



ASIA REGIONAL SUMMARY

India - Chilika Lake is the largest lagoon in India and one of the largest in the world. The interplay between fresh water—draining into the shallow lake from rivers to the north and west—and salty tidal water—encroaching from the Bay of Bengal to the south—gives Chilika’s waters a brackish quality, with salinity varying significantly throughout the lake. These variations open up a range of ecological niches and promote a rich diversity of species.

OVERVIEW

Asia is the world's largest single landmass, and second-largest economy, and is home to five of the 10 largest countries by population. In China, Asia has the world's largest electrical power system, and its largest national source of CO₂ emissions. In India, distributed energy holds great promise and new business models are under development to meet the needs of the world's largest single population without reliable access to electricity. From Tajikistan in the heart of central Asia, to the outlying islands of Indonesia, Asian countries have a remarkable breadth and depth of clean energy opportunities.

As the only two countries on earth with populations over a billion, China and India require an extended frame for comparison to the rest of the world and thus *Climatescope* included examinations of 15 provinces and 10 states within each, respectively. But these two giants are not Asia's only large populations or economies. Indonesia is the world's fourth-largest country, after the US, and Pakistan is almost the same size as Brazil. Densely populated Bangladesh has a significantly larger population than the world's largest country by land area, Russia. Vietnam has a larger population than Germany; Myanmar is bigger than Spain.

With its diverse terrain ranging from the Himalayas to high desert to tropical forests, Asia has outstanding national resource potential for clean energy. Naturally, large, windy, sunny coun-

tries such as China, India, and Pakistan have excellent wind and solar potential, but smaller nations such as Nepal and Tajikistan offer ample opportunities for small hydro development. Tropical and subtropical countries such as Indonesia, Vietnam, and Myanmar have major biomass resources.

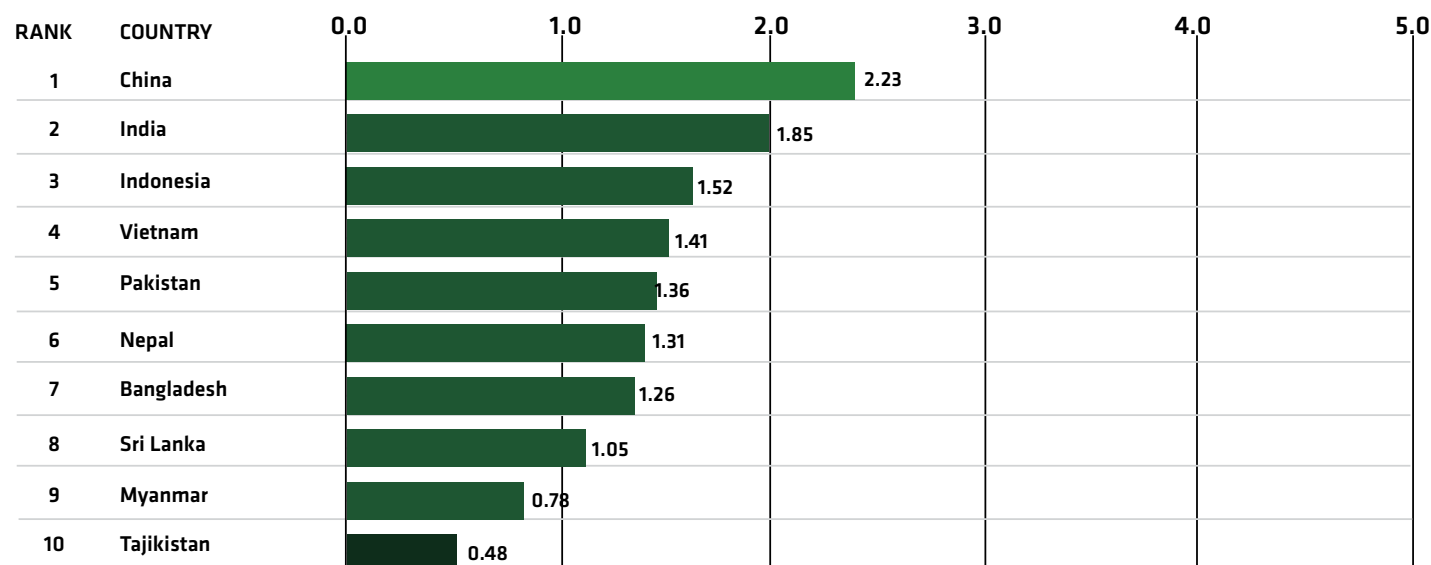
Within the context of *Climatescope*, Asia is a study in contrasts. Nearly every country in the region studied has made efforts to establish clean energy policies, though with significantly varying degrees of success in implementation. China is the world's largest wind and solar market, as measured in terms of megawatts installed, but has proportionally little clean energy online due to its great size. Capital, likewise, is readily available in China but is much scarcer, to nearly nonexistent, elsewhere.

In general, Asian countries have strong participation across renewables value chains, and not just because some countries are large markets. Asia's strong position in global manufacturing extends to clean energy.

The only area in which Asian countries generally performed lower on *Climatescope* was on greenhouse gas management activities: though China and India have a long history of CDM projects.

2014 Global *Climatescope* scores

Asia ranking



ENABLING FRAMEWORK PARAMETER I

Asian countries had a range of performance in *Climatescope's* Enabling Framework Parameter I. This includes 22 indicators that between them account for a country's policy and regulatory frameworks, levels of clean energy penetration, level of price attractiveness for clean energy development, and the expectations for how large the market for clean energy can become.

Of the 10 Asian countries surveyed, China and India scored highest and second-highest on this parameter, respectively. In fact, the two countries and 12 of their states and provinces accounted for the top 14 jurisdictions. This is a reflection of both the strong policy scores that India and China overall received and their exceptional deployment rates, particularly in some states. Indian state Karnataka and Chinese province Xinjiang topped both the list overall and their respective countries, as scored on a national basis, thanks to their high rates of clean energy penetration.

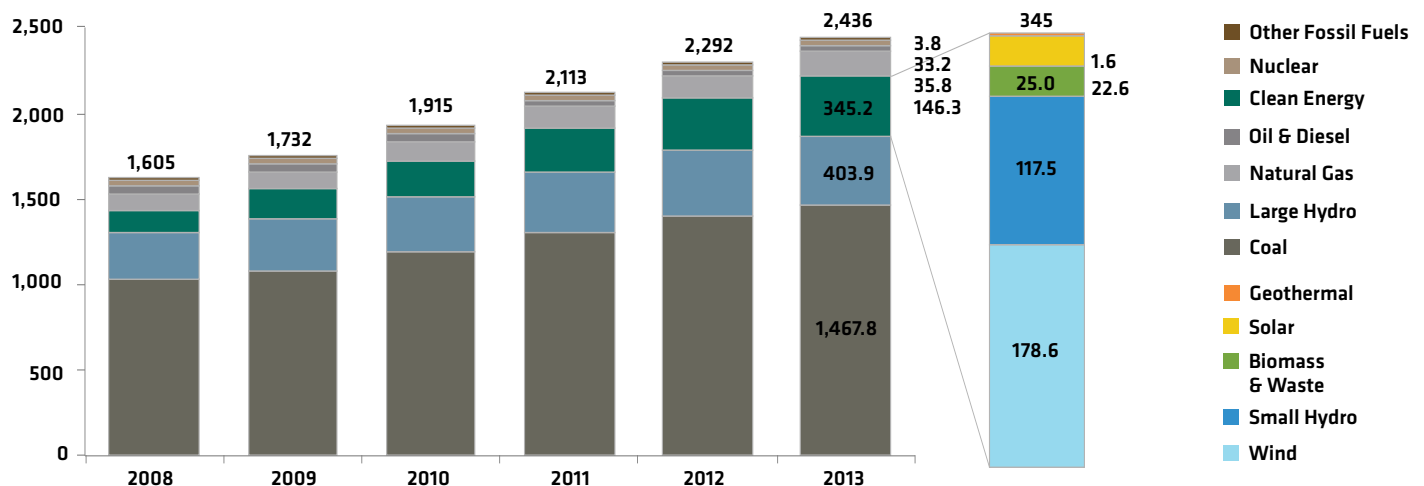
The only non-Chinese/Indian jurisdictions in the top 20 countries globally were Nepal (11th position) and Vietnam (15th). The former benefited from having decently regarded policies to foster off-grid development, while the latter was rewarded for a particularly strong rate of clean energy capacity growth. Myanmar (49th globally) and Tajikistan (52nd) rounded out the list and trailed far behind other nations. In Myanmar's case, the country has seen very little clean energy deployment to date and fared poorly on the policy score. Tajikistan actually scored well for its clean energy policy regime, but has seen little deployment locally and was not regarded as having great market size expectations or particularly attractive local energy prices.

Within Asia, it is important to highlight the differences between two key drivers of Parameter I scoring: energy market structures and the health of these markets, and electrification rates within countries. State control ranges over markets from the merely strong to the almost absolute. Every country studied has state-owned power generators and transmission and distribution firms, though Indonesia, China, and India all have large networks of independent power producers. Within these state-controlled power systems, financial and technical health varies greatly as well. China's power generators and its powerful grid company are solvent and strong, but many of India's state-owned distribution companies are in poor financial health.

In some countries, power generators would not be considered a 'going concern' were it not for state support. Low levels of reliability and the high prices of off-grid energy sources make clean energy promising in places such as Bangladesh, the islands of Indonesia, Myanmar, and much of India – though policy support is needed.

Electrification rates vary greatly between the countries studied. China achieved effectively 100% electrification years ago while India, with nearly the same population, is at only 75% meaning that hundreds of millions of people lack reliable grid access. Indonesia has a 77% electrification rate, and thousands of small islands which now rely on costly diesel to meet electricity needs. Myanmar, a closed economy until very recently, has only a 30% electrification rate and now is making a concerted effort to electrify. Bangladesh has a 62% electrification rate, but has numerous effective initiatives for deploying solar energy systems to millions of homes and small businesses.

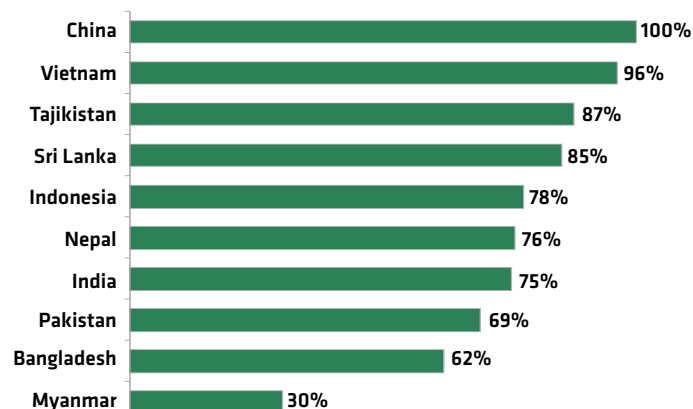
ASIA INSTALLED POWER GENERATION CAPACITY, CUMULATIVE (GW)



Source: Bloomberg New Energy Finance

Installed clean energy in the Asian countries examined in *Climatescope* had an extraordinary distribution. China had a world-leading 166GW of clean energy capacity as of year-end 2013, which was built at a compound growth rate of nearly 17%. India has 33GW at a growth rate of 12%. Importantly, in some countries with small installed clean energy capacity bases, growth rates in installation are still high – 12% in Pakistan and 9% in Sri Lanka.

ELECTRIFICATION RATES BY COUNTRY



Source: IEA

CLEAN ENERGY INVESTMENT & CLIMATE FINANCING PARAMETER II

Asia shone in Clean Energy Investment & Climate Financing Parameter II, which accounts for the amount of clean energy capital a country attracts, the availability of local funds, the local cost of debt, and green microfinance activity through a total of 14 indicators. China placed first among the 10 Asian *Climatescope* countries on Parameter II, with four of its provinces and regions faring better on their own than the overall country. Among nations alone (not including states and provinces in India and China) Bangladesh scored second, thanks to its vibrant microfinance market for clean energy. India placed third, with several of its states scoring higher. Pakistan trailed far behind in fifth place despite having a large potential market, as did Indonesia and Myanmar in seventh and ninth place, respectively. Tajikistan had the lowest score.

China has attracted \$302bn in total clean energy investment for large (greater than 1MW) projects from 2006-2013. India secured \$61bn; Indonesia, \$5.7bn. Even small Sri Lanka attracted more than \$1.3bn in clean energy financing. At the

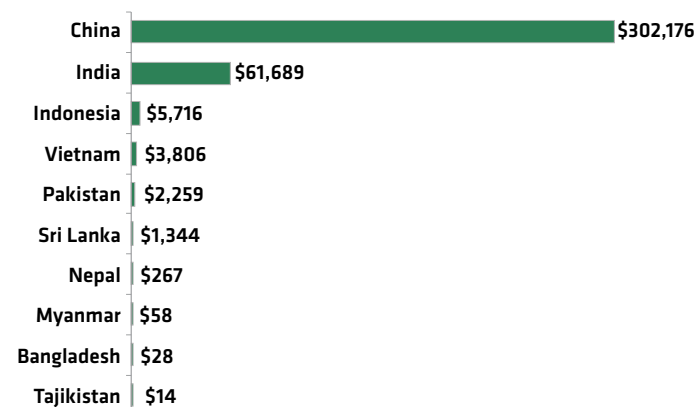
same time though, two countries – Myanmar and Tajikistan – have attracted only \$58m and \$14m in investment, respectively.

As in most countries, the vast majority of dollars invested in clean energy in Asia flowed into asset finance for generation projects. China and India, however, also have markets for corporate finance and venture capital (VC). China had more than \$3.5bn of VC investment, while India received over \$2.5bn. While China's total dollars invested, and capacity installed, were world-leading, investment must be understood in context and within the methodology of *Climatescope*. As the world's second-largest economy and its largest electricity system, the amount invested is relatively small as a proportion of GDP.

Naturally, capital availability varies greatly between countries. China has abundant capital thanks to its central government financing of infrastructure and favorable lending to state-owned project developers and builders as well as manufacturers. In-

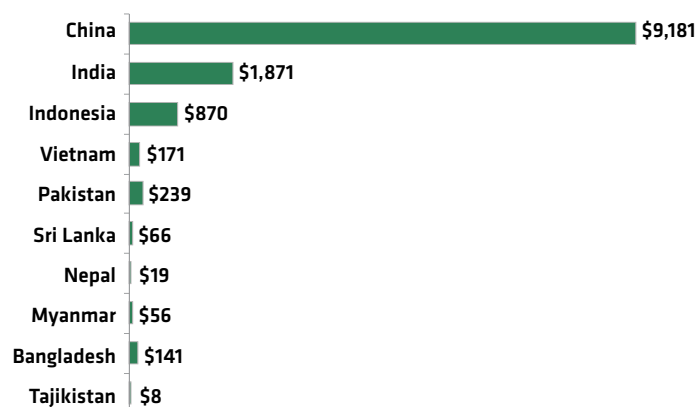
TOTAL CLEAN ENERGY INVESTMENT AND NATIONAL GDP

2006-2013 clean energy investment, cumulative (\$m)



Source: Bloomberg New Energy Finance

2013 GDP



Source: World Bank

dia has a reasonably strong financial network, but high costs of capital, which prove challenging for smaller project developers. In countries such as Tajikistan, Vietnam, Nepal, and Pakistan, traditional capital is relatively to very scarce.

In Bangladesh, however, green microfinance appears to be a true bright spot. Bangladesh has at least six green MFIs, more

than \$2.7bn in green micro-loans cumulatively issued to date, and more than 175,000 green micro-borrowers, respondents said in a survey conducted for Climatescope. While Bangladesh has some way to go to rival China’s financial prowess for clean energy, its performance in structuring and delivering financing for those in need of capital for electrification is striking.

LOW-CARBON BUSINESS AND CLEAN ENERGY VALUE CHAIN PARAMETER III

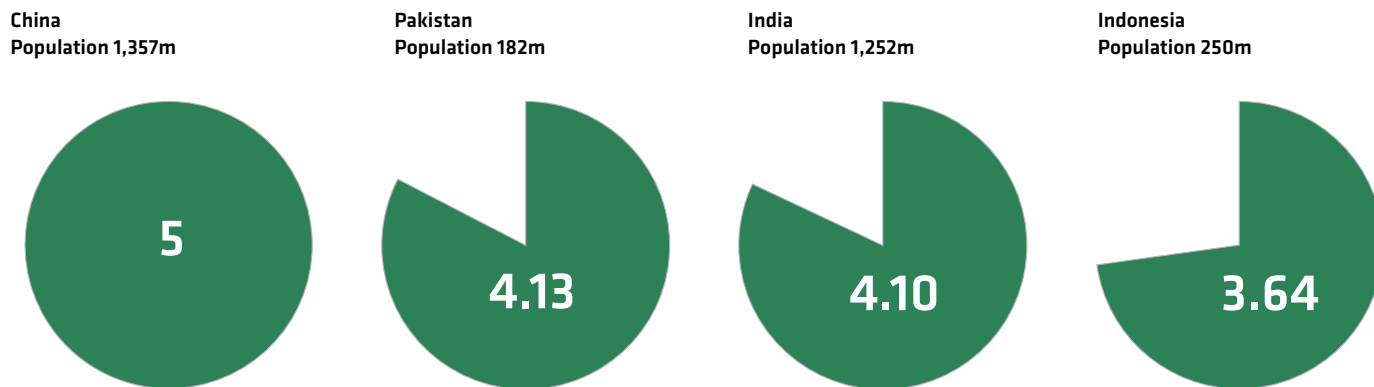
Asia truly excelled on Low-Carbon Business and Clean Energy Value Chains Parameter III, which assesses the availability of local manufacturing and other capacity to spur clean energy deployment through five data indicators. These took into account the presence of local manufacturers, service providers and, in the case of lesser developed nations, players participating in facilitating the growth of distributed generation specifically.

As whole, Asia left both the African and the Latin American & Caribbean regions trailing far behind. Three Asian countries were placed in the top five globally. China led the world with the maximum possible score, meaning that its manufacturing and service firms cover every aspect of the clean energy value

chains surveyed. Pakistan was next in fourth place, then India in fifth, followed by Indonesia in eighth position.

China’s and India’s provinces and states, however, scored very differently when analyzed individually compared with the large countries. Each nation’s wealthier and more industrialized areas had high scores for value chains, while their less-developed areas had lower scores. In fact, two Indian states and seven Chinese provinces ranked below the lowest scoring country on this parameter, Tajikistan. These regions, in particular in China, have low populations and while they make superb sites for clean energy project development, they are not home to the significant amounts of human capital needed for the sector beyond that needed for project construction.

ASIA CLIMATESCOPE CLEAN ENERGY VALUE CHAIN INDICATOR SCORES AND POPULATIONS



Source: Bloomberg New Energy Finance

Two factors drove Asia’s strong performance in low-carbon value chains. The first is the continent’s (and in particular, China’s) status as the “workshop to the world”. Within Asia, every aspect of the manufacturing value chain is met in China and nearly all of it in other large countries. Past a population threshold of several hundred million, there are manufacturing and assembly capacities for wind, solar, and biomass power, as well as small hydropower.

The second is the matter of scale. Asia’s top-scoring countries in low-carbon value chains were the world’s first, second, fourth, and sixth-largest countries – two of which have more than a billion people, and the smallest of which has nearly 200m. These large economies and large workforces also have diverse service and support value chains, in legal and financial services but also in areas such as public relations.

Asia’s value chain parameter performance also suggests two patterns of future growth. The first is driven by labor availability. China and India are hubs for manufacturing given their size, but in the future Indonesia, Pakistan, Vietnam and even Myanmar might be added to this list. Large countries, with growing labor forces, have an imbedded option, so to speak, to play a role in labor-intensive manufacturing.

The second is human capital. Again, both China and India have excellent human capital but as other countries develop, they too can expand the capabilities of their workforce and move up the value chain into new areas which supplement their clean energy economies.

GREENHOUSE GAS MANAGEMENT ACTIVITIES PARAMETER IV

Asia enjoyed its second strongest performance on Greenhouse Gas Management Activities Parameter IV, which takes into account carbon offset project activity, the level of policy support for carbon emissions reduction, and local corporate awareness of carbon issues.

Despite being the world's largest emitter of CO₂, China performed best, taking third place globally, followed by India in seventh position. No individual Chinese province or region, or Indian state, performed better than their countries on the whole due to the aggregated strength of individual performances. Myanmar, Bangladesh and Sri Lanka had the lowest scores, ranking 40th, 43rd and 54th, respectively.

Though these countries are currently exempt from legally binding greenhouse gas emissions targets within the international climate change process, there is growing interest in voluntary and state and local greenhouse gas targets and registries. China, in particular, has seven provincial emissions trading schemes in pilot phase, many of which are larger than the total emissions of other countries. It plans a national emissions trading scheme beginning as early as 2016. China as well as a number of countries also host Clean Development Mechanism (CDM) projects.

In India and elsewhere, there is also a growing corporate recognition of the value of greenhouse gas mitigation. Notably, this stems not just from an awareness of climate change caused by emissions, but also from a growing sense that greater measurement of emissions gives companies the opportunity to make their businesses more efficient – in cases where lowering emissions can improve performance. Even in the absence of top-down international or national controls on greenhouse gas emissions, accounting for emissions and mitigating them can be good business. Emissions, in this sense, are a matter of a dual bottom line, wherein better accounting creates opportunities while also reducing impacts on the environment.

In Asia, the environmental impact of fossil fuels consumption is not only a matter of atmospheric CO₂. Particulate emissions can have a profound impact on public health, and represent another case where reducing emissions through more efficient and cleaner consumption has positive impacts on business performance, the global climate, and the local environment.

CHINESE PROVINCES WITH PILOT CO₂ EMISSIONS TRADING SCHEMES

