yes
Chile	7.8	78%	Yes	Yes	Yes	Yes
Vietnam	7.4	19%	Somewhat	Yes	No	Yes
Thailand	6.9	7%	Somewhat	Yes	No	Yes
Morocco	6.8	64%	Somewhat	Yes	Yes	Yes

Yes Somewhat No

Source: BloombergNEF, Climatescope. Note: PPAs are power-purchase agreements.

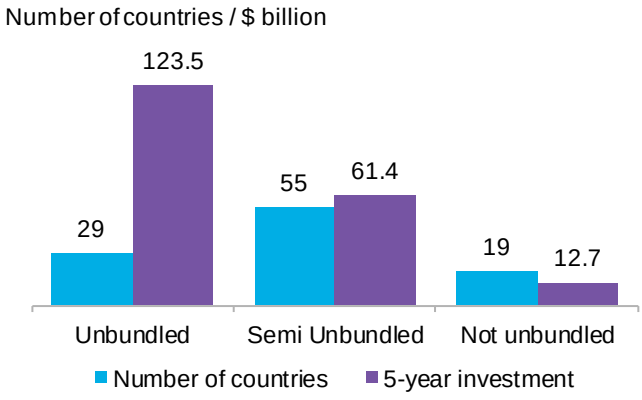
Markets with totally unbundled power sectors captured almost 10 times more clean energy asset finance for new plants over the past five years (excluding China) than fully "bundled" markets. An unbundled market has all segments (generation, transmission and distribution) managed independently. A bundled market has generation, transmission and distribution fully controlled by just one entity, typically a vertically-integrated monopoly. In semi-unbundled markets, generation is independent, with other segments managed by a single entity.

Bundled markets attracted just 0.6% of 2014-2018 clean energy investment across the 104 markets surveyed. The 29 countries with unbundled power sectors accounted for two-thirds of the total while the 55 semi-unbundled power markets accounted for nearly all the rest (31%) (Figure 62).

Markets where generation is managed independently (unbundled and semi-unbundled) are also more attractive to foreign investors. Together, they received $81.2 billion of 2014-2018 clean energy inflows, compared to the just $2.8 billion that went to bundled power markets (Figure 63).

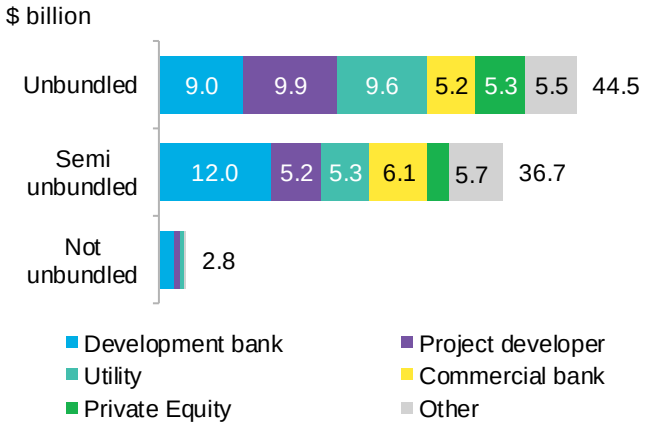
Foreign investor types also vary by power sector structure. In fully bundled markets, public capital in the form of development banks accounts for 55% of total foreign investment. This drops to 32% in semi unbundled markets and 20% in fully unbundled countries. In unbundled markets, private finance plays a bigger role. In such countries, project developers, utilities and private investors account for the lion's share of foreign investment.

Figure 62: 2014-2018 new-build clean energy asset finance by structure of power sector (excluding China)



Source: BloombergNEF, Climatescope

Figure 63: 2014-2018 disclosed foreign direct investment by country power sector structure (excluding China)



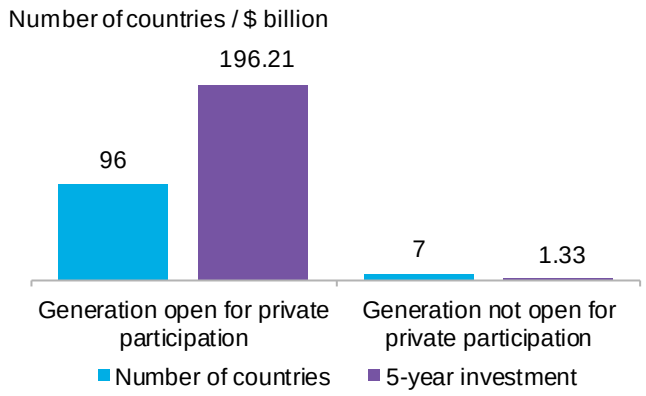
Source: BloombergNEF, Climatescope. Note: includes disclosed foreign investment deals only

Not surprisingly, another important element directly linked to the volume of investment a country receives is whether or not generation is open for private investment. Climatescope research shows that of the 104 markets surveyed, 97 had generation open for private investment, while just seven markets do not.

From 2014-2018, 96 economies with power sectors open for private participation (excluding China) received $196 billion in clean energy investment, an average of just over $2 billion per country. The seven markets not open for private generation attracted just $1.3 billion, or $0.19 billion per country (Figure 64).

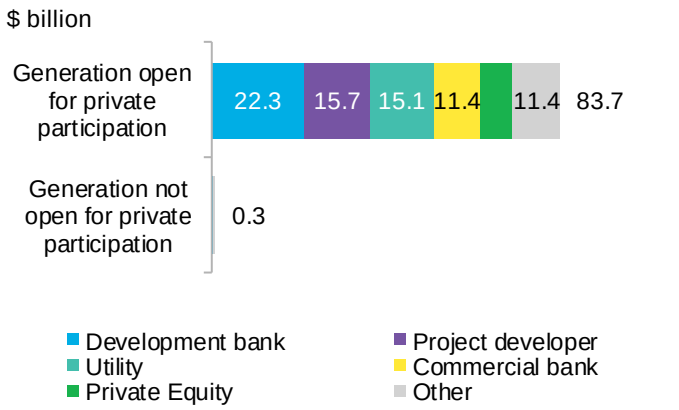
An even starker divide exists between countries that do and do not allow private ownership of generation assets. Not including China, countries that allow private generation received $83.7 billion from 2014-2018 from foreign investors, or 46% of all such investment over the period. Countries not open to private ownership of generation attracted just $0.3 billion, mostly from development banks (Figure 65).

Figure 64: 2014-2018 new-build clean energy asset finance, by structure of power sector (excluding China)



Source: BloombergNEF, Climatescope

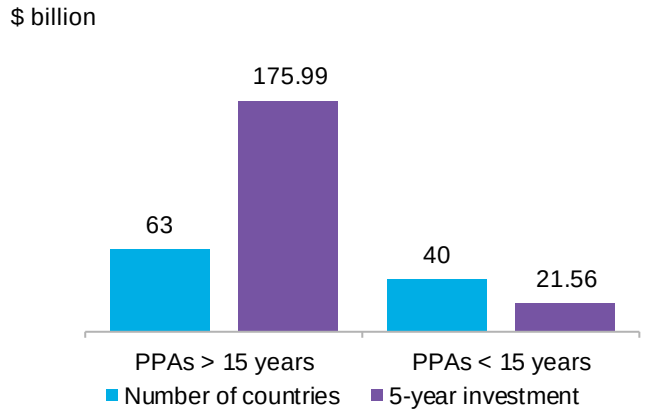
Figure 65: 2014-2018 disclosed foreign direct investment by power sector structure (excluding China)



Source: BloombergNEF, Climatescope. Note: includes disclosed foreign investment deals only

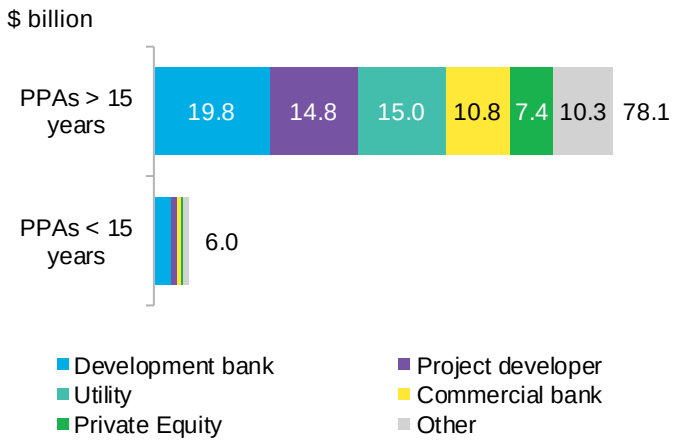
The types of contracts project developers can sign to provide power also heavily influence finance flows. Markets that offer power-purchase agreements 15 years or longer in duration have historically attracted far more investment than those with shorter-duration contracts. The 63 Climatescope markets offering 15-year PPAs attracted $176 billion 2014-2018, an average of $1.2 billion per country. The other 40 economies surveyed in Climatescope (excluding China) received $21.6 billion, or just $0.15 billion per market (Figure 66).

Figure 66: 2014-2018 new-build clean energy asset finance, by duration of PPAs (excluding China)



Source: BloombergNEF, Climatescope

Figure 67: 2014-2018 disclosed foreign direct investment by investor type and duration of PPA (excluding China)



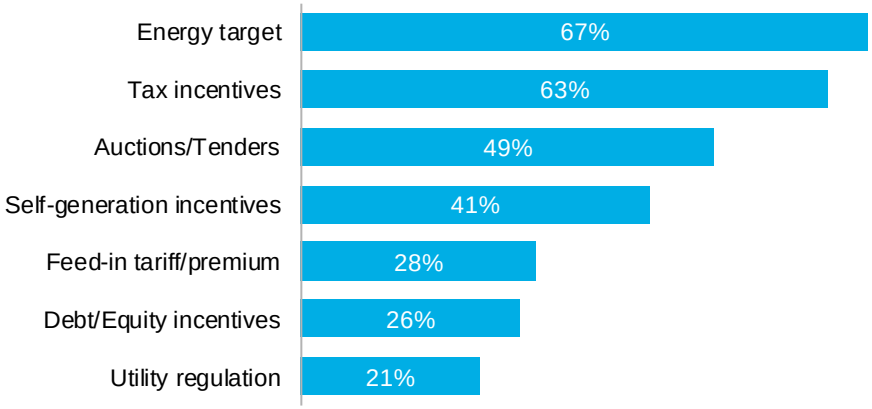
Source: BloombergNEF, Climatescope. Note: includes disclosed foreign investment deals only.

5.2. Policies

A decade ago, policies explicitly intended to bolster clean energy development were few and far between in emerging economies. A confluence of factors, including growing concerns about climate change and renewables' improving economics, have dramatically changed that, however. Among the 104 emerging markets surveyed for Climatescope, just ten had no clean energy policies of any sort in place as of year-end 2018.

Of those policies that are on the books, renewable energy targets are most popular. These are in place in two-thirds of the markets analyzed, or 70 markets. This is followed by tax incentives, which are present in 63% of the countries and clean energy auctions, available in 49% of the markets studied (Figure 68).

Figure 68: Share of Climatescope markets with policy in place



Source: BloombergNEF, Climatescope

Renewable energy targets

Setting targets represents the starting point for most renewable energy policy frameworks. However, an objective alone is not enough to create a vibrant local clean energy sector. Targets must be accompanied by more specific policies that ensure stakeholders have sufficient incentives to act. In a sign that a growing number of policy-makers recognize this, over half the emerging markets Climatescope tracked with clean energy targets on their books have at least three other policy types as well.

India, for example, has some of the most ambitious renewable energy targets in the world and aims to reach 175GW clean energy capacity by 2022, and 500GW by 2030. That is accompanied by several other policies to ensure the goal could potentially be achieved. In 2018, India was the world's largest renewables auction market, contracting 19GW from wind and solar.

Tax incentives

Tax incentives are the second most popular renewables support mechanism in emerging markets and their popularity predates the recent wave of renewables targets. This can partly be explained by the formerly high cost of renewables and the relatively low levels of deployment. Indeed, from a government's perspective, tax incentives are not terribly costly so long as build/investment levels and the associated tax revenues foregone are low. Tax incentives are a relatively blunt mechanism that, similarly to clean energy targets, tend to fail if not combined with other

incentives. It is also worth noting that such incentives can typically be removed relatively easily as tax policies are often reviewed annually. Their impact can also be offset through separate levies and duties.

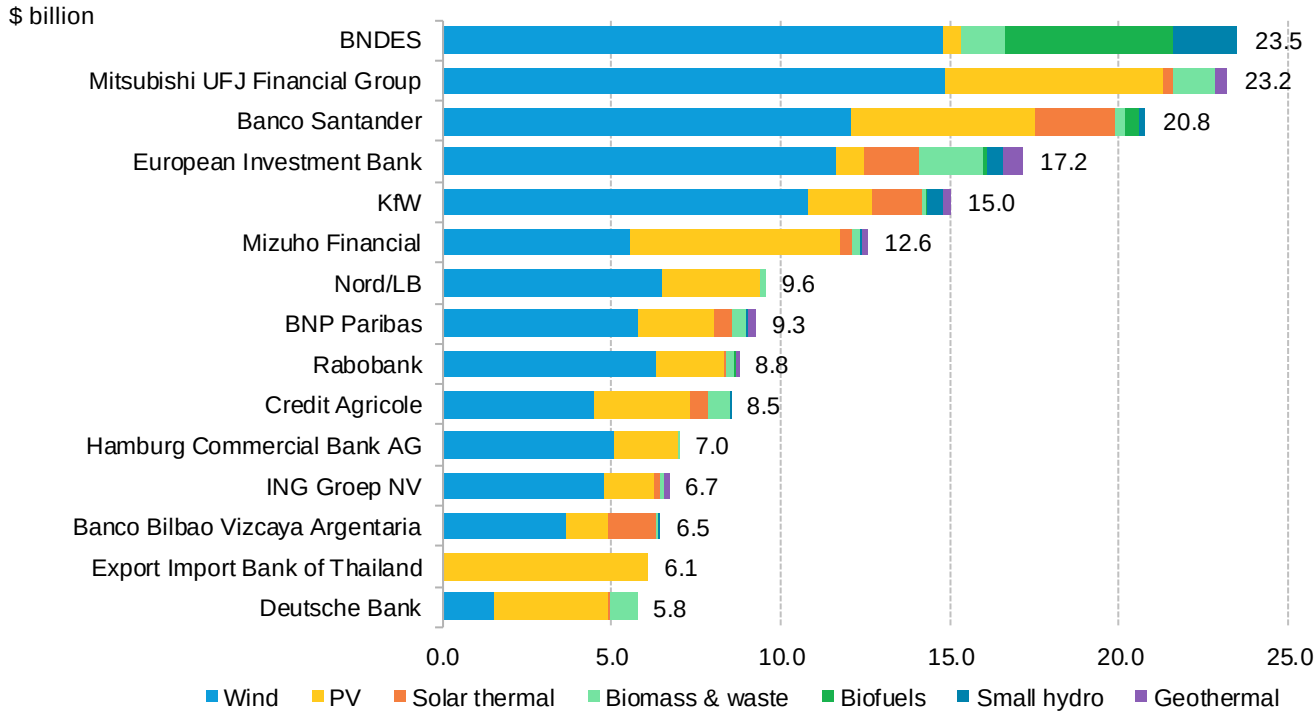
Debt incentives

Debt incentives have proven to be extremely effective when well designed as they address the major challenge of access and cost of finance in emerging markets. Brazil's national development bank BNDES, for example, dominates clean energy lending thanks to below-market rates and generous terms. From 2009-2018, BNDES provided over $23.5 billion to clean power plants, making it not just the largest clean energy lead arranger in Brazil, but worldwide (Figure 69).

Concessional loans were key to helping Brazil's clean energy sector mature, but now the country's wind and solar sectors are no longer in need of subsidized capital. In Brazil and other mature markets, concessional finance is likely to have a higher impact if directed to newer and less mature technologies than conventional wind and PV[10].

In line with that, in 2018 BNDES changed the methodology it uses to calculate its rates. Those are now slated to increase gradually for new loans until 2023 when they reach par with commercial levels. Between now and then, we expect development banks' contributions to fade somewhat as private capital takes a more prominent role.

Figure 69: Top global clean energy project lenders, 2009-2018



Source: BloombergNEF. Note: data includes all markets, not only emerging markets.

[10] For more details, see the report Clean Technology Fund and Concessional Finance: Lessons Learned and Strategies Moving Forward, commissioned by the Climate Investment Funds and produced by BloombergNEF.

Feed-in Tariffs

Along with clean energy auctions, feed-in tariff (FiT) mechanisms have supported the vast majority of renewables build to date. While less popular than five years ago, FiTs remain particularly effective in supporting development of projects that might otherwise be deemed too small for reverse auctions.

However, as clean technology costs have fallen to allow renewables to compete on price with thermal plants, governments are moving away from this incentive toward competitive auction mechanisms. As of year-end 2017, FiTs were on the books in a third of Climatescope nations. In 2018, that fell to 28%.

China's generous FiTs that were the norm for much of the past decade, for instance, are now coming to an end. Subsidy-free projects and those that win auctions in competitive tenders will define the market in 2019-2020, unless things change dramatically. The government has signalled that post-2020 it plans to remove all remaining subsidies.

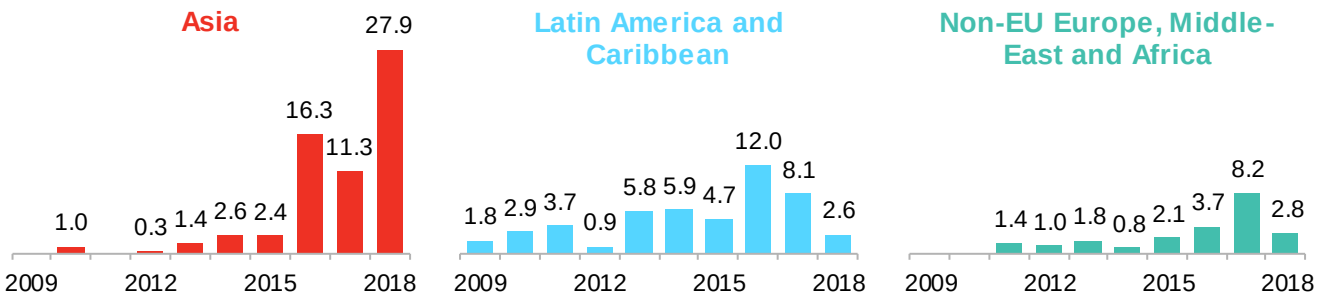
Auctions

Hoping to better manage overall build while keeping a lid on public liabilities, governments have increasingly turned to reverse tenders or auctions for procuring new clean energy supply. Auctions have proven effective at driving down clean-energy tariffs awarded to projects while giving regulators better control over volumes of renewables added to the grid. As a result, they are the mechanism of choice to secure clean energy contracts of nearly half of the markets surveyed by Climatescope.

Over the past ten years, emerging markets have awarded over 133GW of clean energy capacity in PPAs via competitive auctions, of which a fourth was contracted in 2018 alone. With a boom in 2018, Asia now leads the way with 63GW contracted over the period, mainly in India and China. India alone contracted over 40GW since 2012 and almost 30GW since 2017, when it moved away from FiTs (Figure 70).

Latin America, which pioneered the use of competitive mechanisms to secure low bids, has contracted over 48GW for renewables to date via auctions. After a peak of 12GW signed in 2017, contracts awarded fell to just 2.6GW in 2018, all in Brazil. The significant decline was due to a stall in activity in Chile, Mexico and Argentina.

Figure 70: Clean energy delivery contracts signed annually under organized auctions, by region (GW)



Source: BloombergNEF

The Kazakhstan government announced in January 2018 it would hold Central Asia's first renewable energy tender. This reverse auction was slated for May 2018 and concluded in October 2018 by contracting a total of 1GW capacity from wind, PV, biofuel and hydro projects.

Cambodia and Colombia are examples of countries that kicked off auction programs in 2019. With nearly no solar capacity, Cambodia leapfrogged to an auction mechanism in 2019. The country's first solar auction attracted 26 bidders, including international companies, and registered a record low bid for the Southeast Asian region at $38.77/MWh.

Colombia, after a misfire in February, held its first successful renewable energy auction in October 2019, contracting 1.4GW of wind and solar projects on October 23. For the first time in an auction globally, distributors participated alongside generators with successful bids matched by supply and demand, as well as three daily timeblocks that allow intermittent technologies to bid to supply energy during specific times.

Section 6. Methodology

The Climatescope 2019 methodology includes 167 indicators and sub-indicators split into three key topic areas that encompass each country's previous accomplishments, its current investment environment, and the future opportunities it presents. These are the following:

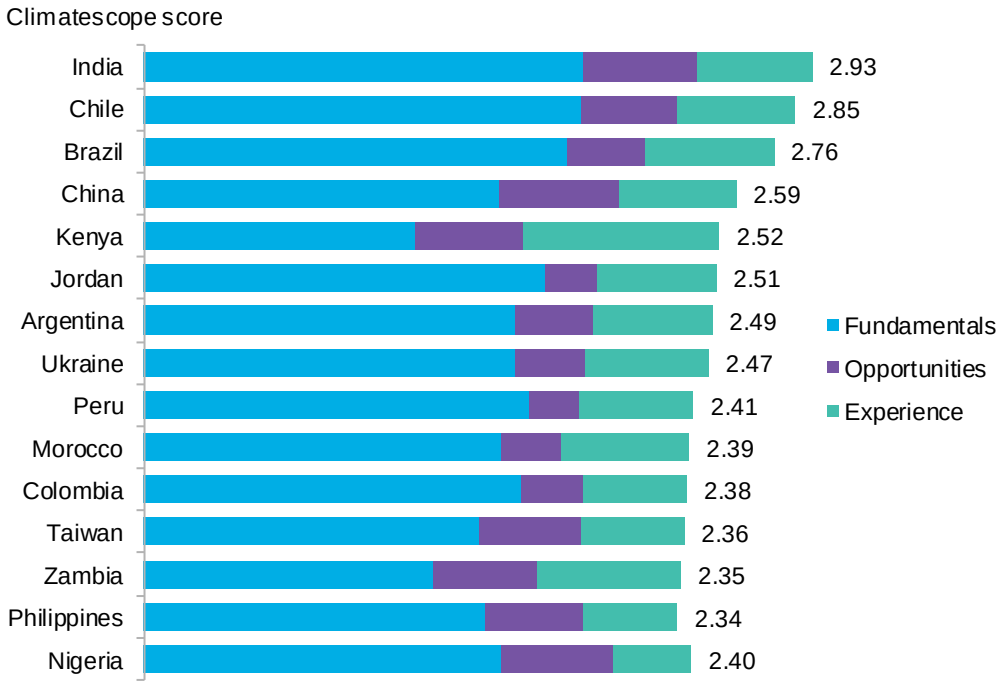
1. **Fundamentals.** This topic area encompasses a country's clean energy policies, power sector structure and regulations as well as local barriers that might obstruct renewable energy development. A country with comprehensive and strong policies and a more liberalized power sector tends to be more welcoming to private investment than one with weaker frameworks and less liberalization. This topic area seeks to assess the fundamental structures that can help clean energy flourish.
2. **Opportunities.** This includes a country's current and future electricity demand, its energy consumption, and its CO2 emissions from the power sector, along with overall price attractiveness, short- and medium-term opportunities for renewable energy procurement, history of corporate commitment with sustainability and existing electrification rates. This topic area seeks to encapsulate future opportunities for clean energy growth available in a country.
3. **Experience.** This includes a country's volume of installed clean energy, historical levels of renewable energy investment and the comprehensiveness of its non-manufacturing clean energy value chains. Markets with greater experience deploying renewable energy capacity typically offer lower risks, lower technology costs and lower costs of capital for investors.

It is important to note that several key indicators are "levelized" against a country's gross domestic product, population, installed capacity and generation. The methodology seeks to take into account and then discount the fact that some nations attract larger volumes of capital simply because they are bigger. For a complete description of Climatescope's updated methodology, visit the website.

Section 7. Score review

Climatescope takes into accounts 167 indicators to create a composite overall score for each of the 104 nations in the survey. This marks the second year the project has included over 100 nations to encompass virtually all developing markets on Earth.

Figure 71: Climatescope score of top 15 countries

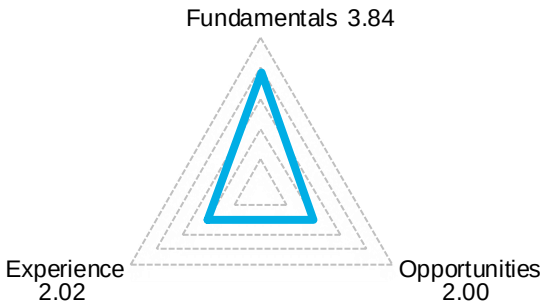


Source: Climatescope

For the first time since BloombergNEF began the Climatescope survey, India tops the rankings. The Asian nation is followed in the top five by Chile, Brazil, China and Kenya (Figure 71). It is important to note that a balance among the three Climatecope categories (Fundamentals, Opportunities and Experience) is key for a market to become fully attractive for clean energy investment.

1. India

Scores



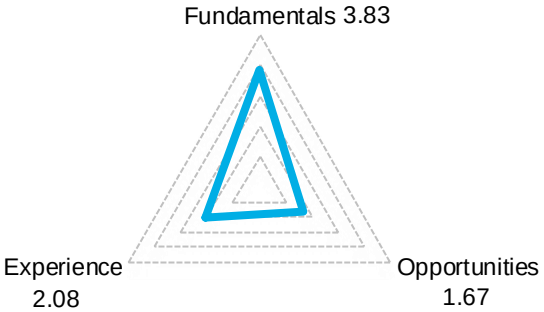
India's ambitious policy framework and copious capacity expansions pushed the country to 1st position in 2019, from 2nd in 2018. The Indian government has set one of the world's most ambitious renewable energy targets by aiming for 175GW by 2022, with 100GW to come from solar, 60GW from wind, and 15GW from other sources.

India has also held the most competitive and largest auctions for clean energy power-delivery contracts. These resulted in the procurement of the equivalent of 19GW in 2018 alone. Together, these developments pushed the country to the top of the table on its Fundamentals score and 3rd on Opportunities in the Climatescope ranking.

Renewables, excluding large hydro, account for 81GW of India's 356GW capacity. Since 2017, capacity additions from renewables have exceeded those of coal. While wind capacity additions of 2.3GW in 2018 were 44% below 2017 levels, solar saw its best year to date with 9GW installed. This included utility-scale, rooftop and off-grid capacity. Wind's 2018 decline was partly due to a switch in the market from a reliance on feed-in tariffs to reverse auctions.

2. Chile

Scores

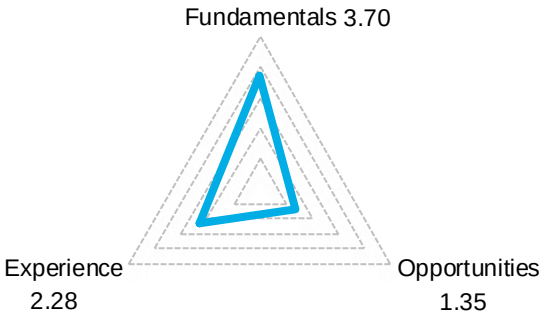


Chile's exceptional natural resources, along with (until very recently) a stable government and healthy economy have made it attractive to clean energy investors. The government has set ambitious long-term clean energy goals and begun implementing policies which make renewables more price competitive. Targets include a clean energy mandate of 20% of generation for utilities by 2025 and 60% of generation by 2035. By 2050, the country aims to have 70% renewables generation. This led to Chile finishing 2nd in the Fundamentals section of the Climatescope ranking. (It should be noted, however, that recent events have certainly called into question the stability of the Chile market and Climatescope scores are based on a country's status as of the prior year-end.)

At the end of 2018, Chile had 2.3GW of solar and 1.5GW of wind online. This represented 16% of total installed capacity and renewables (excluding large hydro) accounted for 15% of all power generated. Wind generation in Chile surged from 1.4TWh in 2014 to 3.6TWh in 2018, while solar output spiked from 0.5TWh to 5.1TWh. Together, wind and solar represented 11% of total 2018 power generation, up from virtually nothing five years ago.

3. Brazil

Scores



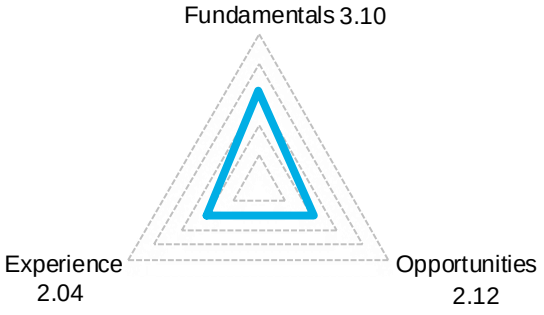
Brazil continues to be one of the main emerging markets for renewable energy deployment and the largest power market in Latin America, with a total installed capacity of 162GW in 2018. Its matrix remains highly reliant on hydropower, which accounted for roughly 65% of the country's generation in 2018. However, penetration of non-hydro renewables generation has been growing year-on-year and reached a peak of 18% in 2018.

The country has a comprehensive and inviting clean energy policy framework and has pioneered competitive auctions to contract clean energy, which led to over 28GW of renewable energy contracted 2009-2018.

With the worst of its economic crisis now behind it and plans to hold two auctions per year 2019-21, clean energy appears poised for renewed growth. Brazil attracted almost $56 billion in new asset finance for clean energy plants 2009-18, by far the largest amount in Latin America over the period.

4. China

Scores

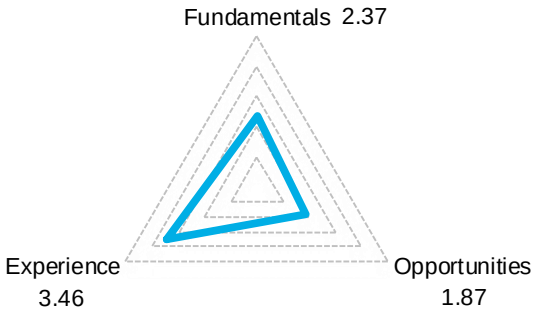


A decade of nearly uninterrupted growth in clean energy in China came to an abrupt end in 2018. Changes to critical policies resulted in new investment sinking to $86 billion in 2018 from $122 billion the year prior, and new-build for clean energy dropping to 71GW from 76GW. Generous feed-in tariffs that were the norm for much of the past decade are coming to an end. Despite this, China still represents a land of enormous potential for renewables, scoring highest among all Climatescope countries for Opportunities.

Although coal still dominates China's power system, accounting for 54% of capacity and 65% of generation in 2018, both figues are down nearly 10 percentage points from 2012, demonstrating the speed of change. Wind and solar together now account for 20% of capacity and almost 8% of generation in China, up from just 3% and 13%, respectively, in 2014. Generation from renewables continues to grow, not only due to growth in capacity, but also because of reduced curtailment. China's grid companies have deployed multiple approaches to incorporate more renewables, including generation rights trading, expanded inter-regional power transfer, thermal generator flexibility retrofits and spinning reserves reduction. The result is historically low national average curtailment rates of 7.2% for wind and 3.0% for solar in 2018.

5. Kenya

Scores



A boom in clean energy investment in 2018 along with Kenya's extensive renewable energy value chain pushed the country to 5th position in the survey. Kenya is gradually boosting the contribution non-large hydro renewables make to its grid by adding more solar, wind and geothermal capacity. In 2018, non-hydro renewables accounted for 38% of the country's capacity and 49% of generation. This is set to continue growing as clean energy investment reached a new record in 2018 with $1.4 billion attracted for geothermal, wind and solar plants.

The country is in the process of shifting from feed-in tariffs to reverse auctions as its primary means for spurring new-build. In August 2018, the parliament approved draft legislation to make this change but final action is still required. Under the last set of feed-in tariffs offered, the government received applications from over 4GW of clean energy projects. While this signalled the strength of the local development pipeline, it was also far more than the Kenyan grid was ready to absorb at the time.

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