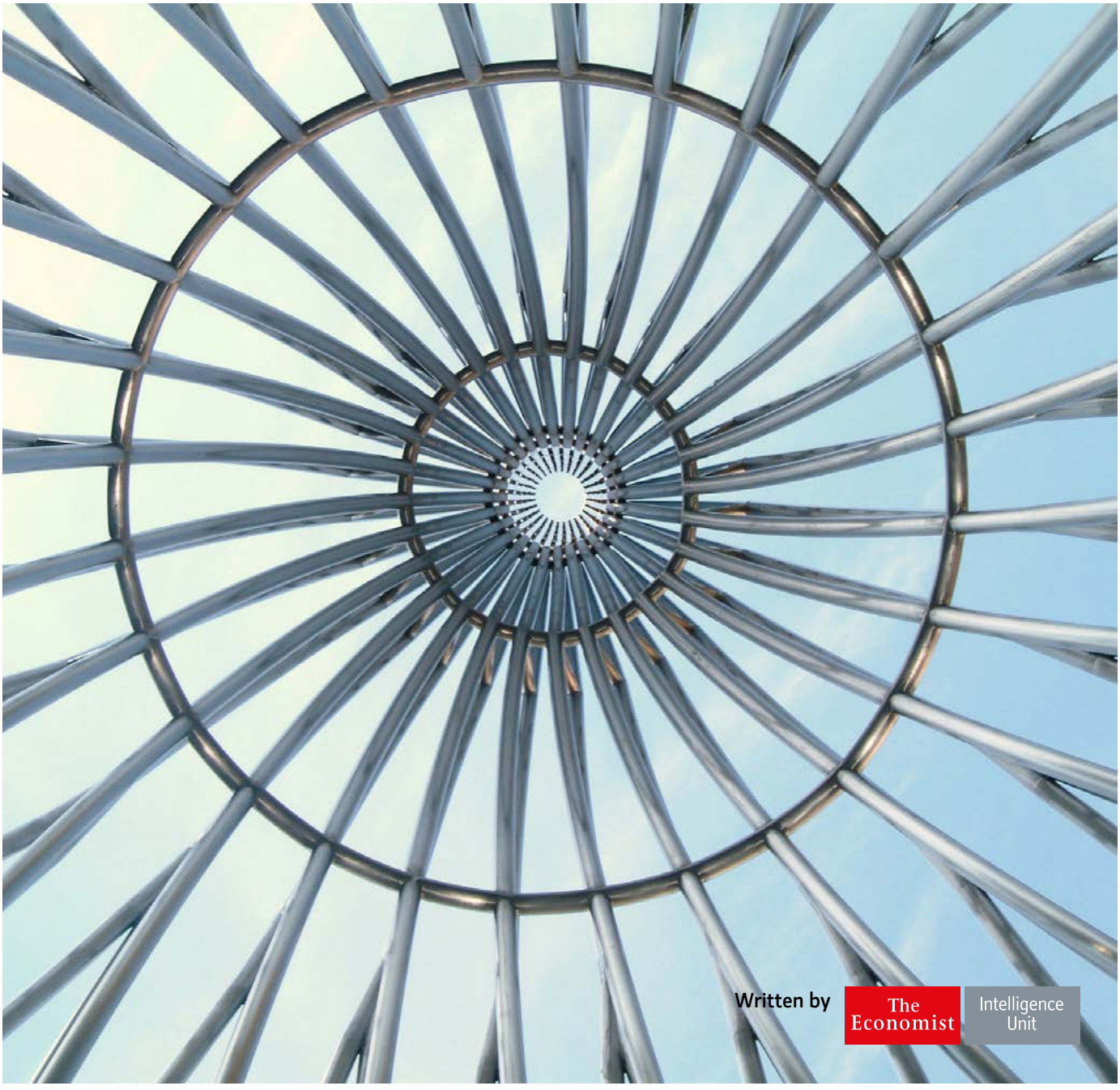
Morgan Stanley

INSTITUTE FOR SUSTAINABLE INVESTING

Climate Change Mitigation Opportunities Index 2017

Navigating In-Country Opportunities for Technology-Enabled Sustainable Investing



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Foreword from the Morgan Stanley Institute for Sustainable Investing

Human-induced climate change is happening, and fast. 2016 was the third consecutive hottest year on record and since 1880, the global average temperature has risen by 0.8°C (1.4°F). But the impacts go far beyond global warming. Extreme weather events such as droughts, flooding and hurricanes pose risks to national security, business, infrastructure and vulnerable communities everywhere. Since 1980, billion-dollar weather events in the US alone have killed more than 9,600 people and cost the economy more than $1.1 trillion.*

The threats posed by climate change require that we adapt to a new reality of severe weather, rising resource costs, and increased risk. But underpinning a successful adaptation strategy is the need for mitigation—reducing emissions to avoid the worst impacts of climate change.

With or without the United States government, the global community and many US states have reaffirmed their commitments to fighting climate change through the 2015 Paris Climate Agreement. Countries, states, cities, businesses and investors from all over the world are viewing climate change as a critical risk and mitigation as an opportunity for innovation and economic growth. Solar power is now the least expensive form of new electric capacity, according to Bloomberg New Energy Finance. And in the United States solar energy jobs outnumber coal more than two to one. New global clean tech leaders are emerging and many countries are on track or ahead of schedule to meet their voluntary goals.

The Morgan Stanley Institute for Sustainable Investing believes that there are vast opportunities for private capital to invest in climate change solutions, and attractive profits to be made by doing so. Across all sectors, innovation is driving efficiency and productivity.

We engaged The Economist Intelligence Unit to explore opportunities for climate change mitigation in greater depth. The resulting Climate Change Mitigation Opportunities Index report and dashboard examine the risks and opportunities of climate change mitigation for investors. As it can play in important role in climate change mitigation, we focused on technology as a lever for addressing this threat. With input from a panel of experts, we selected twenty countries as indicative, and interesting, examples of different markets around the globe. The selected countries aim to illustrate climate change mitigation opportunities across a range of geographies and economies.

The index evaluated technology solutions in five sectors—energy, transportation, industry, agriculture and the built environment—and considered country-level conditions such as sector maturity, infrastructure, political environment and other enabling factors in order to inform investors about specific opportunities and risks.

While it may not come as a surprise that population growth and rising incomes will lead to increasing demand for affordable energy and other natural resources, some investors may underestimate the need for substantial capital to meet the demands for cleaner technologies in emerging and nascent economies. Meanwhile, climate change mitigation technologies in the agriculture sector are gaining attention after years of neglect. Soil carbon sequestration alone could absorb up to 20 tons of carbon dioxide emissions each year.

The goal of this work is for investors to develop a deeper understanding of the range of technologies and types of investments that can help mitigate climate change, and where those investments are likely to have the greatest environmental impact and financial reward.

The Climate Change Mitigation Opportunities Index is the second in a two-part study that seeks to equip investors with data-driven tools to identify sustainable investment opportunities in support of two outcomes—mitigating climate change and driving inclusive growth. Published in May 2017, the Inclusive Growth Opportunities Index uncovers insights about the opportunity for technology investments to promote inclusion across financial services, education, healthcare and gender themes.

In addition to this report, we encourage readers to explore the dynamic index tool www.morganstanley.com/ideas/climate-change-mitigation-index, which allows for the exploration of this work in greater detail. The tool can be customized based on areas of interest such as countries, risk tolerance or economic sectors.

We wish to thank our colleagues at The Economist Intelligence Unit and all the experts who have provided feedback for this project—their input has been invaluable.

We aim to accelerate the ability of private capital to create a more sustainable future, and hope that investors find this Index and report a thought-provoking place to start.

New York, July 2017

* NOAA National Centers for Environmental Information (NCEI) U.S. Billion-Dollar Weather and Climate Disasters (2017). https://www.ncdc.noaa.gov/billions/

Project Teams

About The Economist Intelligence Unit

The Economist Intelligence Unit is the research arm of The Economist Group, publisher of *The Economist*. As the world's leading provider of country intelligence, we help governments, institutions and businesses by providing timely, reliable and impartial analyses of economic and development strategies. Through our public policy practice, we provide evidence-based research for policymakers and stakeholders seeking measureable outcomes in fields ranging from gender and finance to energy and technology. We conduct research through interviews, regulatory analysis, quantitative modeling and forecasting, using interactive data visualization tools to display the results. Through a global network of more than 350 analysts and contributors, we continuously assess and forecast political, economic and business conditions in more than 200 countries. For more information, visit www.eiu.com.

About the Morgan Stanley Institute for Sustainable Investing

The Morgan Stanley Institute for Sustainable Investing builds scalable finance solutions that seek to deliver competitive financial returns while achieving positive environmental and social impact. We create innovative financial products, develop thoughtful insights and design capacity-building programs that help maximize capital to create a more sustainable future. For more information about the Morgan Stanley Institute for Sustainable Investing, visit www.morganstanley.com/sustainableinvesting.

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Acknowledgments

The Climate Change Mitigation Opportunities Index 2017 is the first edition of a study conducted by The Economist Intelligence Unit with the Morgan Stanley Institute for Sustainable Investing. It is a companion piece to the Inclusive Growth Opportunities Index 2017, which was launched in May 2017 and is available at www.morganstanley.com/ideas/eiu-inclusive-growth-morgan-stanley.

The following researchers, specialists and country analysts contributed to the report. We thank them for their participation.

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Expert panel members

The following experts on climate change and sustainable investing contributed significantly to shaping the index methodology, vetting the indicators and analytical framework and providing input into the weighting aggregation framework. Their diverse backgrounds and extensive experience ensured that a wide variety of views were considered. The volunteer panel met as a group in June 2016 in New York City to review the initial analytic framework and has provided ongoing support throughout the research process.

Benoit Allehaut (Capital Dynamics); Terry Babcock-Lumish (Islay Consulting); Rosina M. Bierbaum (University of Michigan); Edward Cameron (Business for Social Responsibility); Skip Grow (Morgan Stanley); Katie Harrison (motive); Geoffrey Heal (Columbia University); Peter S. Knight (Generation Investment Management); Mindy Lubber (Ceres); Eliza Northrop (World Resources Institute); Margarita Pirovska (Cornerstone Capital Group) and Lauren Sorkin (100 Resilient Cities).

Executive Summary

2016 was a landmark year. The 2015 United Nations Framework Convention on Climate Change's Paris Agreement entered into force, marking the first truly global commitment to climate policy. But it was also the third consecutive hottest year on record.[1]

The potential impact of climate change is immense. The Economist Intelligence Unit has estimated that the damage from extreme weather associated with a 5°C (9°F) warming, alongside weaker economic growth, could result in $7 trillion of global losses in investment assets under management alone—a figure greater than Japan's entire economy.[2] The losses to governments will be much higher, and the human toll will be catastrophic.

Rising incidence of extreme weather has spurred global leaders in the public and private spheres to double down on efforts to address climate change. Leaders in both sectors have increasingly acknowledged that economic growth and environmental protection are not a zero-sum game, but rather two core and complementary elements of a sustainable economy. The Paris Agreement commitments have elevated climate resilience, and investment in adaptation[i] is gaining momentum. Alongside these efforts, mitigation[ii] remains critical to avoid the worst impacts of climate change.

Dynamics are shifting in the global mitigation market. In the US, opposition to climate change action has gained traction with the arrival of a new administration that announced its intention to withdraw from the Paris Agreement. Similar attitudes from nationalistic politicians (opposed to the international nature of the climate agreement) elsewhere could also imperil multilateral mitigation efforts. But as some retreat, new climate leaders are emerging. The governments of nations like China and India increasingly see renewable energy as a strategic sector that reduces poverty, boosts the economy, creates jobs, and improves energy security.[iii] China is stepping up its mitigation efforts as worsening pollution puts the health of its population—and social stability—at risk. And India recently completed construction of the world's largest solar plant.[3]

Corporations, cities and investors are also embracing market forces to advance mitigation efforts independent of clear and favorable national policy, creating a structural shift towards renewables. Thanks to technological advances, solar power is now the cheapest form of new electric capacity globally; and half the price of coal in some emerging markets.[4] The solar energy sector now employs more people in the US than oil, natural gas and coal combined.[5] More broadly, technological advances—from low-cost solar systems to carbon capture and storage business opportunities to clean vehicle development and efficient agriculture innovations—are incentivizing stakeholders to push the global mitigation agenda forward.

Countries assessed in the Climate Change Mitigation Opportunities Index 2017 were chosen as indicative examples of different types of markets across the globe:

North America: United States (US)

Latin America: Argentina, Brazil, Cuba, Mexico

Asia-Pacific: Australia, Bangladesh, China, India, Indonesia, South Korea

Europe: Netherlands, Poland, Turkey, United Kingdom (UK)

Middle East: Israel, Saudi Arabia

Africa: Kenya, Nigeria, Rwanda

The Climate Change Mitigation Opportunities Index, developed by The Economist Intelligence Unit with the Morgan Stanley Institute for Sustainable Investing, is a starting point for investors to identify in-country investment opportunities in climate change mitigation technology. The index assesses demand for climate change mitigation across five sectors—energy, agriculture, the built environment, transport and industry.[iv] It also seeks to connect that demand with technological adoption, innovation capacity and financial risk to highlight investment opportunities in each sector.

The current analysis explores a small set of 20 potentially high opportunity markets. They were selected by The Economist Intelligence Unit and the Morgan Stanley Institute for Sustainable Investing in consultation with a volunteer panel of experts to represent markets with different levels of economic development in various regions, and to encompass markets where interesting developments are occurring.

i Climate change adaption includes actions taken to help economies, communities and ecosystems cope with the impacts of climate change. See http://unfccc.int/adaptation/items/4159.php-climate-change

ii Mitigation efforts reduce the production of greenhouse gas emissions—or remove them from the atmosphere—that exacerbates extreme weather and temperature rises. See https://unfccc.int/files/press/backgrounders/application/pdf/press_factsh_mitigation.pdf

iii For those interested in learning about investment opportunities tied to inclusive growth, please see the Opportunities for Inclusive Growth Index report available at https://www.morganstanley.com/ideas/eiu-inclusive-growth-morgan-stanley

iv In this report, we use the term "built environment" to collectively refer to the building sector and the land use, land use change, and forest (LULUCF) sector.

Highlights

Emerging economies like China and India are stepping up as major mitigation players. Technology innovation is increasingly arising outside of developed economies. Investment opportunities range from renewable energy to biodiesel for city transport. The climate change mitigation market is strengthening and becoming truly global.

Mitigation across sectors is interconnected and investments in one sector can reduce emissions in others. For example, transitioning to new high-efficiency diesel engines to generate more reliable on-site power at manufacturing plants can expand power capacity while reducing diesel consumption and energy emissions.

With large and growing economies and expanding populations, emerging markets will require substantial capital to meet growing demand for cleaner technologies. In energy and transport in particular, investment opportunities lie both in substitution of new (clean) for old (dirty) infrastructure and in capacity expansion as these economies play catch-up to mature markets.

In advanced economies—that are both able to afford mitigation technologies and have sophisticated investment markets—**growth opportunities lie in substitution of clean for dirty infrastructure.** These countries dominate the top of the overall index rankings.

Low incomes and shallow pools of skilled labor in the nascent markets—clustered near the bottom of the rankings—**can mean less ready capacity to absorb, implement or innovate high-tech mitigation solutions.** Tech-orientation, however, is fast-rising among these populations and there is significant longer-term potential.

The international climate policy outlook is uncertain, especially with the US's withdrawal from the Paris Agreement, but corporations and other public leaders are tightening their focus on climate change mitigation, adding market impetus for investment. Almost a quarter of Fortune 100 companies have pledged to move to 100% renewable energy[6] and in a public letter to US President Donald Trump in May 2017, 30 CEOs from the world's biggest companies, including Morgan Stanley, supported the Paris Agreement and its business benefits.[7] Additionally, within a week of the US withdrawal, 12 US states and Puerto Rico joined the United States Climate Alliance coalition to uphold Paris Agreement commitments.[8]

The clean energy outlook remains strong in the emerging markets with their growing energy demand, rising emissions and pollution concerns and falling clean tech prices. A drop-off in total clean energy investment in 2016 from all-time highs in 2015[9] was partially driven by falling tech prices.

Agriculture-focused climate mitigation is coming to the forefront after years of neglect as countries develop strategies, commitments and technologies to reduce methane and nitrous oxide emissions.

Demand for cost efficiency, rapid urbanization and environmental concerns are creating substantial opportunities in the green buildings sector. These are complemented by strong land use, land-use change and forestry investment opportunities in emerging and nascent markets, where agriculture-driven deforestation has threatened ecosystems and increased climate change risks.

Noteworthy markets from the Climate Change Mitigation Opportunities Index	
The emerging market giants	India and China have the twin pillars of large and fast-growing markets, and are giants across all mitigation sectors, with continued strong opportunity expected in energy, transport, industrials and agriculture in particular.
Substitution opportunities in advanced economies	The US and the UK in particular remain strong mitigation markets, despite the policy uncertainty created by nationalistic politicians and political dislocation.
The high-potential nascent markets	Bangladesh, Nigeria and Cuba are relatively nascent and risky markets but present noteworthy mitigation technology investment opportunities: Bangladesh in its agriculture and industrial sectors; Nigeria in its large and growing energy sector; and Cuba, opening to the world but plagued by energy security concerns.

Growing populations and rising incomes will drive investment in clean transport technologies, which have skyrocketed and will continue to attract capital. Mature markets, like tech-savvy Israel, are making advances in hybrid and electric vehicles and the greening of public transport. In emerging markets, demand for clean transport is supported by high levels of emissions, rapidly growing vehicle demand and, in countries like Brazil, a well-established biofuel market.

Uncertainties around carbon capture and storage (CCS) technologies and lags in regulatory development have acted as a brake on investment, but this is changing. Major middle and high-income large industrial producers—particularly in China, India and South Korea—offer attractive industrial mitigation opportunities.

How can investors use the study?

This report and the accompanying index dashboard assess potential market opportunity, which may help to inform investor decisions and deepen understanding of investment opportunities connected to climate change mitigation. The index aggregates more than 125 individual metrics in 50 indicators organized into six categories. The Economist Intelligence Unit worked closely with the Morgan Stanley Institute for Sustainable Investing and a panel of experts to select the 20 countries in this year's index and to develop the analytic framework; The Economist Intelligence Unit also undertook extensive research to develop the index and rate and rank the countries. The Climate Change Mitigation Opportunities Index is housed in an interactive Excel-based dashboard (available for download at www.morganstanley.com/ideas/climate-change-mitigation-index) that allows users to customize data to reflect specific priorities and interests (eg., risk appetite or regional focus), providing unique and actionable intelligence.

This report highlights key findings, for example, where market potential appears strong, and identifies some specific channels or areas in which that investment might be directed.

Introduction

With 2016 the hottest year to date[10] and 2017 already recorded to be among the hottest,[11] and with widespread commitments secured from the Paris Agreement, global leaders across both the public and private spheres are doubling down on efforts to address climate change.

Given the rising frequency of extreme weather from severe storms to droughts, the world clearly needs to build resilience against the shocks of a changing climate, and investment in adaptation (action taken to help economies, communities and ecosystems cope with the impacts of climate change[12]) is gaining attention. But risks are great and the cost of inaction is high. The Economist Intelligence Unit has estimated that a 5°C warming could result in $7 trillion of global losses in investment assets under management alone, greater than Japan's entire economy.[13] The losses to governments and society will be much higher. Mitigation (actions to reduce the production of greenhouse gas emissions, or remove them from the atmosphere[14]) remains imperative, and will require substantial levels of private investment capital.

While acknowledging the importance of adaptation, this report focuses on mitigation and the associated technology-driven investment opportunities. By examining the mitigation market potential, it aims to highlight the important role that private investment can play in supporting climate change mitigation.

Global mitigation market dynamics are shifting. Nationalistic attitudes across developed countries have sparked opposition to the international nature of climate agreement. However, among other stakeholders, it is increasingly acknowledged that economic growth and environmental protections are not a zero-sum game. And as some retreat, new climate leaders are emerging.

China is stepping up its mitigation efforts as worsening pollution creates growing risks to its population—and to social stability. President Xi Jinping positioned China as a leader on climate action in his January 2017 speech at Davos. In China and India, government increasingly sees renewable energy as core to economic development strategies, reducing poverty, boosting the economy, creating jobs and improving energy security. And the mitigation technology frontier is increasingly being furthered in these emerging markets. India recently completed construction of the world's largest solar plant and has made strides with innovative carbon capture technologies.[15]

Independent of clear and favorable national policy, corporations and cities are embracing market forces to advance mitigation. In the US, for example, volatile climate policy has not prevented the growth of a strong market for renewable energy, and cities like New York and Los Angeles have reiterated city-level mitigation efforts even as support at the national level unwinds. The solar industry now employs more people in the US than oil, natural gas and coal combined.[16]

Population and economic growth around the world will continue to drive strong demand for new capacity across sectors—from energy to transport to industry, buildings and agriculture. Innovations in mitigation technologies are increasingly occurring in emerging and nascent markets. And, as the risks of climate change to businesses, cities and countries become increasingly clear, new climate leaders will come to the fore and the mitigation market will continue to globalize. The risks of climate change are also top of mind for a growing set of investors who recognize that the rapidly growing cross-sectoral mitigation market presents enticing investments opportunities while also directing capital to one of the greatest threats to long-term business sustainability globally. Ultimately, mitigation requires the cooperation and participation of private sector, local and national government and industry stakeholders.

Technology and Climate Change Mitigation

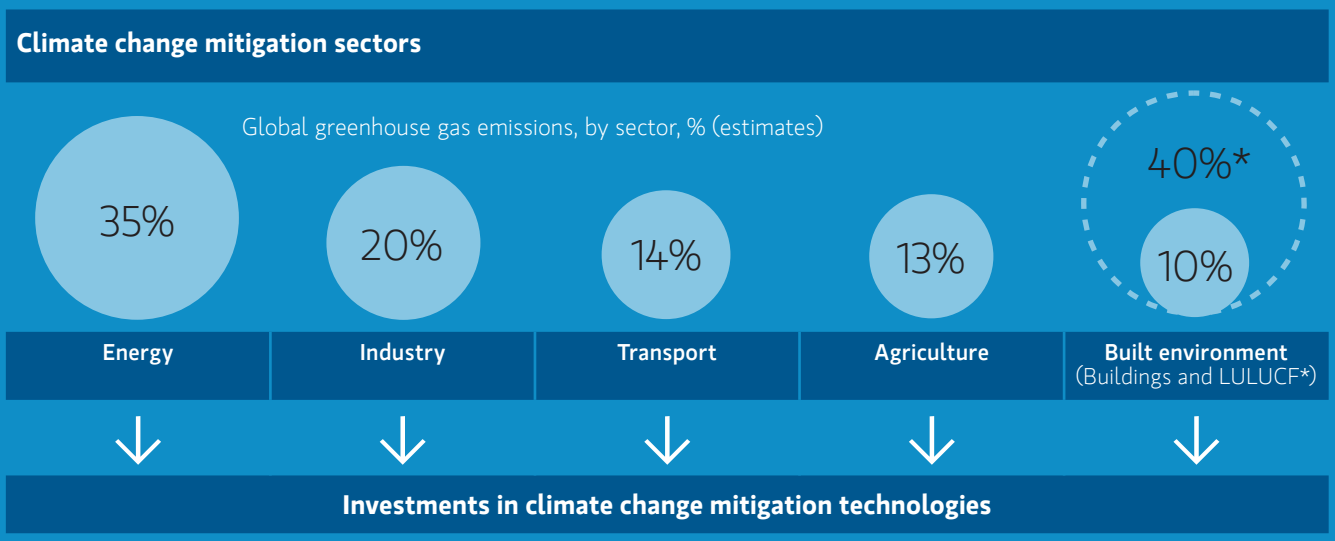
Technological innovation has been the most common and scalable approach for mitigating the effects of climate change. Innovations across sectors—energy, transport, agriculture, industry and the built environment—have paved the way for new technologies that mitigate climate change. As investors seek disruptive innovations that yield positive environmental impact alongside financial returns, technological innovation will continue to be at the heart of the solution.

The Climate Change Mitigation Opportunities Index focuses on technology-oriented investment opportunities to promote climate change mitigation and highlights how technology can be harnessed across the energy, transport, industrial, agriculture, and built environment sectors. The index includes a dedicated category designed to reflect each country's

Defining Climate Change Mitigation

The Economist Intelligence Unit defines climate change mitigation—in line with the United Nations Framework Convention on Climate Change definition—as any effort to reduce greenhouse gas emissions or remove them from the air.[17] Mitigation includes adopting new technologies, improving efficiency of older equipment and protecting natural carbon sinks.

Five sectors—energy, transport, agriculture, industry and the built environment—account for over 90% of global greenhouse emissions, and are examined within this report.



*Land use, land use conversion and forestry emissions, which, with buildings emissions, comprise the Climate Change Mitigation Opportunities Index's built environment emissions indicator. Building emissions, which account for approximately 40% of total emissions, are encompassed within the energy and industry sectors.
Sources: The Economist Intelligence Unit calculations based on data from the EC Joint Research Centre Institute for Environment and Sustainability; the United States Environmental Protection Agency; World Resources Institute.

technological capabilities and innovation environment—including infrastructure, the capacity of people and businesses to adopt or innovate, and indicators assessing access to technology and digital divides.

This report does not aim to comprehensively analyze the need and rationale for a low-carbon economy, or to critique country-level policies for promoting climate change mitigation. Rather, the Climate Change Mitigation Opportunities Index, establishes an analytic framework that connects demand for climate change mitigation across five key sectors with technological take-up capacity and financial risk to identify potential investment opportunities.

This report finds that the 20 countries analyzed offer many varied investment opportunities — opportunities that may appeal to investors of all risk appetites and sectoral interests. In this report, we approach the analysis by sector (transport,

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agriculture, industry, built environment, and energy), though we note that there are many interactions, and investments in one sector can have co-benefits in others.

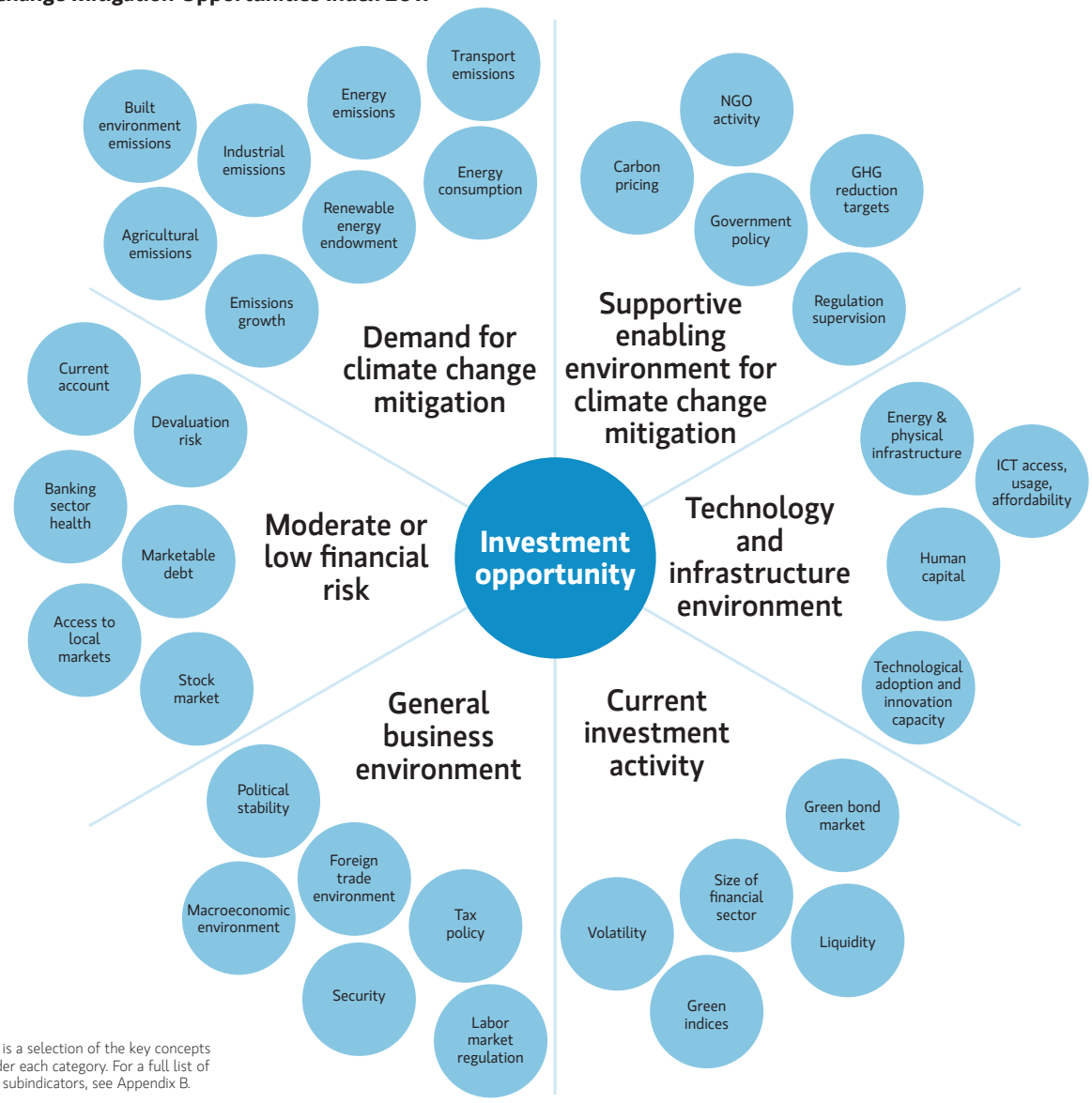
This report outlines key findings, focusing on where investment opportunity appears strongest and identifying some specific areas for investment. It also aims to showcase the depth of data available; the broader study, including the interactive Excel-based index dashboard, provides analyses that can enable investors to engage in data-driven decision-making to direct private capital to one of the foremost issues facing the world today. Users can customize the analysis to suit their interests. Investors can use this powerful tool to explore and benchmark opportunities, achieve additional insights and track such opportunities over time.

The Climate Change Mitigation Opportunities Index Framework

The Index comprises more than 125 metrics aggregated into 50 indicators, organized across six categories that measure the demand for climate change mitigation solutions as well as the strength of a country's investment environment.

The index framework was developed in consultation with a panel of experts convened in June 2016. Experts include investors, academics, climate change specialists, information and communication technology (ICT) experts and financial services innovators (see Acknowledgments on page 4). Experts were invited by The Economist Intelligence Unit to take part in this volunteer advisory panel. Experts provided input into the index framework (categories, indicators and weighting) and country selection. The country research was conducted from July through October 2016.

Climate Change Mitigation Opportunities Index 2017



Note that this is a selection of the key concepts addressed under each category. For a full list of indicators and subindicators, see Appendix B.

Country Selection

The Climate Change Mitigation Opportunities Index assesses the market opportunities for climate change mitigation technologies in a select set of 20 countries. These countries were chosen by The Economist Intelligence Unit and the Morgan Stanley Institute for Sustainable Investing, in consultation with the volunteer expert panel, to explore an indicative set of interesting and compelling, potentially high-opportunity markets.

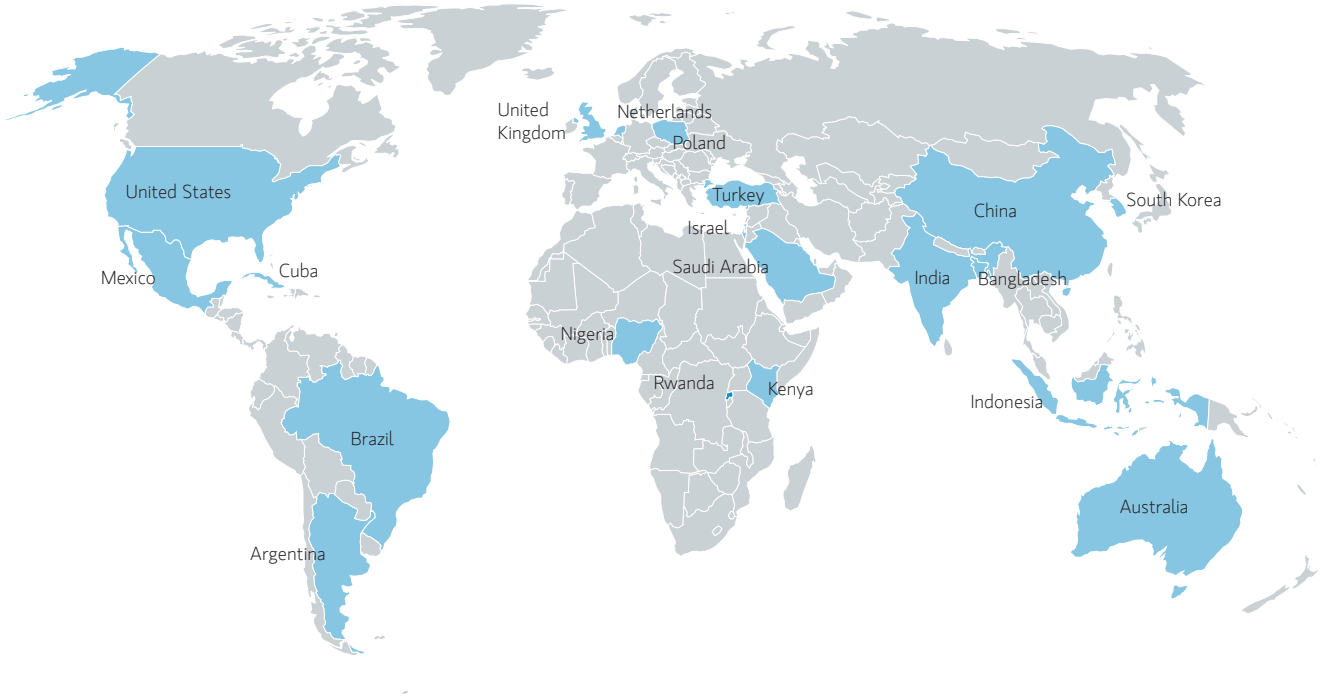
The country choice reflects a mix of regions as well as countries at different development levels.[v] The Economist Intelligence Unit and the Morgan Stanley Institute for Sustainable Investing looked to various criteria to guide the country selection, including economic and demographic indicators, financial sector indicators, topic-related indicators and indicators of risk. But in the end, the final selection came down to choice: which markets were most interesting to explore and assess for investment opportunities across the fields in question and over time.

In this way, some of the countries selected may represent others within a broader group. For example, the Netherlands and the UK were chosen as examples of mature Western European economies, whose characteristics and dynamics may be reflective of other mature Western European markets that were not explored in the 2017 study.

The countries selected for the 2016 index represent 61% of global GDP and 65% of the global population.

For more information on the country selection, please see Appendix A.

Map of Climate Change Mitigation Opportunities Index countries



v The Climate Change Mitigation Opportunities Index categorizes markets into three groups based on their level of economic and financial development: Advanced markets (Australia, Israel, Netherlands, Poland, Saudi Arabia, South Korea, UK, US); Emerging markets (Argentina, Brazil, China, India, Indonesia, Mexico, Turkey); Nascent markets (Bangladesh, Cuba, Kenya, Nigeria, Rwanda)

Weight Profiles of the Climate Change Mitigation Opportunities Index

In its assessment of market opportunity, the index aggregates indicators that reflect demand for climate change mitigation with measures of the strength of the investment environment. The weighting assigned to each category and indicator aims to reflect different assumptions about their relative importance to market potential. As investor appetite for risk and exposure to nascent markets will vary, the study provides two sets of indicative weight options: base weights and demand-centric weights.

One possible option, described as **base weights**, assigns relative importance to categories and indicators based on a consensus of expert opinion, developed with input from the study's volunteer panel of experts (see Acknowledgments on page 4).

The second option, known as **demand-centric weights**, provides an indicative weighting framework for investors who prefer to give market demand factors a heavier weighting. In this setting, a lighter weighting is given to investment environment factors (compared with the base, expert-assigned weights). No penalizing adjustment is made for financial risk.

These weighting frameworks are built into the index dashboard, available at www.morganstanley.com/ideas/climate-change-mitigation-index. As investors' individual preferences may differ, the dashboard allows users to tailor core weight settings (or input new ones) to reflect their interests and risk appetites.

Demand-centric weight settings allow some of the less developed and riskier investment markets, e.g., India, to rise to the top. India rises to second-place under demand-centric weights, thanks to its large and fast-growing economy and breadth of scope for climate change mitigation. Interestingly, the US still tops the demand-centric rankings despite its score taking a hit: demand is supported by its large overall emissions market, extensive renewables capacity and strong technology orientation, even without additional advantage from its friendly investment environment.

Weight settings

Category	Base weight settings		Demand-centric weight settings	
Demand for climate change mitigation	3	33%	5	56%
Climate change mitigation enabling environment	2	22%	2	22%
Technology and infrastructure environment	1	11%	1	11%
Business environment	2	22%	1	11%
Current investment activity	1	11%	0	0%
Financial risk (adjustment factor)	25%	–	0%	–

Notes: Weight setting numbers reflect the relative importance assigned to that category. For example, a weight setting for the Demand category of 3, compared with a weight setting for the Technology and infrastructure environment category of 1, indicates that demand factors are assumed to be three times as important in an assessment of market opportunity, compared with the technology and infrastructure factors.
Gray shading indicates different setting compared with risk-neutral weight profile.

The tables below provide the top-ranked countries under the two different weight settings. Countries are listed in rank order starting with most favorable market opportunity.

Base country rankings

	Country	Index score
1	United States	71.7
2	United Kingdom	61.3
3	Netherlands	60.4
4	South Korea	60.2
5	China	56.0

Rankings for demand-centric investors

	Country	Index score
1	United States	69.8
2	India	67.2
3	South Korea	64.1
4	United Kingdom	61.4
5	China	60.5

Key Findings

The climate change mitigation market is strengthening and becoming truly global

Opportunities range across sectors, from renewable energy to transport innovations to green building and agricultural innovations, which must respond to growing populations and rising incomes with sustainable and affordable solutions. Emerging economies like China and India are stepping up as major mitigation players, and technology innovation is increasingly arising outside of developed economies, which will drive continued expansion in the range of investment opportunities available.

From technologies that produce biodiesel for city transport from home vegetable oils in Buenos Aires, to water and fertilizer efficient seed varietals in Nigeria, and geothermal power plants in Indonesia, emerging and nascent markets are demanding attention as sources of major mitigation technology innovation.

Mitigation across sectors is interconnected and investments in one sector can create benefits across others

Advances in clean energy support mitigation across the transport and industrial sectors. Transitioning to new high-efficiency diesel engines to generate more reliable on-site power at manufacturing plants can expand power capacity while reducing diesel consumption and energy emissions.

And soil carbon sequestration, which could absorb up to 20 tons of carbon dioxide emissions each year,[18] supports mitigation opportunities across sectors, while enriching soil for agriculture.

With large and growing economies and expanding populations, emerging markets will require substantial capital to meet growing demand for cleaner technologies

Investors can look to emerging markets for opportunities not only in the energy and transport sectors but also in agriculture, industry and built environment. In energy and transport in particular, investment opportunities lie both in substitution of old for new infrastructure but also in capacity expansion as these economies play catch-up to mature markets.

In advanced economies, growth opportunities lie in substitution of new (clean) for old (dirty) infrastructure

While their economies are slowing, the advanced markets are—for the most part—found at the top of the overall rankings when it comes to the attractiveness of their mitigation investment opportunities. These markets can afford mitigation technologies and have sophisticated investment markets.

Potential exists for nascent markets to adopt clean energy and transport systems to build capacity, but opportunities may be longer-term

Low incomes and shallow pools of skilled labor in nascent markets can mean less ready capacity to absorb, implement or innovate high-tech mitigation solutions, which impacts near-term investment attractiveness. But tech-orientation is fast-rising among these populations, and there is significant longer-term potential for nascent markets to build capacity, particularly through clean energy and transport.

The international climate policy outlook is uncertain, but corporations are tightening focus on climate change mitigation, adding market impetus for investment

Corporate buyers accounted for 40% of all publicly announced utility-scale wind and solar purchases in the US in 2015.[19] And despite an uncertain policy environment, almost a quarter of Fortune 100 companies have pledged to move to 100% renewable energy[20]—Google recently announced that it will reach its full renewable energy goal by 2017.[21] Meanwhile, retailers including Target, Wal-Mart and Costco are meeting renewable energy commitments through rooftop solar installations.

The clean energy outlook remains strong, with growing capacity demands, rising emissions and pollution concerns, falling clean tech prices and public focus in emerging market giants

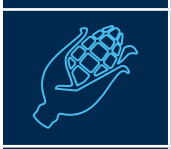
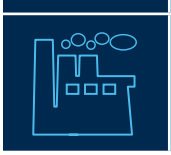
Slumping commodity prices in recent years prompted increased investment in coal-fired power stations in places like Indonesia. But rebounding fossil-fuel prices and continued declines in clean energy prices have shifted the market dramatically: Solar power is now the world's least expensive new energy source, owing largely to investments in developing markets.[22] And growing focus from the emerging world, as giants like China and India position themselves as global climate leaders, pledging policy support and billions of dollars to renewable energy capacity growth, support a strong outlook for mitigation markets.

Agriculture-focused climate mitigation is coming to the forefront after years of neglect[23]

Most countries in this year's index have formally acknowledged the sector's importance in climate mitigation. And large agriculture producers, threatened by worsening extreme weather, saline intrusion and drought, are incentivized to invest in mitigation technologies.

In the built environment, emerging markets present attractive investment opportunities

We define the built environment sector as both the green buildings and land use, land use conversion and forestry subsectors. There is significant opportunity in the growing green buildings sector, motivated by cost-efficiency as well as environmental considerations. While momentum may slow in advanced economies, in emerging markets, urban expansion will prompt rapid growth in green buildings activity. In land use, land use conversion and forestry, strong mitigation opportunities exist in nascent markets where agriculture-driven deforestation threatens ecosystems and harms resilience, increasing future costs from climate change.

Investment Opportunities to Watch		
	**Energy**	• Large-scale wind and solar power in US, India, China and Saudi Arabia • Small-scale, off-grid solar where energy infrastructure is underdeveloped • Efficiency technologies world-wide
	**Agriculture**	• Livestock methane reduction innovations in agriculture-heavy economies • Efficient seeds and crop varietals in Sub-Saharan Africa and South Asia • Mechanization of agriculture process in Rwanda, Kenya and Bangladesh
	**Built environment**	• Green building development and refurbishment in major cities • Vertical farming in Brazil, Indonesia, Australia, Kenya and Bangladesh • Remote sensing systems to monitor deforestation in Brazil
	**Transport**	• Rapid electric vehicle take-up in developed markets • Public transportation initiatives/biodiesel innovations in Brazil and Argentina • Longer-term opportunities for green transport in low-income economies
	**Industry**	• Carbon capture and storage technologies across the globe • High-efficiency industrial power generation in Bangladesh • Innovations to decouple industrial production and emissions in the advanced economies

Growing populations and rising incomes will drive investment in clean transport technologies, which have skyrocketed and will continue to attract capital

Mature markets, like tech-savvy Israel, are advancing hybrid and electric vehicles and the broader greening of transport, driven by shifting consumer preferences. Strong market opportunities in mature Western economies like the UK are supported by commitments to renewable energy targets, shifting consumer preferences toward energy-efficient and green vehicles, and public transport initiatives. Nascent markets have the potential to leapfrog technologies but these represent longer-term prospects. In Nigeria, for example, despite high demand for cleaner transport, government support is weak.

Uncertainties around carbon capture and storage (CCS) technologies and lags in regulatory development have acted as a brake on investment, but this is changing

Major upper-middle income and high-income manufacturing-heavy and large industrial producers— like China, Israel, South Korea, India and Turkey—offer attractive investment opportunities to reduce or capture emissions from industrial processes.

Attractive mitigation investment markets exist across every country and every sector

Demand for mitigation technologies and solutions are found everywhere: from nascent markets with smaller populations and economies to fully industrialized advanced economies, and from electric vehicles to energy-conserving plastic insulation to methane backpacks for cattle. Patterns in demand typically align with levels of development, but local market features give rise to unique investment options.

Noteworthy Markets

The results from this year's Climate Change Mitigation Opportunities Index point to a number of markets that may be of interest to investors. These noteworthy markets are highlighted in this section.

The emerging market giants

Familiar to many climate change mitigation investors, the emerging markets of **India** and **China**—with 37% of the world's population and responsible for nearly 50% of expected energy consumption growth to 2020[24]—cannot be ignored.

India: While ready access to cheap coal may slow renewables adoption, the task of providing sustainable electricity to the 300 million people in India who lack access[25] presents investment opportunities, particularly in decentralized solutions like off-grid solar. Supporting the opportunity is the country's strength in technology innovation, a population expected to grow by 90 million people by 2020[26], and rapid industrial growth. With a large part of the population engaged in agriculture, there is focus on introducing clean agriculture tech, like solar-powered irrigation, that will increase efficiency as well as sustainability.

China: China is increasingly positioning itself as a global climate leader. The country has said that it will implement a cap-and-trade program by the end of 2017.[27] Mitigation investment opportunities exist across all sectors in this large market, but are particularly strong in energy and transport. In energy, China far outstrips all other countries in terms of consumption and emissions, but its market still has plenty of room for growth. While it will continue to invest in coal-generated power, the country's need to exponentially expand capacity will simultaneously drive demand for renewable energy.

Country rankings under demand-centric weights

	Country	Index score
1	United States	69.8
2	India	67.2
3	South Korea	64.1
4	United Kingdom	61.4
5	China	60.5
6	Netherlands	56.1
7	Brazil	55.9
8	Australia	54.4
9	Turkey	53.4
10	Poland	53.2
11	Mexico	52.0
12	Indonesia	51.4
13	Israel	51.3
14	Kenya	46.1
15	Bangladesh	44.9
16	Cuba	44.2
17	Argentina	43.8
18	Rwanda	41.5
19	Saudi Arabia	38.9
20	Nigeria	34.0

The demand-centric settings weight demand for climate change mitigation more heavily than the base-settings, reduce the weight of the business environment and do not incorporate current investment activity and financial risk.
For a detailed explanation of the risk profiles, please see page 13.
'=' denotes a tied rank between two or more countries.

High-potential nascent markets

The potential to build capacity through clean technology take-up—particularly in energy, transport and agriculture—underpins the growth of these countries' mitigation markets, especially as renewable prices fall and industry embraces energy-efficient technologies. However, given a lack of funds and shallow pools of skilled labor, the challenge will be realizing this potential. Relatively weak enabling environments and high financial risk make the nascent markets more attractive for less risk-averse investors.

Bangladesh: High vulnerability to climate change and energy insecurity—along with a growing population and rising energy and transport needs—underpins strong demand for mitigation. Heavy dependence on agriculture makes Bangladesh a market of interest, particularly given the sector's vulnerability to climate change impacts including flooding, saline intrusion and drought. However, weak tech-orientation and innovation capacity temper the investment opportunity, though industry in the country is starting to embrace clean technologies to increase capacity.

Nigeria: Despite similar population size and income levels, Nigeria's energy consumption is 35 times greater than that of Bangladesh.[28] With tremendous population growth expected, Nigeria's transport, agriculture and energy capacity will need to expand. Some of the energy needs will be met through solar power: the country has already begun to

develop its solar sector, but capacity falls far short of what is needed. However, this is a financially risky market plagued by government ineffectiveness that may be best suited to highly risk-tolerant investors.

Cuba: Until recently, Cuba was rarely considered in investment decision-making. But with its economy slowly opening up to the world, potential mitigation market opportunities are emerging, particularly in energy and agriculture. While total energy consumption is lower than in any other country in this year's index (except Rwanda), double-digit growth is expected over the next five years.[29] In addition, energy security concerns—half of its energy is imported from Venezuela, which has in recent years slashed oil exports to Cuba—present potential for a renewables market.

Substitution opportunities: the advanced economies

United States: Clean energy investments have been dampened by the success of the US shale gas sector and its contribution to energy independence. Nevertheless, the US remains a strong mitigation market in energy—particularly given the need to upgrade the country's aging infrastructure—as well as in transport and buildings. In this market, policy is taking a backseat to private sector action, particularly with uncertainty surrounding the new administration's environmental policy. Companies are stepping into the policy vacuum, pursuing low-carbon strategies to reduce risk and cut costs.

United Kingdom: The UK's large market offers robust mitigation opportunities particularly in the energy and transport sectors, despite carbon market uncertainty following the Brexit vote. As the only major coal user in Europe to have made a firm commitment to phase out coal generation within the next ten years, the UK market is ripe for investment. High energy security concerns (almost 40% of energy is imported, primarily from Norway, OPEC countries and Russia[30]), aging infrastructure, a highly developed clean tech sector, and, as in the US, private sector action, provide additional market drivers.

South Korea: With substantial energy and industry emissions, energy security concerns, and a high-tech economy, South Korea's large industrial sector offers attractive investment opportunities.[31] The country has strong governmental support for mitigation; South Korea launched an emissions trading scheme in 2016 and has called for a legal framework for CCS.

Country rankings under base weights

	Country	Index score
1	United States	71.7
2	United Kingdom	61.3
3	Netherlands	60.4
4	South Korea	60.2
5	China	56.0
5	India	55.8
7	Australia	55.7
8	Israel	49.7
9	Poland	49.3
10	Brazil	47.8
11	Mexico	46.5
12	Turkey	44.7
13	Indonesia	42.1
14	Bangladesh	36.5
15	Saudi Arabia	36.1
16	Kenya	35.3
17	Argentina	35.0
18	Rwanda	32.4
19	Cuba	31.6
20	Nigeria	24.1

The base settings weight categories and indicators according to a consensus of experts.
For a detailed explanation of the weight profiles, please see page 13.
'=' denotes a tied rank between two or more countries.

Sustainable investing: Connecting investments in inclusive growth and climate change mitigation

This study by The Economist Intelligence Unit and the Morgan Stanley Institute for Sustainable Investing aims to develop opportunities for investors to explore sustainable investment themes across countries.

Sustainable investment opportunities exist across a range of different, but related, areas. This year's study explores two areas—inclusive growth and climate change mitigation—in separate benchmarking indexes and reports. These two important and distinct areas are, in many ways, related and complementary. Both issues have far reaching impacts on the global economy and society. We believe that capital markets have an important role to play in developing solutions and creating opportunities for investors.

The goal of inclusive growth refers to an environment where economic growth and prosperity are complemented by broad opportunity to access the benefits of that growth. The consequences of climate change interfere with these goals.

Climate change threatens to hit the poorest among us the hardest, reducing or removing their ability to share in the benefits of growth. Many emerging markets are geographically vulnerable to sea-level rise and warmer temperatures. Many poorer people live in inadequately reinforced housing, and insurance or other risk-mitigation options may be unaffordable or nonexistent. Poorer countries often rely on agricultural sectors for output and employment; climate change puts this sector at high risk. Climate change will also impact the availability of clean water and exacerbate food security challenges. Developing economies, with strained budgets and limited financing options, are typically poorly equipped to invest in mitigation, build disaster resilience and respond to extreme weather.

Investments can have complementary benefits for both inclusive growth and climate change mitigation. For example, there is high and growing demand for affordable senior housing in countries like the US. One way to make housing more affordable is to cut building energy costs. In Anchorage, Alaska, new low-income senior housing complexes are using alternative-energy ground-source heat-pumps in housing developments, supplemented with solar panels, thus reducing reliance on expensive, and less climate-friendly, natural gas heating systems.[32]

Similarly, investments in climate change mitigation can support inclusive growth goals by ensuring that economic development does not occur at the expense of the environment. For example, Enel, a multinational energy company with a presence in 30 countries across four continents, has established a program to bring clean, affordable sustainable energy solutions to rural communities lacking ready access to energy. The program constructs and maintains small-scale solar power stations in communities and also trains semi-illiterate women from villages lacking sufficient electricity to install and maintain solar panels. Initially launched in Latin America in 2015, the program has since expanded to Kenya and Tanzania.

As part of the study, The Economist Intelligence Unit has evaluated the investment opportunities connected to inclusive growth technologies in the same 20 countries covered in the Climate Change Mitigation Opportunities Index. The Inclusive Growth Opportunities Index is available at www.morganstanley.com/ideas/eiu-inclusive-growth-morgan-stanley

Sector 1: Energy

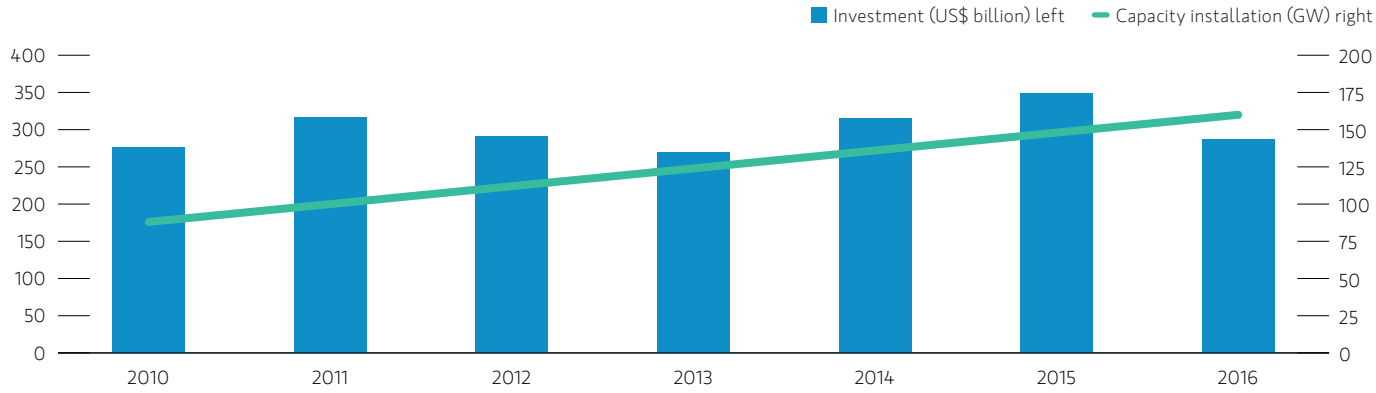
With clean technologies advancing in everything from solar roof tiles to smart grids, mitigation and maximizing efficiency in the high-emitting energy sector (which accounts for 35% of greenhouse gas emissions globally[33]) continues to attract the attention of researchers, entrepreneurs, corporations and investors.

The global solar energy market alone is expected to expand at the rapid clip of almost 25% per year on average through 2022 to reach $422 billion.[34] Investment in clean energy reached an all-time high of $349 billion in 2015, but fell nearly 20% in 2016, according to Bloomberg New Energy Finance (BNEF).[35] The decline is partly attributed to Japan's softening economic outlook and a tapering of investment in China following a rampant boom, but also cheaper prices of clean technology.[36] Renewables prices fell nearly 12% in 2016.[37] And though falling prices may have dampened the clean investment headline figure, they bode well for wider clean tech take-up: clean energy installations hit new highs in 2016.[38]

Investment opportunities to watch:

- Large-scale wind and solar power in US, India, China and Saudi Arabia
- Small-scale, off-grid solar where energy infrastructure is underdeveloped
- Efficiency technologies world-wide

Global renewable energy installations are growing despite falling investment



Source: Bloomberg New Energy Finance

Energy sector

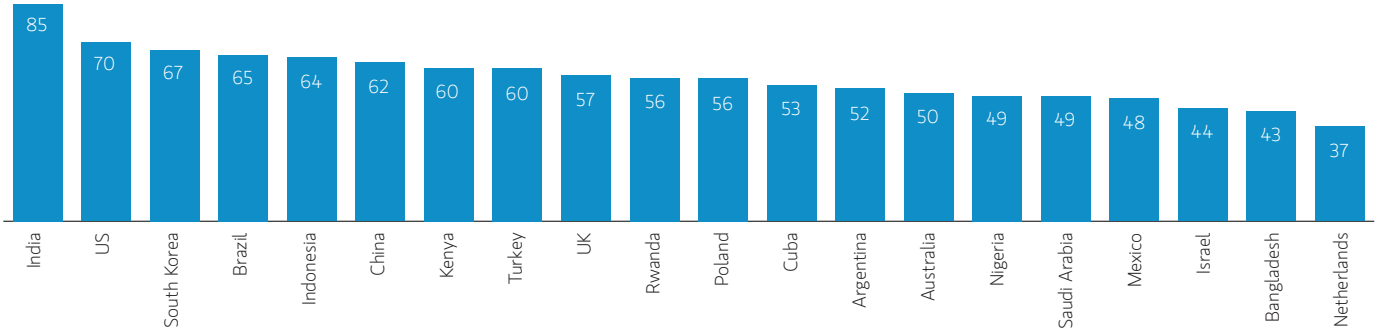
The Index includes 15 metrics related to market opportunities for energy sector investment:

Demand for climate change mitigation	Enabling environment
• Energy consumption • Energy consumption forecast • Energy sector emissions • Energy sector emissions growth to 2020 • Relative prices, renewables vs. hydrocarbons • Energy security • Age and capacity of energy infrastructure • Hydrocarbon endowment (oil, coal, natural gas) • Renewables endowment (wind, solar, hydro, geothermal, biofuels, nuclear)	• Government policy that harms mitigation targets: - Existence of retail fuel subsidy - Spending on fossil fuel subsidies • Established carbon price • Energy emission standards • Renewable energy targets • Government funding for clean energy

To explore in more detail, see the Climate Change Mitigation Opportunities Index dashboard at www.morganstanley.com/ideas/climate-change-mitigation-index

Demand for climate change mitigation: energy sector

India outstrips others in the index's nine part energy sector mitigation demand indicator
Aggregated score of all nine subindicators



Note: Rankings and scores are based on the average of nine energy-related demand metrics: energy consumption; forecast energy consumption; energy emissions; emissions growth; relative prices, renewables vs. hydrocarbons; energy security; age/capacity of energy infrastructure; hydrocarbon endowment; and renewables endowment. Higher scores indicate a greater demand for investments in climate change mitigation technologies.

Source: Climate Change Mitigation Opportunities Index 2017

And across the globe, advances in smart grid technologies and the Internet of Things—the connection of any device with an on and off switch to the Internet[39]—are making energy grids more efficient, reliable and low cost. China has already installed 430 million smart meters,[40] while India just developed its first smart grid project.[41] These technologies also provide opportunity for less developed countries to leapfrog to more efficient energy systems. In Kenya, $1.1 million has been set aside to construct a solar energy storage facility to increase the reliability of the country's power grid.[42]

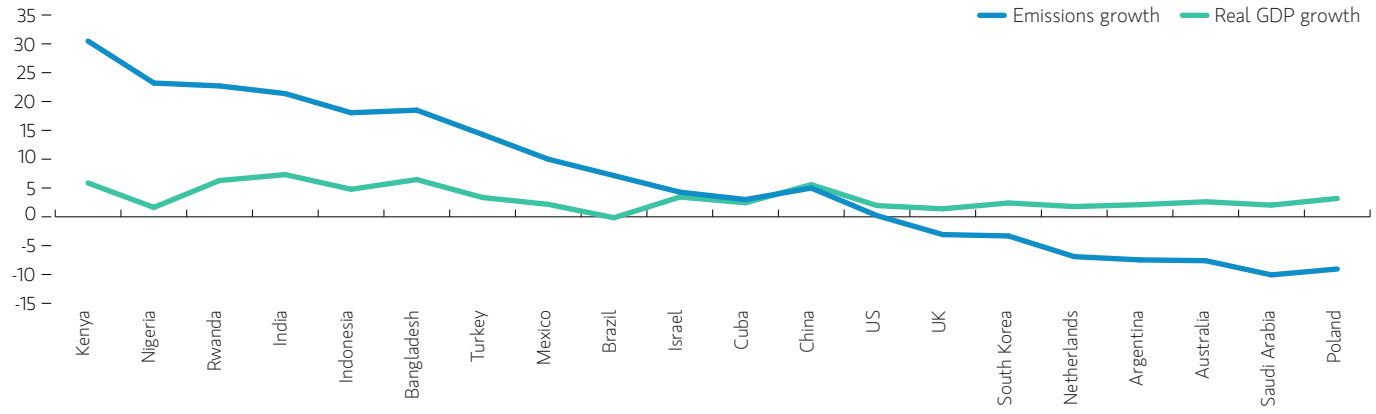
Despite sizeable investment, countries—especially emerging market ones—continue to grapple with addressing rising energy demands sustainably. Policy has provided some impetus to raise the bar, but business has increasingly started to drive progress. Decades of slow and volatile policy progress have led private actors to pursue market-based mitigation solutions that can increase security and promote environmental sustainability and cost efficiency while reducing the risks posed by regulatory uncertainty.

Advanced economies: Steady substitution in large energy consumers

Advanced economies are typically large emitters with big energy sectors and high levels of energy consumption, but have modest outlooks for energy consumption growth. Among these markets are a few with huge hydrocarbon reserves—the

Advanced countries typically show stronger ability to generate growth without an equivalent increase in emissions

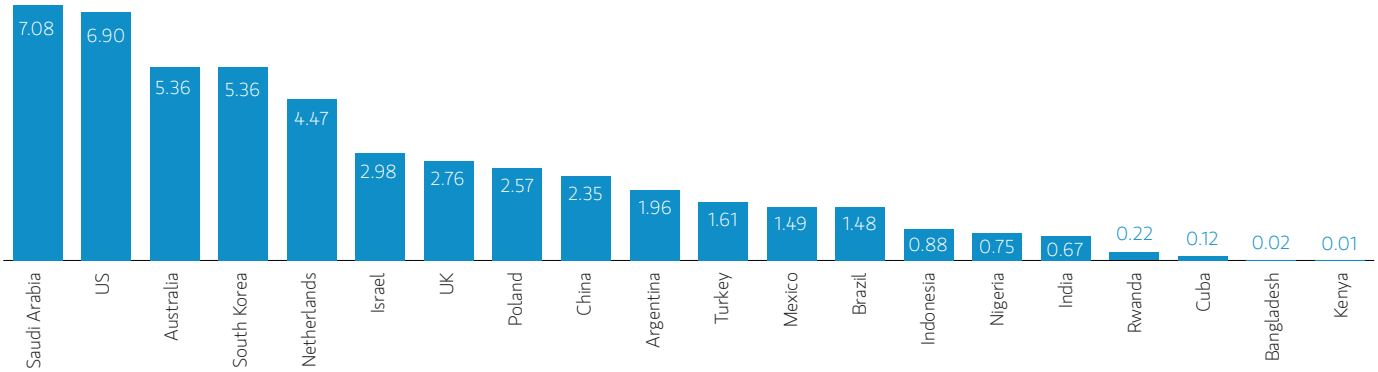
% growth (2015-20)



Sources: EIU CountryData; The Economist Intelligence Unit calculations based on data derived from CAIT

Energy use per head is highest in Saudi Arabia and the US

MT CO_2 equivalent per head



Sources: EIU CountryData; The Economist Intelligence Unit calculations based on data derived from CAIT

US, Australia and Saudi Arabia—but they also have some of the most advanced and largest renewables markets. The **US** is a giant in the energy market: energy consumption and emissions are more than 10 times greater than any of the other advanced economies.[43] While US energy consumption is growing modestly, investment opportunity in the well-developed renewables market remains strong. In 2016, for the first time ever, the US solar industry employed more workers than the hydrocarbons sectors—coal, oil and natural gas—combined.[44] In fact, solar employs more than twice as many people as coal and in 2016 accounted for one of every 50 new jobs across the country.[45] And private sector actors are continuing to advance mitigation: In 2015, corporate buyers accounted for 40% of all publicly announced utility-scale wind and solar power purchase agreements in the US,[46] and the top 50 US corporate buyers of solar and wind energy are expected to add 80.8GW to the power supply by 2025 (or approximately 15% of 2015 total global accumulated wind and solar power—611GW).[47]

Less attractive market opportunities are found in **Saudi Arabia**, despite leading the pack in terms of energy use per head. Saudi Arabia's energy consumption growth will be fueled by population growth of almost 30% between 2015 and 2030 (though from a relatively small base—at 30 million, Saudi Arabia's population is half that of the UK[48]). The Organization of Petroleum Exporting Countries (OPEC) estimates that the country has enough oil to maintain current production levels for the next 70 years,[49] but internal demand is rising, which—in the absence of alternative energy forms—will require diverting produced oil from international sale to domestic use. This is an unappetizing prospect for Saudi Arabia, especially since domestic oil is sold at highly subsidized rates.

In 2016, for the first time ever, **the US solar industry employed more workers than the hydrocarbons sectors combined.**

Market Challenges for Investors

The Economist Intelligence Unit and the Morgan Stanley Institute for Sustainable Investing recognize that investors face challenges in places like India, China, Rwanda and others, where business environment factors like intellectual property protection, contract enforcement and corruption may present risks. These factors are included in the overall index model and reflected in these countries' low scores for business enabling environment. (For more, see dashboard available at www.morganstanley.com/ideas/climate-change-mitigation-index). ESG investors must always be mindful about these considerations, but our goal is to highlight—for those who can navigate these obstacles—the interesting and potentially high impact investment opportunities available in these markets.

Saudi Arabia's solar sector may provide investment opportunities, with potential capacity estimated at 16 million terawatt-hours (TWh) per year, and plans under the country's strategic plan, Vision 2030, to install 9.5 GW of renewable energy.[50] However, the potential is contingent on uncertain government implementation of its promises to reduce the economy's dependence on oil.

Emerging economies: rapidly growing energy needs will require new clean capacity and substitution

Mitigation opportunities in emerging economies center on large and growing energy demand. Large hydrocarbon endowments in some countries are contrasted with burgeoning renewable energy sectors. Increasingly, government commitments to expanding renewable capacity have risen as a way of securing future energy supply, resulting in the emergence of mitigation technology leaders in these countries.

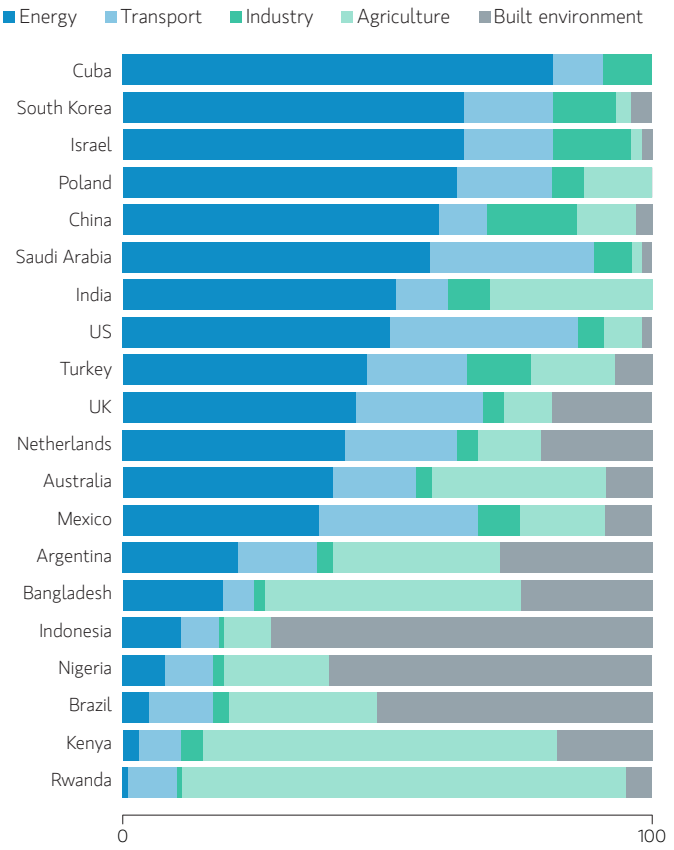
China far outstrips all other countries in the index in terms of total energy consumption and emissions. Emissions from China's energy sector are twice as high as those of the US and four times higher than third-ranked India.[51] The country needs to rapidly expand capacity, with energy consumption expected to grow by 12% to 2020.[52] While China has a sizeable coal endowment, and will continue to invest in coal-fired power, capacity expansion will underpin demand for new renewable energy—supported in part by the government's interest in the estimated 13 million jobs that would be created by the sector.[53] The International Energy Agency forecasts that China will account for nearly 40% of total renewable power capacity growth to 2020.[54] The country has an established renewables market, which provides a degree of operational and regulatory certainty.

Renewables market development in **India** has been slow, dampened by the abundance of cheap coal, but has shown recent signs of acceleration. In 2016, India unveiled the world's largest solar power plant with a capacity of 648MW, putting the country on track to become the world's third biggest solar market in 2017 behind the US and China.[55] With a population anticipated to grow by 90 million people by 2020[56] and rapid industrial expansion, the country's energy consumption is

In China, **capacity expansion will underpin demand for new renewable energy**—supported in part by the government's interest in the estimated 13 million jobs that would be created by the sector

Emissions by sector

% of total emissions contributed by each sector, ranked by highest proportion from energy



Note: Built environment emissions may be negative and, if so, are not shown.

Source: The Economist Intelligence Unit calculations derived from CAIT, FAO, IEA and the World Bank

forecast to grow by 27.5% from 2015-20.[57] India has significant capacity expansion needs, which will be boosted by generous electricity subsidies that are rapidly expanding power demand and straining existing infrastructure.[58]

Indonesia's sizeable geothermal resources—the country's archipelago traces an active volcanic range—has made it a global center of geothermal technology exploration. Many energy companies are piloting geothermal innovations in the country: France-based Engie, a multinational electric utility company, is constructing a plant in West Sumatra,[59] while GFZ Potsdam, the Agency for the Assessment and Application of Technology in Indonesia and Indonesia's state-owned PT Pertamina are collaborating to build a geothermal binary power plant in Lahendong.[60] The government plans to triple installed geothermal capacity by 2020,[61] supporting market potential. But an abundance of readily available and cheap

coal—coal accounts for about 50% of Indonesia's electricity capacity and major expansions in domestic coal-generation electricity capacity are planned—acts as a dampener to broader mitigation opportunities.[62]

Nascent markets: small fast-growing markets but restricted by capacity and risk

Nascent markets generally have the lowest current levels of energy consumption and emissions. While rapid population growth and economic expansion will fuel fast growth, the low starting base limits the scale of investment opportunity. Moreover, the high levels of risk posed by these markets may deter all but the least risk-averse investors. For those prepared to tolerate the risk, **Nigeria** and **Cuba** present markets of particular interest.

Nigeria's current energy consumption is 100 times larger than that of Cuba and is expected to grow by almost 14% to 2020.[vi] A rapidly growing population that is expected to add 100 million people by 2030[vii] and a growing middle class signal a need to rapidly expand energy capacity. State officials note that the country's sizeable oil and gas reserves are declining and will be insufficient to meet the country's future energy needs.[63] Nigeria has already begun to develop its solar sector: generation reached an all-time high of 5,075MW in 2015, and the government has signed purchase agreements to support solar plant construction that will generate an additional 975MW.[64] That said, shallow pools of skilled labor, weak technological adoption and innovation capacity and an unfriendly business environment make the market best suited to the least risk-averse of investors.

Developments in off-grid solar technology allow for decentralized power generation, which offer valuable solutions in markets like Nigeria which have underdeveloped infrastructure. For example, a Netherlands-based tech start-up is selling low-cost off-grid solar-powered kits to electrify Nigerian homes and power small appliances and mobiles. Worldwide, off-grid solar solutions generated $223 million in 2016.[65]

Cuba's small energy market is expected to see double-digit growth over the next five years, and while energy emissions are relatively low, they account for more than 80% of the country's total.[66] Cuba has no available fossil fuels, prompting energy security concerns. Currently, half of Cuba's energy is oil imported from Venezuela at highly subsidized rates. But over the past few years, Venezuela has slashed oil exports to Cuba—signaling demand for alternative energy sources. Cuba has started to explore renewable energy options: the Cuban Electric Group and a group of Chinese firms recently agreed to build a renewable energy research and development center in Cuba, in addition to developing wind towers.[67] Though still in the early stages, and while poor infrastructure and high financial risk limits the attractiveness of these opportunities, Cuba could be a market of interest for more risk tolerant investors, especially with the slow opening up of the country.

Developments in **off-grid solar technology** allow for decentralized power generation, which offer valuable solutions in markets like Nigeria which have underdeveloped infrastructure.

vi EIU calculations using data from the International Energy Agency
vii EIU forecast

CASE STUDY: **Climate investment and the energy-water-food nexus**

Energy, water and food systems are inextricably linked. Producing energy requires water, but so does growing food and feeding livestock. Freshwater provision and food production require energy. Successful long-term investments must consider these connections or risk throwing money towards an unsustainable equilibrium.

With total global renewable energy investment estimated to reach $5.1 trillion by 2030,[68] with around $2 trillion in China alone,[69] there is increased need to focus on the energy-water-food nexus—the links between securing energy, water and food—or risk investing huge sums in an unsustainable future.

After growing nearly ten-fold since 1990, hydropower is now China's second-largest energy source after coal, accounting for roughly 20% of electricity generation,[70, 71] and installed hydropower is expected to rise almost 30% by 2020 to reach 442GW.[72] Embracing hydropower has allowed the country to shift towards cleaner energy options—a necessity given air pollution levels, but not without a price. These clean energy investments have disrupted river ecosystems in China, as well as in countries downriver like Thailand, Cambodia and Vietnam. Hydropower dams impact irrigation and fish spawning in water-abundant regions, including in the Mekong Delta —the so-called rice-bowl of Asia—harming freshwater supply and food security. These effects not only impact local communities, but also threaten the sustainability of the broader economy.

Efficiency technologies form the foundation of balancing the nexus. China's 80,000 dams (the country accounts for half of all dams globally) are highly inefficient, typically operating at one-third of capacity and wasting enough energy in a year to power Britain and Germany together.[73] Energy efficiency—for example, efficient industrial production or efficient retail appliances—helps to alleviate the strain on the system. And efficiencies in the other prongs of the nexus—for example technologies that improve the water-intensity of agriculture—are also critical to maintaining the delicate equilibrium.

Sector 2: Agriculture

While transport and power generation are often cited as leading climate change culprits, agriculture is responsible for a surprising share of emissions. The world's farms account for an estimated 13% of global greenhouse gas emissions.[74]

In agriculture-intensive economies such as Argentina, Australia and India, the sector accounts for more than a third of total greenhouse gas emissions. In nascent economies like Bangladesh and Rwanda, which remain reliant on agriculture, the sector is responsible for more than half of total emissions.

With growing agricultural production demands to feed the world's expanding population—expected to reach almost 10 billion by 2050[75]—there is urgent need to develop a rich agriculture mitigation market. Reflected in the Paris Agreement submissions, policymakers are expanding their historically narrow focus on energy and transport to address agricultural emissions.[76]

Private innovators are starting to see the opportunities. Investment in AgTech (agricultural technology) reached record highs of $4.6 billion in 2015—a remarkable 95%

Investment opportunities to watch:

- Livestock methane reduction innovations, including technologies that capture emissions, in agriculture-heavy economies
- Efficient seeds and crop varietals in Sub-Saharan Africa and South Asia
- Mechanization of agriculture process to reduce livestock emissions scaled to small-holder farmer plot sizes in Rwanda, Kenya and Bangladesh

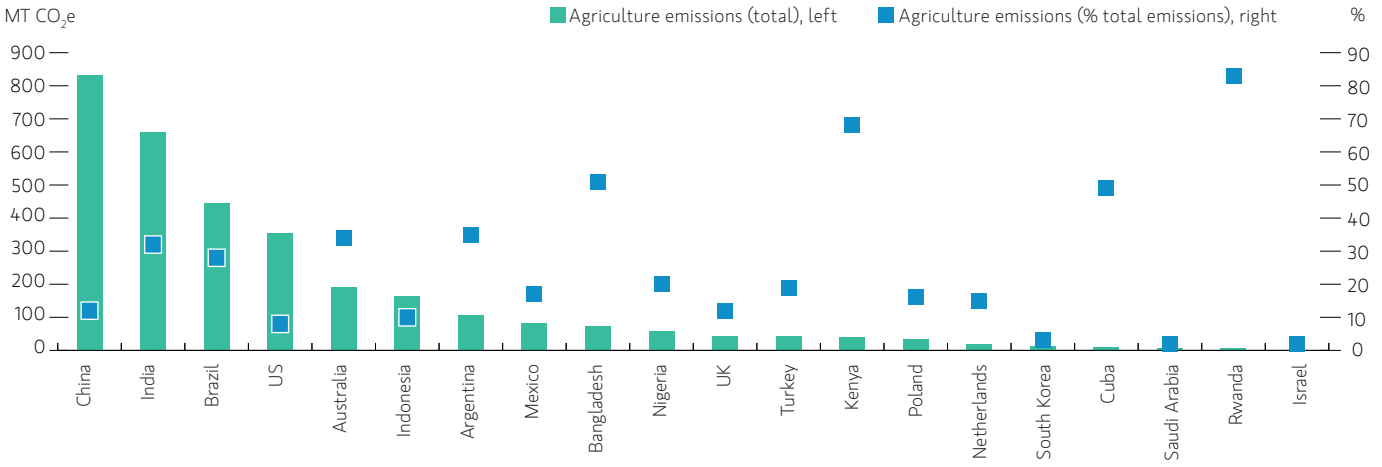
Agriculture sector

The Index includes 2 metrics related to market opportunities for agriculture sector investment:

Demand for climate change mitigation	Enabling environment
• Agriculture sector emissions	• Renewables targets for the agriculture sector

To explore in more detail, see the Climate Change Mitigation Opportunities Index dashboard at www.morganstanley.com/ideas/climate-change-mitigation-index

Agriculture emissions are highest in large economies, but are more important to nascent markets



Source: The Economist Intelligence Unit calculations based on data derived from CAIT and FAO

growth from 2014 levels.[77] As the focus on innovation in the sector has grown, AgTech investments have moved beyond biofuels, water purification and seed genetics. The sector is experimenting with digital technologies to make agriculture more resource efficient and resilient while also cutting emissions, and is optimizing performance using technology like sensors on farm machinery to track relative seed performance and drones with cameras to track yield patterns.

Investment in AgTech (agricultural technology) reached record highs of $4.6 billion in 2015—a remarkable 95% growth from 2014 levels.

Advanced economies: large agricultural producers are increasingly focused on expanding cleaner technologies

Economies in advanced countries are typically less reliant on agriculture, and with slow-growing populations, are subject to less pressure to increase agricultural production to meet local needs. That said, the **US** and **Australia** are among the top six global agricultural greenhouse gas emitters. This underpins investment opportunities for agriculture mitigation technology in these two markets that are further strengthened by their tech-savvy populations and businesses accustomed to seeking technology-driven solutions.

Of the two, **Australia** presents a particularly noteworthy market. While US agricultural emissions are higher, they account for a far lower percentage of total emissions (8% compared with 35% in Australia[78]), reducing relative focus on the sector. Political attitudes to climate policy in Australia have fluctuated, with the 2014 cap-and-trade policy revoked shortly after introduction. But harnessing technology to drive agricultural growth is a priority, with Australia's position as a key agricultural exporter slipping in favor of high-producing emerging markets.[79] SproutX, designed to turn the country's $60 billion agriculture industry into a $100 billion industry by 2030, launched in September 2016, backed by a partnership of government and private companies, paving the way for future AgTech investment opportunities.[80]

Government policy: agriculture

The indicator score is determined based on the following sub-indicator question: Does the country have greenhouse gas emission targets for the agriculture sector?

Yes	No
Argentina	Netherlands
Australia	Nigeria
Bangladesh	Poland
Brazil	Saudia Arabia
China	United Kingdom
Cuba	
India	
Indonesia	
Israel	
Kenya	
Mexico	
Rwanda	
South Korea	
Turkey	
United States	

Source: Climate Change Mitigation Opportunities Index
To explore in more detail, see the Climate Change Mitigation Opportunities Index dashboard at www.morganstanley.com/ideas/climate-change-mitigation-index

Emerging economies: Some of the largest and most promising clean agriculture investment markets

While many emerging economies are starting to move away from reliance on agriculture towards industry and services, agriculture sectors will need to continue to grow at robust rates to support growing local populations, indicating continued high demand for agricultural mitigation technologies. Additionally, changing consumption patterns—pork, poultry and beef output in China alone is forecast to increase almost 30% by 2023-24[81]—will increase livestock emissions, creating additional incentive for innovative solutions.

Among this group are the three largest global agricultural emitters: **China**, **India** and **Brazil**. **China**'s focus on using technology to modernize the agriculture sector and increase production and efficiency to feed its large population, coupled

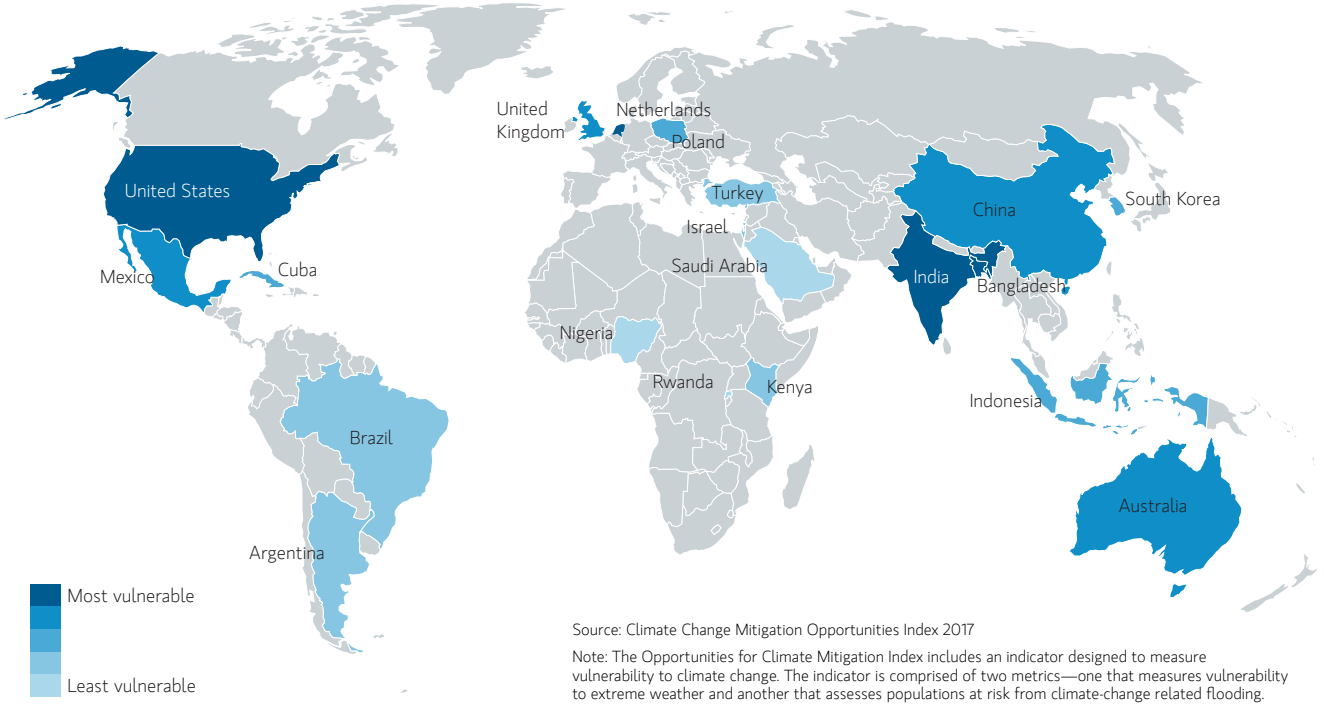
with agriculture emissions of more than 800 $MTCO_2e$,[82] provides ample opportunity for mitigation technologies. Though the sector accounts for just 12% of the country's total emissions,[83] excessive use of fertilizers has escalated pollution levels. Since 2014, the Guangdong Agricultural Pollution Control Project has piloted an automated program in the major agriculture-producing province that identifies and caps high intensity fertilizer use.[84]

Agriculture climate change mitigation technologies are also being adopted in **Turkey**. In 2014, the country set ambitious goals to be among the top five agricultural producers globally by 2023[85] and the government has committed to sustainable agriculture development (although past mitigation commitments have been lukewarm). At the city level, opportunity is becoming increasingly apparent: Gaziantep in south-eastern Turkey has an agriculture-focused climate change action plan that promotes technologies like precision agriculture systems and waste-to-energy technologies.[86] High political instability, however, plagues Turkey, and financial risk and a weak macroeconomic outlook may discourage some investors.[87]

Local scientists in **Argentina** are experimenting with new technologies, reflecting growth of innovation hubs outside of the mature economies and a potentially significant investment market. Researchers from the Argentina National Institute of Agricultural Technology are exploring the development of methane-capture backpacks for cattle. Though still early stage, the backpacks have been able to extract 300 liters of methane a day from a single cow, enough to power a refrigerator for a day.[88] Such advancements are critical, as agriculture emissions account for 35% of the total[89] and primarily emanate from the country's large and still fast-growing cattle sector. But, as mentioned, despite recent developments, Argentina remains a relatively high-risk market, and may be best suited for risk-tolerant investors.

Backpacks have been able to extract **300 liters of methane a day** from a single cow, enough to power a refrigerator for a day.

Vulnerability to climate change
Bangladesh and India, along with the US and the Netherlands are most vulnerable to climate change



Source: Climate Change Mitigation Opportunities Index 2017

Note: The Opportunities for Climate Mitigation Index includes an indicator designed to measure vulnerability to climate change. The indicator is comprised of two metrics—one that measures vulnerability to extreme weather and another that assesses populations at risk from climate-change related flooding.

Nascent economies: Heavy reliance on agriculture and high vulnerability underpin small but strong markets

Relative to other countries in the index, total levels of agricultural emissions are low across this group. But the group includes four heavily agriculture-reliant economies. In **Rwanda**, agricultural emissions account for 83% of total emissions; in **Kenya**, 68%.[90] And as temperatures rise from climate change and agriculture emissions, and populations and food demand continue to grow, the nascent markets are innovating new approaches to agricultural production. In **Nigeria**, for example, the National Cereal Research Institute is developing a resilient, salt-tolerant rice variety that economizes on water and fertilizer inputs as a way to increase production and minimize emissions.[91]

Significant opportunity lies in **Bangladesh**, where vulnerability to climate change poses a risk to the agricultural sector, particularly in areas impacted by flooding, saline intrusion and drought (see Chart: Vulnerability to climate change).[92] Given the country's weak tech-orientation, low-cost, simple mitigation technologies such as reducing emissions from livestock through agricultural mechanization (which removes the need for animals to prepare land for crops[93]) can play an important role. An example is the development and increased use of smaller two-wheel tractors, better suited to the small landholder farms in Bangladesh.[94]

Sector 3: Built Environment

In this report, we use the term "built environment" to refer to greenhouse gas emissions that stem from the conversion of land for new agricultural, industrial and urban development. The sector accounts for both the buildings sector and the land use, land use change and forestry (LULUCF) sector.

Collectively, around 40% of carbon emissions are channeled through buildings.[95] LULUCF is estimated to account for an additional 10-12% of total emissions.[96] With a growing global population driving the rapid expansion of cities and urban areas, reaching climate change targets is dependent on the participation of stakeholders in these sectors.

Investment opportunities to watch:

- Green building development and refurbishment in major cities
- Vertical farming in Brazil, Indonesia, Australia, Kenya and Bangladesh
- Remote sensing systems to monitor deforestation in Brazil

Land use, land use conversion and forestry sector: Mitigation opportunities in emerging economies and nascent markets

Land use, land use conversion and forestry (LULUCF) emissions—especially emissions from deforestation[viii] and the conversion of land for agriculture, but also those from urban growth, infrastructure expansion and mining—have intensified with economic development and growing populations, making the emerging markets high-potential opportunities for emissions mitigation.

In **Indonesia**, conversion of land for agriculture—primarily for palm oil, for which Indonesia is the world's largest supplier—accounts for more than 70% of total emissions.[97] However, despite a Nationally Determined Contribution (NDC)[ix] commitment of 29% LULUCF emissions reductions by 2030,[98] recent data show no signs of deforestation slowing down.[99]

In contrast, **Brazil** is a more favorable market opportunity. Illegal deforestation in the Amazon is the primary driver of the country's LULUCF emissions. Emissions from the sector are more than 10 times greater than in any of the other emerging economies (besides Indonesia), and account for 51% of total emissions. The country has turned to technology, adopting a remote-sensing system to monitor deforestation. And the Brazilian Institute of Environment and Renewable Natural Resources is developing a system to detect illegal logging.[100] Brazil's NDC highlights the necessary engagement of three priority sectors: LULUCF, agriculture and renewable energy.[101] These commitments, along with the vulnerability of Brazilian ecosystems to climate change and the interactions between LULUCF and global warming,[102] make Brazil a strong investment market for land-use mitigation.

Among the more nascent markets, land conversion emissions account for a large share of total emissions in **Kenya** and **Bangladesh**, at 21% and 17% respectively.[103] Both countries have made specific commitments to reduce LULUCF emissions in their NDCs, and multilateral institutions have partnered with government entities to begin mitigation efforts. Of the two, **Bangladesh** arguably presents a stronger opportunity for less risk-averse investors. Economic and physical vulnerability to extreme weather plagues the country, driving a strong desire for mitigation, as well as a need to improve resilience.

Built environment

The Index includes 4 metrics related to market opportunities for built environment investment:

Demand for climate mitigation	Enabling environment
• Land use and forestry emissions	• Funding for clean buildings
• Residential building emissions	• Efficiency standards for clean buildings

To explore in more detail, see the Climate Change Mitigation Opportunities Index dashboard at www.morganstanley.com/ideas/climate-change-mitigation-index

viii Forests, through tree growth and soil carbon, provide carbon sinks for a large part of the carbon stored on land. Deforestation, in addition to limiting the availability of natural carbon storage, increases carbon emissions through the conversion of forests to agricultural land or to building land, exacerbating either agriculture or buildings emissions, or both. The climate actions a country commits to undertake upon on the ratification of, accession to, or approval of the Paris Agreement through its submission to the United Nations Framework Convention on Climate Change

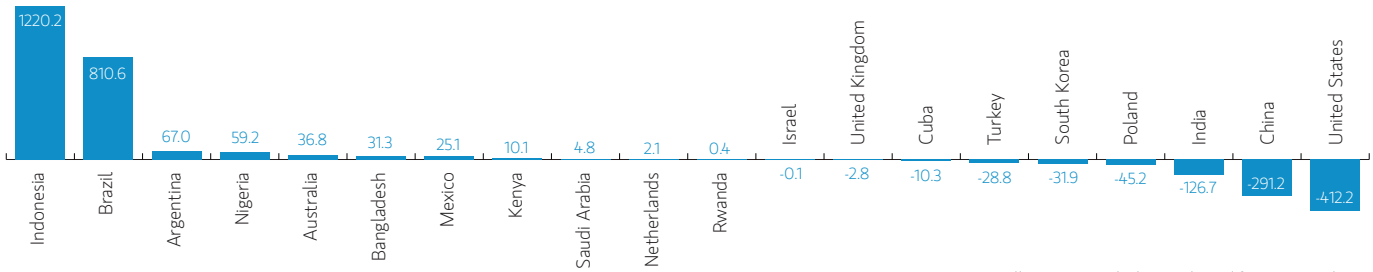
ix The climate actions a country commits to undertake upon on the ratification of, accession to, or approval of the Paris Agreement through its submission to the United Nations Framework Convention on Climate Change." World Resources Institute, "What is an INDC?". Available at: http://www.wri.org/indc-definition

SECTOR SPOTLIGHT: **Sustainable agricultural practices provide opportunities to counteract LULUCF emissions**

Though almost a third of the world's land area is still covered in forest, about 7 million hectares of forest—the equivalent of a country the size of Panama—are lost each year.[104] This deforestation releases about 3 Gigatons (Gt) of CO_2 emissions into the atmosphere.[105] Much of the land lost to deforestation is converted into land for agriculture: between 2000 and 2010, there was a global net gain of 6 million hectares of agricultural land a year.[106] Large-scale commercial and local subsistence agriculture account for almost three-quarters of forest land conversion around the world.[107] And with agriculture's approximately 6000Gt of emissions,[108] agriculture-related activities (including deforestation) account for almost of quarter of the globe's yearly emissions.

As the global population burgeons, demand for food will require increased agricultural output; however, repurposing land for agriculture increases agriculture emissions while also exacerbating LULUCF emissions. Additionally, forests are a key player in sustainable agriculture development and climate change mitigation, supporting soil conservation, carbon sequestration and the water cycle. Reforestation and innovations to more effectively monitor and prevent deforestation, along with mitigation technologies that enable cleaner, more efficient agricultural practices such as building soil carbon through farming techniques will support LULUCF mitigation (for a discussion of opportunities to mitigate in the agricultural sector and make farming more efficient, see "Sector 2: Agriculture" on page 26).[109]

Demand for climate change mitigation: LULUCF emissions
Indonesia and Brazil dominate with significant emissions from LULUCF



Source: Economist Intelligence Unit calculations derived from CAIT and FAO

Buildings sector: advanced economies dominate, but there are fast-growing opportunities in emerging economies and bright spots in unexpected places

In the **buildings sector**, investment opportunities are manifold: The market for green building—the practice of creating structures and using processes that are environmentally responsible and resource efficient[110]—is expanding rapidly, doubling every three years.[111] The share of firms engaged in green building construction is expected to double by 2018 from 18% to more than 36%.[112] Activity is particularly picking up in emerging markets, driven by new commercial construction and burgeoning populations.[113] And, although the momentum for new building in advanced economies is slowing, much of the building stock in these markets is old and energy-inefficient, offering plenty of conservation opportunities within existing constructions.

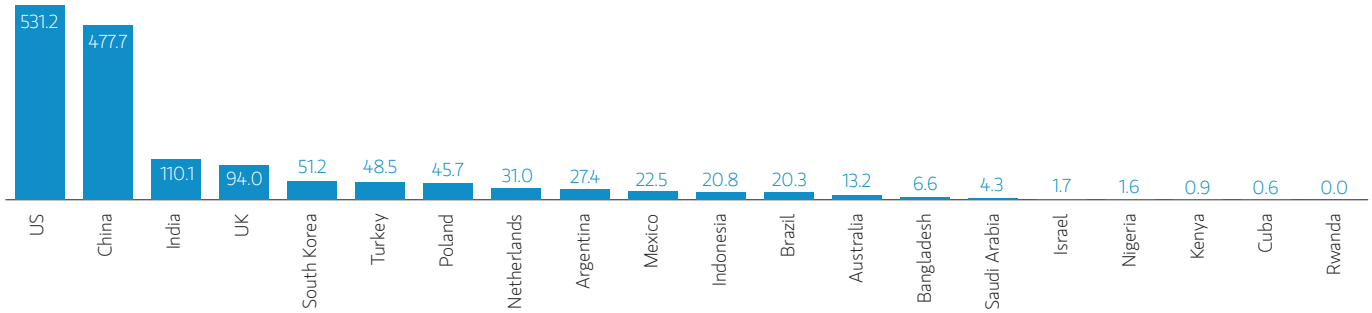
The highly urbanized advanced economies offer high potential markets for energy efficient building. Growth in LEED certifications, the world's most widely used green buildings rating system, has occurred rapidly. For example, **Poland** saw a 60% increase in green-certified buildings[x] between 2014 and 2015,[114] and the number of LEED-certified projects in the

x This includes both LEED and BREEAM certified buildings.

Demand for climate change mitigation: Residential building emissions

US and China dominate with significant emissions from residential buildings

MT CO_2



Source: Economist Intelligence Unit calculations derived from IEA and the World Bank

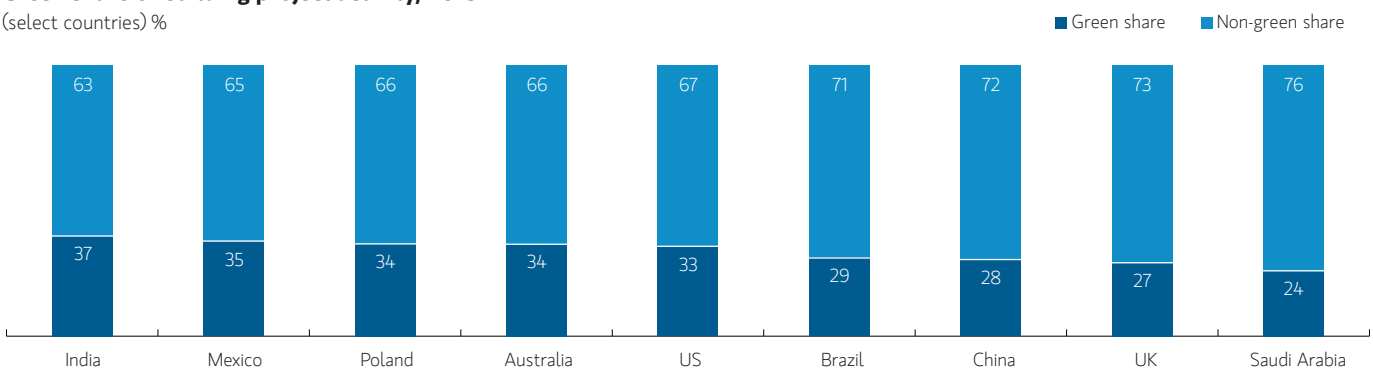
US rose from 296 certifications in 2006 to over 33,600 in 2016.[115] And that growth is projected to continue: greening of institutional buildings like schools and hospitals is anticipated to rise rapidly, in part a result of certification requirements for public buildings and schools.[116] Retrofit projects have also been cited as an area of potential for growth in the **UK** alongside the US.[117]

For more risk-tolerant investors, **Saudi Arabia**'s buildings sector presents a potential opportunity in an otherwise rather unfriendly mitigation market, as energy efficient building activity is estimated to grow fourfold by 2018.[118] The large emerging markets also present opportunity. The US Green Building Council estimates that **Brazil**'s activity will grow six-fold from 2015 to 2018,[119] while **China** expects its number of environmentally-friendly building projects to be five times higher in that period.[120]

In the more nascent markets, perhaps unexpectedly, local focus on energy cost-efficiency presents green building opportunities for risk-tolerant investors, as urbanization and industrialization advance. **Bangladesh**'s manufacturing sector, which has also pioneered adoption of clean industry technologies, has shown appetite for energy efficient construction. The ready-made garment sector, which accounts for over 80% of Bangladeshi exports, is leading the way: Almost 30 factories have obtained LEED certifications (10 of which have received the highest platinum-level certifications) and about 100 more have been registered.[121] Private sector commitments to green building help drive clean industry, highlighting how investments in the built environment also support preferences for sustainable practices across other sectors.[122]

Green share of building project activity, 2015

(select countries) %



Source: Dodge Data & Analytics 2016

CASE STUDY: **With a protective focus, cities are doubling down on climate action**

Cities are actively pursuing climate goals to protect inhabitants from the worst climate change impacts, presenting focal points for mitigation investment opportunity.

Home to more than half of the world's population (and projected to absorb 2.5 billion additional people by 2050—almost double the current population of China[123]), cities account for over 70% of carbon emissions.[124] The World Bank has estimated that climate change and rapid urbanization will increase expected losses from flooding, multiplying from $6 billion per year at present to more than $52 billion per year by 2050.[125] With around 90% of urban areas situated geographically in coastal regions,[126] the urgency to address climate change in cities is clear.

Mitigation in cities presents a significant market opportunity, particularly in green building. The Business and Sustainable Development Commission, a non-profit supported by the UN and the Gates Foundation, estimates that energy efficient buildings, clean vehicles, urban public transport and resilience-building in cities represents an opportunity of over $1.1 trillion globally by 2030 with more than half coming from energy efficient buildings.[127]

The market opportunity is bolstered by city support, as officials recognize the need for holistic, coordinated action to mitigate and adapt. London is just one of many cities trying to step up to the plate with policy action and strategic development. As part of the update of the Smart London Plan—the capitol's smart city strategy—the Greater London Authority (GLA) is exploring how smart solutions, such as smart grids and smart meters in homes, could address the city's energy challenges. The GLA estimates that the market for smart energy solutions in London could grow by over $2 billion by 2020.[128]

London's air quality issue, however, proves a more pressing problem. Air pollution in the city is high—primarily a product of vehicle emissions—resulting in over 9,000 deaths a year.[129] Vehicles in central London will have to meet minimum exhaust emissions standards in central London later starting in October 2017 and the city is exploring the possibility of introducing the world's first Ultra Low Emission Zone in 2019.[130]

More broadly, London sees the maintenance of natural capital—air quality, water resources and land—as fundamental to ensuring continued economic growth and prosperity. And persistent flooding, drought and extreme heat waves—in tandem with air pollution—have led the city to develop a progressive climate mitigation and adaption strategy.[131] The London Plan is wide-ranging and designed to position the city as a world-leader in addressing climate change, improving air quality to benefit a growing population and support an attractive business environment.[132, 133] As part of the London Plan, the city aims to reduce emissions to 60% below 1990 levels by 2025 and has already made significant progress: In 2016, emissions had fallen to 11% below 1990 levels.[134] Over 20% of the public bus fleet is hybrid and the city is focused on ensuring all new buses meet London's new transport emissions standards. These efforts echo those in other European cities like Paris, another city with notoriously bad air pollution, where by 2025, all of the Greater Paris network (4,500 buses) will be clean, and four out of five will be electric.[135, 136]

Sector 4: Transport

With increasing affluence, global populations are becoming more physically mobile. This is particularly true in those emerging markets playing catch-up, where rapid economic growth and rising incomes are fueling fast-growing demand for vehicles and making travel, both for work and pleasure, more affordable. By 2020, non-OECD countries will account for more than half of global transport energy consumption, up from 45% in 2012.[137]

As vehicle demand continues to rise, already-skyrocketing investment in clean transport technologies will continue to expand. The International Energy Association estimates that the electric vehicle market will account for 75% of global car sales by 2050[138] as companies push forward with innovation. Established companies like Ford—which in late 2015 announced $4.5 billion of investments into electric vehicles by 2020—are competing with newer entrants like Tesla, which aims to revolutionize the market with solar-panel equipped vehicles following its acquisition of SolarCity.[139]

That being said, solar-panel equipped vehicles are still aspirational, and the large investments made in electric vehicle infrastructure in the past few years have not yet created sufficient capacity to meet growing demand. Companies are increasingly focusing on the expansion of charging station infrastructure as the electric vehicle market expands. In California, Pacific Gas and Electric Company is seeking over $250 million to develop necessary infrastructure, while Southern California Edison is asking for $570 million.[140] And Chargerlink, a Shenzhen-based start-up that raised $20 million in February 2016 alone to expand charging station solutions in China, is just one of many companies capitalizing on China's goal of having 4.8 million charging stations in operation by 2020.[141]

Investment opportunities to watch:

- Rapid electric vehicle take-up in developed markets
- Public transportation initiatives and biodiesel innovations in Brazil and Argentina
- Longer-term opportunities for low-emission transport in low-income economies

Advanced economies: rising transport demand and shifting consumer preferences towards cleaner vehicles support robust investment markets

Outside the energy sector, emissions from transport account for the bulk of advanced economy emissions. While demand for cars is forecast to rise across advanced economies,[142] shifting consumer preferences towards cleaner vehicles will lead to a decline in fuel consumption. Local and federal initiatives to fund green public transport systems are also areas of potential private sector opportunity.

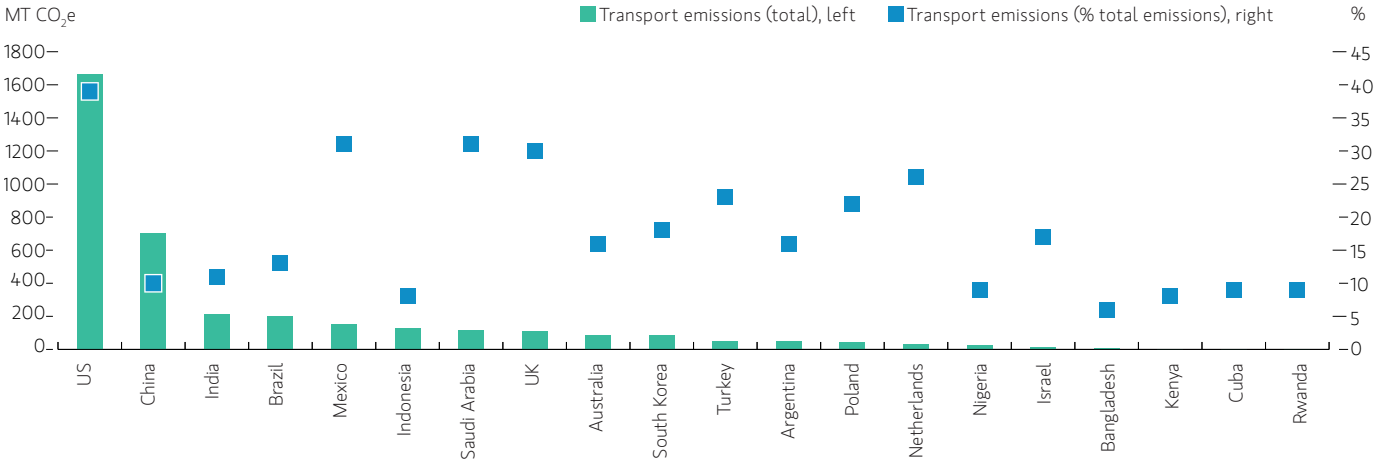
Transport sector

The Index includes 4 specific metrics related to market opportunities for transport sector investment:

Demand for climate mitigation	Enabling environment
• Transport sector emissions	• Transport emissions standards • Transport renewables targets • Major public transport initiatives

To explore in more detail, see the Climate Change Mitigation Opportunities Index dashboard at www.morganstanley.com/ideas/climate-change-mitigation-index

US dominates all other countries in both size and scope of transport sector emissions
Transport also comprises a large share of total emissions in some emerging markets



Source: Economist Intelligence Unit calculations derived from CAIT

Israel is a ripe opportunity for investors looking for innovative transport technology investments as its highly skilled workforce and strong innovation capacity make it a global technical leader on electric vehicles. While the country's transport emissions are relatively small, it has been an influential global pioneer in electric vehicle technologies, and scores strongly on the index's technology innovation and adoption capacity indicators. One current example is Ziv Av Engineering, which supplies electric vehicle battery switching stations to China's Nanjing city.[143]

In both the **US** and the **UK**, market opportunity is high. US transport emissions are more than double that of next-ranked China and ten times greater than emissions from the other emerging economies analyzed in this year's index. Initiatives to expand green public transportation will underpin strong demand for clean transport technologies in the UK. Consumer preferences are shifting towards cleaner vehicles such as hybrids and electric cars, and current government emissions standards and renewables targets support shifts to cleaner fuels in both countries, backing strong markets for clean transport investment. According to data from the Society of Motor Manufacturers and Traders, a trade association, over 35,000 plug-in cars were registered in the UK in 2016 and POD Point, a UK electric vehicle charging company, expects its turnover to double in 2017 to £9m and reach £50m by 2020.[144]

Emerging economies: high-potential clean transport markets as vehicle demand is rising sharply, though cultural challenges exist in some markets

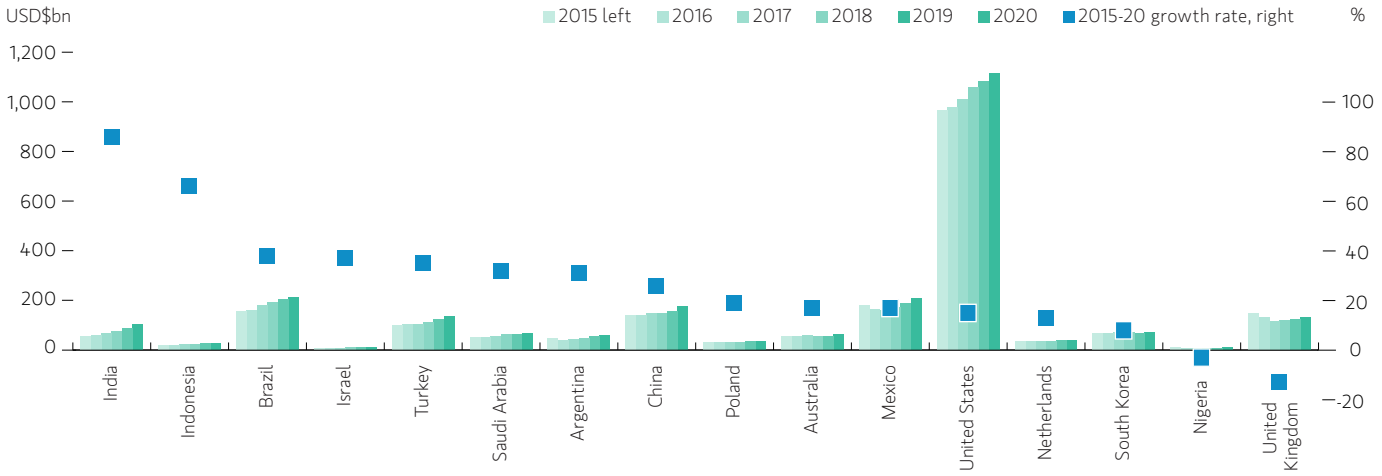
Vehicle demand is forecast to increase rapidly across these growing markets, and alongside growing sustainability concerns, will drive mitigation investment opportunity for risk-tolerant investors. In **India**, for example, vehicle demand is expected to almost double in the period to 2020,[xi] which—combined with dedicated national-level renewable energy targets—underpins significant opportunity for clean transport technology investments to help fill this growing demand.

In India, for example, **vehicle demand is expected to almost double** in the period to 2020

Brazil's strong need for transport mitigation investment stems from high vehicle demand and a culture of individual car ownership. Brazil has a large and well-established biofuel market, which provides an alternative fuel source for the transport sector, underpinning demand for hybrid vehicles. Brazil has also started to explore cleaner public transport in its crowded and growing cities: in 2009, Sao Paulo set the

xi EIU forecast

Demand for cars is surging in many emerging markets
Total market demand for motor vehicles, motor vehicle parts, motorcycles and bicycles



Source: EIU Market Indicators & Forecasts

ambitious target of having its entire 15,000 bus fleet run on renewable energy by 2018 and in 2014 announced plans to make all 70,000 buses in the state renewable by 2020, signaling commitment and future investment potential in the clean transport sector.[145, 146]

Much like Brazil, strong vehicle demand growth and a commitment to sustainability in **Argentina** supports a high-potential investment market, albeit for a risk-tolerant investor. Argentina's commitment to transport mitigation is well-developed: the country has emissions standards, renewable energy targets and has made sizeable investments in clean public transportation systems.[147] As part of its Sustainable Mobility Plan, the city of Buenos Aires has introduced hybrid and electric buses, experimented with diesel-electric buses, and piloted a program to recycle home vegetable oils into biodiesel to be used in city transport.[148, 149] Financing conditions in Argentina have improved since international financing markets have reopened to the country, but the market remains highly risky (Argentina ranks 18th out of the 20 countries in the Climate Change Mitigation Opportunities Index's financial risk category).

Nascent economies: minor, but growing, transport emissions signal long-term market opportunities

Transport sectors (and emissions) in nascent economies are small and account for less than 10% of total emissions in each of the countries explored.[150] Investment opportunities in these countries may be currently muted by low income levels, but significant potential exists for investors with longer-term horizons as these countries grow richer and transport sectors expand. Clean transport in **Rwanda** is likely to grow, with the country showing dedicated efforts towards incorporating clean technologies into its economic development. Kigali, the capital, has included green transport as a key element in city development. Most of the transportation initiatives have yet to be implemented, but could provide future investment opportunities for more risk-tolerant investors.[151]

Lagos, is the sixth-largest city in the world, and **one of the fastest growing and most congested**, with over seven million passengers a day commuting in the city.

High demand for more efficient and cleaner public transport, a growing population and industrial growth—all of which will require improved transport infrastructure—could create a ripe investment opportunity for risk-tolerant investors in Nigeria. Transport emissions in **Nigeria** account for 9% of total emissions,[152] but the country's capital, Lagos, is the sixth-largest city in the world, and one of the fastest growing and most congested,[153] with over seven million passengers a day commuting in the city.[154] Opportunity, however, is dampened by a weak business environment and the country's limited tech-orientation. Government commitment to mitigation in the transport sector also poses a potential barrier: the country has emissions standards but lacks renewable energy targets and currently has limited clean public transport initiatives.

Sector 5: Industry

Economic development and rising incomes bring with it rapid-fire growth in demand for industrial outputs, including iron and steel, cement and petrochemicals, through to retail goods like cars, refrigerators and computers. There is a global challenge to constrain industrial emissions while meeting rising demands.

Emerging economies have large and growing industrial sectors, and new industrial development creates prime opportunities for mitigation technology. In slower-growing and more services-oriented advanced economies, opportunities remain to decouple industrial production from emissions through substitution of legacy equipment for clean energy, innovative process design, and carbon capture and storage (CCS).

Years of wavering support for CCS (in 2015, for example, the UK government retracted £1 billion in funding from CCS technology development[155]) have given way to mounting needs to constrain industrial emissions. The International Energy Agency forecasts that historically vacillating investment in CCS will steady, allowing CCS technology to advance and account for over 10% of global emissions reductions by 2050.[156] Companies are starting to act on such opportunities: in late 2016, a conglomeration of oil magnates, including Saudi Aramco, Royal Dutch Shell and BP announced an investment of $1 billion into CCS development over the next 10 years.[157] Such developments signal a bright future for CCS in years to come.

Advanced economies: large industrial sectors and high tech capacity present opportunity

While many advanced economies are primarily services-oriented, large industrial sectors remain and civil society increasingly demands focus on reducing industrial emissions through technological innovation. This underpins strong markets for mitigation investment targeted at the industrial sector—despite the fact that industry accounts for only about 5% of emissions across these countries.[158]

Investment opportunities to watch:

- Carbon capture and storage technologies across the globe
- High-efficiency industrial power generation in Bangladesh
- Innovations to decouple industrial production and emissions in the advanced economies

The **US** and **South Korea** present high-potential investment markets for industrial emissions mitigation. Total industrial emissions in the **US** are more than four times greater than in any other advanced economy.[159] While there are emissions standards for industrial subsectors in place (including for manufacturing and chemicals) and positive moves to develop CCS regulatory frameworks, uncertainty about the national-level policy environment could reduce mitigation incentives.

In contrast, **South Korea**'s government has recently taken steps to make industrial sector mitigation a priority: In early 2016, the country launched its new carbon emissions trading scheme, despite resistance from industrial groups who argued the scheme would reduce South Korea's international competitiveness.[160] The country has also called for a legal framework for CCS, though one has not yet been introduced. A skilled labor force with technological innovation capacity enhances the market opportunity, which is large, given the country's sizeable industrial sector. Industry accounts for 13%

Industrial sector	
The Index includes three metrics related to market opportunities for transport sector investment:	
Demand for climate mitigation	**Enabling environment**
• Industrial sector emissions	• Industrial emissions standards • Carbon capture and storage laws and regulation

To explore in more detail, see the Climate Change Mitigation Opportunities Index dashboard at www.morganstanley.com/ideas/climate-change-mitigation-index

of total emissions—more than double the share of any other advanced economy in this year's index.[161]

Emerging economies: ripe industrial mitigation markets as manufacturing remains strong and air quality concerns are politicized

Emerging markets present some of the strongest industrial mitigation investment opportunities, given their large and growing industrial sectors and the growth of innovation centers across these countries. Unsurprisingly, **China** and **India** are stand-outs, especially as both countries focus on reducing growing health concerns from air pollution. With large industrial sectors forecast to grow rapidly through 2020 (over 40% in India and 25% in China[162]) and high sectoral emissions, demand in China and India outstrips demand across other countries in the index.

With the change in the US administration's policy toward climate issues, **China** has positioned itself as global climate leader, pushing forward a progressive climate change agenda, including plans to implement a cap-and-trade program in 2017.[163, 164] Industrial emissions are more than five times greater than in any other country and account for a larger share of the total (19%) than anywhere else.[165] And the potential market continues to grow, with robust annual industrial production growth of 5% expected to 2020.[166] Additionally, air pollution is a highly politicized issue in China, and significant attention has been turned towards technology-driven solutions.

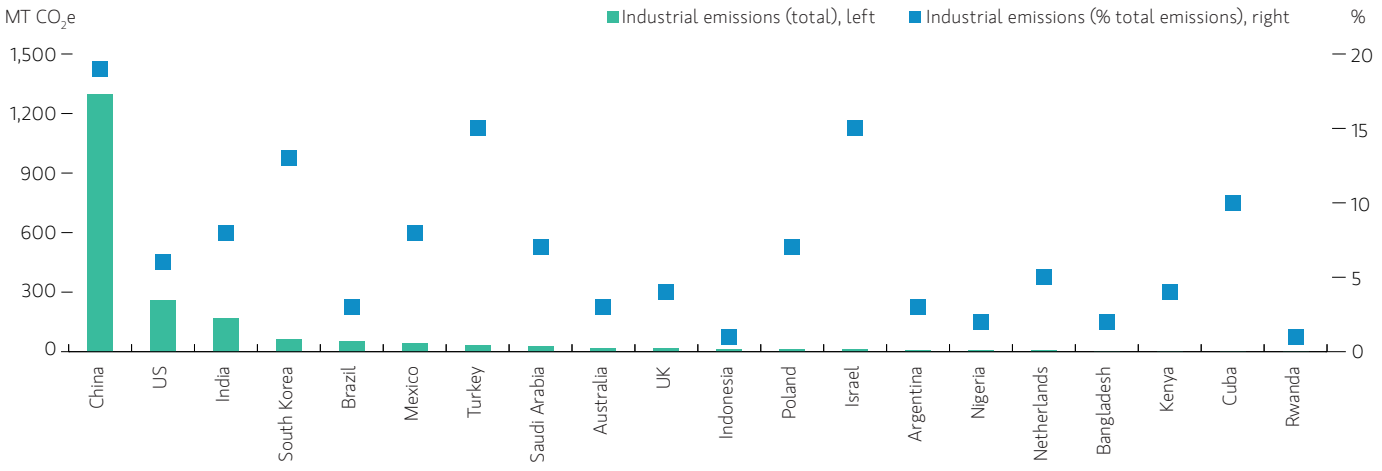
Reducing finite particulate matter releases (a major non-greenhouse gas emission air pollutant) supports industrial mitigation, as it requires substituting new, clean infrastructure for existing infrastructure. In its 13th Five-Year Plan, the government articulated aims to reduce factory emissions of finite particulate matter by 25%, marking China's first specific target.[167] This will indirectly support the industrial mitigation market.

In 2016, **India** surpassed China in the overall amount of harmful air pollution to which its citizens are exposed.[168] These growing air pollution concerns, plus a demonstrated commitment to reducing emissions intensity of industrial output (India reported a 12 percentage point decline in emissions intensity from 2005-10) and a deep pool of science, technology, engineering and mathematics (STEM) graduates, underpins a high-potential industrial mitigation market. Industrial emissions in India are about one-tenth of China's,

In January 2017, a plant in Tuticorin in southern India began using a technology from CarbonClean to **capture and convert carbon dioxide** from its coal-powered boiler into harmless baking soda. This marks the first industrial-scale carbon capture venture that has turned carbon emissions into a commercial opportunity.

Emissions from China's industrial sector outranks all

Overall industrial greenhouse gas emissions, by country and industrial emissions as a percentage of total emissions, by country



Source: Economist Intelligence Unit calculations derived from CAIT

but India's industrial output is anticipated to grow at 4.5% per year through 2020.[169] The country announced its intention to further reduce emissions intensity by at least 20% by 2020.[170]

Highlighting the opportunity is India's recent advances in carbon capture and usage. In January 2017, a plant in Tuticorin in southern India began using a technology from CarbonClean to capture and convert carbon dioxide from its coal-powered boiler into harmless baking soda.[171] This marks the first industrial-scale carbon capture venture that has turned carbon emissions into a commercial opportunity.

Nascent economies: Small but rapidly growing manufacturing sectors provide potential opportunities for tech leapfrogging

Industrial emissions are low but growing rapidly across the nascent markets as economies develop and shift away from their reliance on agriculture. Industrial growth is expected to be most rapid in **Bangladesh** (9% on average each year to 2020) and **Kenya** (7% per year).[172] This growth and the absence of existing industrial plants gives rise to potential opportunities for technology leapfrogging.

In these countries, much of the current activity to develop clean industry practices is concentrated in the private sphere.[173] But only companies at the top of the capability pyramid—those with the ability to adopt clean technologies while retaining profitability—are making the shift towards sustainable practices.[174] As low labor costs and infrastructure build-outs increasingly draw manufacturing to these markets, demand for efficient, clean industry will burgeon even more, providing attractive longer-term opportunities for risk-tolerant investors.

For example, in **Bangladesh** companies are looking for ways to increase growth in a climate-friendly manner.[175] Walton Group, a Bangladesh-based electronics, appliances and automotive manufacturer is transitioning over to new high-efficiency diesel engines to generate more reliable on-site power at one of the company's factories, simultaneously expanding power capacity and reducing diesel consumption and carbon emissions.[176]

CASE STUDY: **A new generation of climate leaders: Corporations**

Corporations are becoming more active in pursuit of climate change goals, independent of policy.

No longer constrained to the realm of corporate social responsibility, corporations are increasingly pursuing broad-based action to reduce their carbon footprints. Spurred by shifting consumer demands, cost-efficiency, the plummeting price of renewables and risk management concerns, the private sector is using the weight of its resources and technological capacity to become a powerful climate player.

Donald Trump's inauguration, and more generally, the rise of nationalist politicians, has brought with it a fresh bout of climate skepticism into circles of power and put continued near-term progress on international climate policy on shaky ground. But market incentives underpin a paradigm shift towards climate-friendly business practices that is not reversing: in a May 2017 public letter to Mr Trump, 30 CEOs supported the Paris Agreement, highlighting its business benefits.[177]

Johnson & Johnson is a prime example. The global medical, pharma and consumer goods company has made climate sustainability a strategic priority. It has rolled out a broad emissions reduction initiative, committing to emissions reduction of 20% by 2020 and 80% by 2050.[178]

The company set goals to procure 35% of energy from clean sources by 2020, and 100% by 2050.[179] To do this, Johnson & Johnson has started producing its own electricity: in late 2016, it agreed to purchase 100MW of wind capacity in the Texas Panhandle, which will provide the equivalent of 25% of its global energy consumption.[180] More broadly it has a fund that provides $40 million each year for greenhouse gas reduction projects. Fifteen such projects were completed in 2015 alone.[181] Mitigation efforts also include commitments to green building—in 2009, the company mandated that all new facilities be LEED certified and currently has around 30 LEED-certified buildings globally.[182]

The investments have been beneficial to the bottom line: over 2005-2016, the company estimates energy reduction projects reduced annual energy costs by $64 million.[183]

Conclusion

The economic impetus to address climate change is clear. The consequences of rising temperatures and extreme weather events cannot be ignored. Ramped up mitigation efforts must complement resilience building and climate change adaptation. As just one of many examples, based on current trends, more than $66 billion of existing coastal property in the US alone will be below sea level by 2050.[184]

On the bright side, we are seeing a paradigm shift, as stakeholders increasingly focus on the direct economic and social benefits of climate change mitigation. Leadership is emerging from places of traditional climate pushback, as a formerly hesitant China is stepping up, championing international climate commitments and seeking the millions of jobs that clean energy would support. And despite policy swings that have created some qualms, falling renewable energy prices, multi-billion dollar market opportunities in city-level energy efficiency and chances to convert mitigation technologies into stand-alone commercial ventures have attracted the eye of the investor.

Though a sectoral lens may drive investor focus, the interconnection of key mitigation sectors means that investments in one sector can create benefits across others. And mitigation across all of these sectors is a must to achieve climate change targets. Of course, opportunities for investors vary greatly based on geography, development level and vulnerability to climate change. And countries' technological capacity, infrastructure development and financial risk also play a part. Such characteristics will lead some investors to focus on substitution in the advanced economies, while others focus on building capacity in the currently underdeveloped, but high growth nascent markets.

And there are other risks: In emerging markets, governments may struggle to balance sustaining emissions reduction with promoting the economic growth needed to combat poverty. But increasing market sophistication and fast-growing issuance of green bonds are making it easier for to investors to participate. And the emergence of new technologies in emerging and developing markets is creating location-specific and globally-adoptable solutions.

The challenges of adequately mitigating against climate change must not be underestimated. Efforts will require coordinated action across multiple spheres, from governments to businesses, international organizations and non-governmental organizations. Among the most important players in this movement are investors. This report aims to highlight the role that private investment can play in supporting mitigation and to provide an analytic framework that enables investors to explore where investment opportunity exists. We hope that this is one step in a longer and more committed journey to building a sustainable global economy.

Index Rankings

Overall Index Rankings and Score

Overall index scores are the weighted sum of the underlying five categories (see index category scores in the table below), adjusted by the level of financial risk, using the base weight settings. For more information on indicator weightings, please see Appendix A.

Index category scores, ranked by overall index ranking*

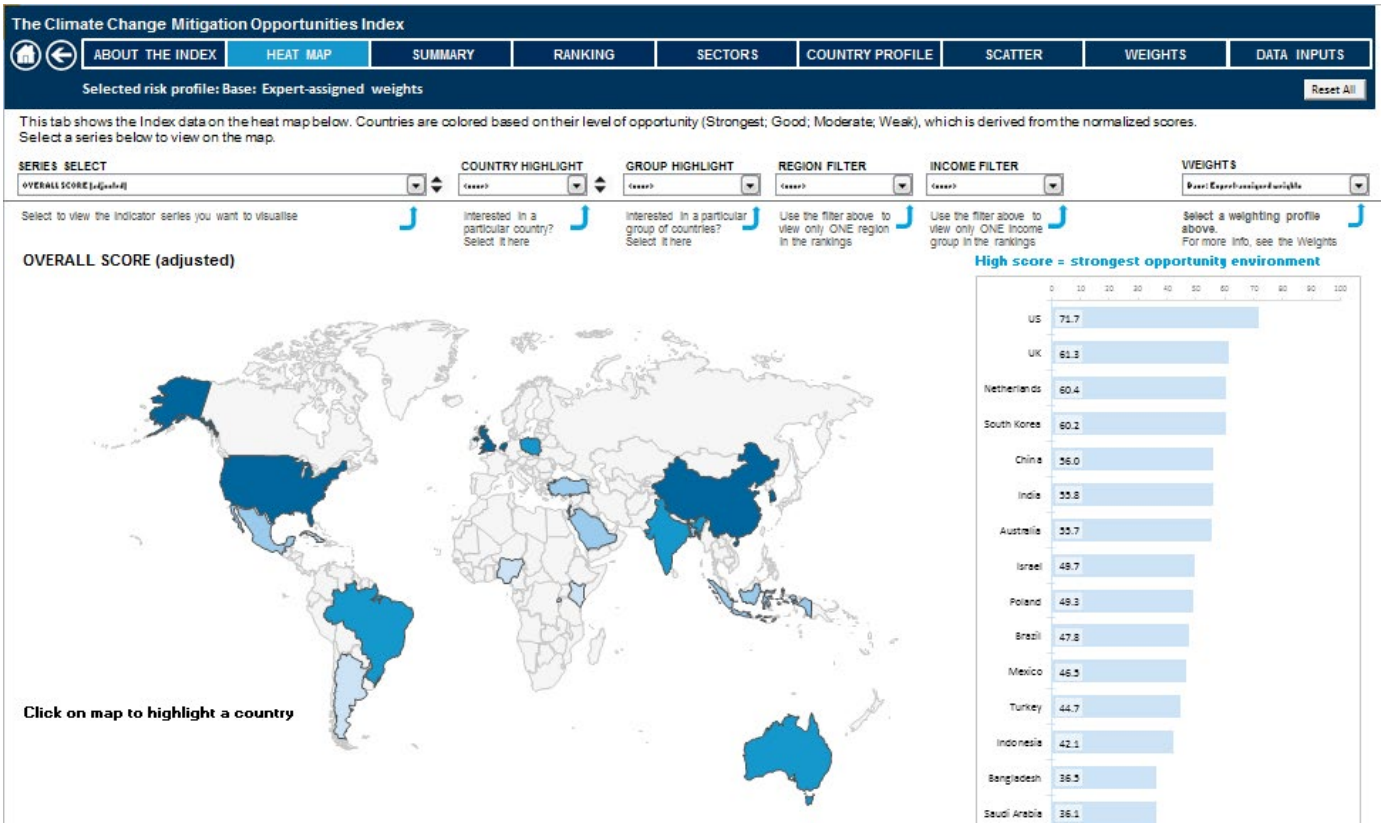
	Demand for climate change mitigation		Enabling environment		Technology and infrastructure environment		Business environment		Current investment activity		Financial risk adjustment factor
Overall index score	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Rank**	**Score**	**Score**
1 United States 71.7	2	62.6	4	74.5	1	85.7	3	80.2	1	83.0	87.5
2 United Kingdom 61.3	10	46.5	2	85.0	3	76.3	4	74.0	3	51.3	77.5
3 Netherlands 60.4	19	35.7	1	85.0	4	75.9	2	80.5	5	43.8	90.0
4 South Korea 60.2	5	54.3	3	79.5	2	78.7	6	67.7	6	38.5	77.5
5 China 56.0	3	61.4	9	63.7	8	55.6	10	54.4	2	80.0	87.5
6 India 55.8	1	75.2	6	67.7	14	42.8	15	50.4	4	49.5	62.5
7 Australia 55.7	16	39.7	7	64.7	5	75.0	1	86.4	12	20.8	62.5
8 Israel 49.7	18	38.2	10	63.5	6	72.6	5	70.8	13	17.7	77.5
9 Poland 49.3	12	46.0	12	61.4	7	60.3	7	65.5	10	21.5	75.0
10 Brazil 47.8	4	56.5	11	63.2	13	43.4	13	50.9	7	30.8	65.0
11 Mexico 46.5	14	43.8	5	74.1	11	45.5	9	55.0	9	23.7	65.0
12 Turkey 44.7	8	50.5	8	64.2	9	52.3	16	47.6	8	25.6	55.0
13 Indonesia 42.1	6	53.7	14	51.6	15	40.3	14	50.6	11	20.9	55.0
14 Bangladesh 36.5	11	46.2	15	50.3	18	25.8	17	46.7	16	8.9	57.5
15 Saudi Arabia 36.1	20	33.7	19	36.3	10	51.1	8	57.7	15	9.0	72.5
16 Kenya 35.3	7	51.1	16	45.8	17	27.7	19	40.2	14	12.7	47.5
17 Argentina 35.0	15	40.4	13	52.0	12	44.0	18	44.5	18	6.5	45.0
18 Rwanda 32.4	13	44.9	17	39.9	20	14.8	11	54.1	19	0.0	45.0
19 Cuba 31.6	9	47.0	18	38.5	16	33.3	12	52.1	20	0.0	20.0
20 Nigeria 24.1	17	38.3	20	32.2	19	23.6	20	26.2	17	7.2	30.0

* '=' denotes a tied rank between two or more countries

About the Dashboard

The interactive dashboard can be practically used in a variety of ways. Go to www.morganstanley.com/ideas/climate-change-mitigation-index to download the interactive Excel dashboard that accompanies this report to:

- Use comparison tools to contrast different countries, regions and income groups
- Look at profiles for each of the 20 countries in the Climate Change Mitigation Opportunities Index 2017
- Delve deeper into the index, leveraging its wealth of data to develop unique and actionable intelligence tailored to your specific priorities and interests
- Adjust the weights for each category and indicator to tailor the rankings to your specific risk preferences



If You're a Private Investor

Download the dashboard to carry out more detailed assessments of target countries and use the Climate Change Mitigation Opportunities Index scores as a starting point to explore countries, regions and sectors of interest. You can review countries in which you already invest—or are considering investing—to see where the index scores highlight new opportunities for investing in technologies that mitigate climate change or where you already face or anticipate challenges to current or future investments.

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Appendix A: Index methodology

The Climate Change Mitigation Opportunities Index evaluates the strength of technology-oriented investment opportunities that support climate change mitigation in 20 countries. The index was constructed to rate, rank and analyze the need for investment, the current market for climate change mitigation technologies, and the business, financial and policy environments that support (or do not support) investment in each country.

Research process

The development of the Climate Change Mitigation Opportunities Index followed a multi-step process. After conducting a literature review and detailed due diligence, The Economist Intelligence Unit developed a draft analytic framework to benchmark investment opportunities connected to climate change mitigation. In June 2016, a panel of experts, from policymaking, private sector, academic, and non-governmental organizations convened in New York to attend a day-long workshop to refine this framework and discuss the intended country coverage. The insights from the expert panel were incorporated into the development of a full scoring model, which includes over 125 metrics combined into 60 indicators, organized across six categories, outlined in this appendix and in Appendix B.

Economist Intelligence Unit analysts and researchers conducted extensive research to develop the research. The expert panelists were again consulted to provide input into the core weighting scheme (an expert-assigned scheme) used to aggregate the data into a benchmarking index that rates and ranks the countries.

The research was modelled in an interactive workbook, allowing for country comparisons and identifying good practices, trends and insights contained in analysis section of this report.

Table 1: The research process

Preliminary research and draft indicator framework	Expert panel	Development of scoring analytic framework	Country research	Model finalization
We conducted a detailed literature review and secondary research related to sustainable investing and climate change mitigation models, and developed a draft analytical framework	In June 2016, in collaboration with Morgan Stanley, The Economist Intelligence Unit hosted a panel of experts to refine the framework and provide input into country selection	The Economist Intelligence Unit team implemented the panel's input into a refined analytical framework, with over 125 quantitative and qualitative sub-indicators and detailed scoring methodology	Our team of country analysts and researchers conducted in-depth research into country-specific climate mitigation opportunities and investment environment indicators	We produced an interactive dashboard model in Excel, allowing users to compare countries, deep dive into individual countries and indicators, and build customized analytical profiles

Scoring criteria and categories

Categories and indicators were selected on the basis of Economist Intelligence Unit expert knowledge and analysis, consultation with external investment and climate change mitigation experts, and with input from the Morgan Stanley Institute for Sustainable Investing.

The Index contains over 125 sub-indicators combined into 60 indicators, organized across six categories that measure (1) the demand for climate change mitigation, (2) the enabling environment for investment in climate change mitigation, (3) the technology and infrastructure environment, (4) the business environment, (5) the current investment activity, and (6) financial risk. Each category receives a score, calculated from a weighted mean of the underlying indicator scores (see "Weights"), and scores are scaled from 0 to 100, where 100 = the strongest opportunity or environment for investment in technologies that support climate change mitigation. The overall country score (adjusted) is a weighted mean of the category scores, adjusted for financial risk.

Country selection

The Climate Change Mitigation Opportunities Index evaluates the strength of investment opportunity in climate change mitigation technologies in 20 countries that were carefully selected by The Economist Intelligence Unit and Morgan Stanley, in consultation with the expert panels, to explore a range of interesting, potentially high-opportunity markets. The country choice reflects a mix of advanced, emerging, and nascent markets, with geographic representation. We looked to various criteria to guide the country selection, including economic and demographic indicators, financial sector and investment activity indicators, climate change and inclusion market indicators, and indicators of risk. But in the end, the final selection came down to choice: which markets we thought were most interesting to explore and assess for investment opportunities across these fields and over time. For example, Cuba and Argentina were added to the mix, as markets likely to experience interesting and substantive development in the next two to five years.

The countries selected for the 2017 index represent 61% of global GDP and 65% of the global population. The 20 markets explored are:

Africa	Asia Pacific	Eastern Europe	Latin America	Middle East	North America	Western Europe
Kenya, Nigeria, Rwanda	Australia, Bangladesh, China, India, Indonesia, South Korea	Turkey, Poland	Argentina, Brazil, Cuba, Mexico	Israel, Saudi Arabia	United States	Netherlands, United Kingdom

The current World Bank income groupings break out the countries into the following buckets:

High-income countries	Upper-middle income	Lower-middle and low-income
Australia, Israel, Netherlands, Poland, Saudi Arabia, South Korea, United Kingdom, United States	Argentina, Brazil, China, Cuba, Mexico, Turkey	India, Indonesia, Bangladesh, Kenya, Nigeria; Rwanda (low income)

The Climate Change Mitigation Opportunities Index evaluates the strength of investment opportunity in these countries across six categories, which have been identified as key drivers of investment opportunity. The six categories are:

1) Demand for climate change mitigation: this category assesses the demand for climate mitigation in a country. What is the current level of emissions in the economy (in the energy, transport, industrial, built environment, and agricultural sectors)? How are emissions levels going to change? Does a country's energy security situation or age of energy infrastructure inhibit investments in mitigation? What is the country's endowment of hydrocarbon resources and renewables look like? How vulnerable is the country to the impact of climate change? This category looks at these indicators and more to assess where the strongest demand for investments in climate change mitigation technologies lie.

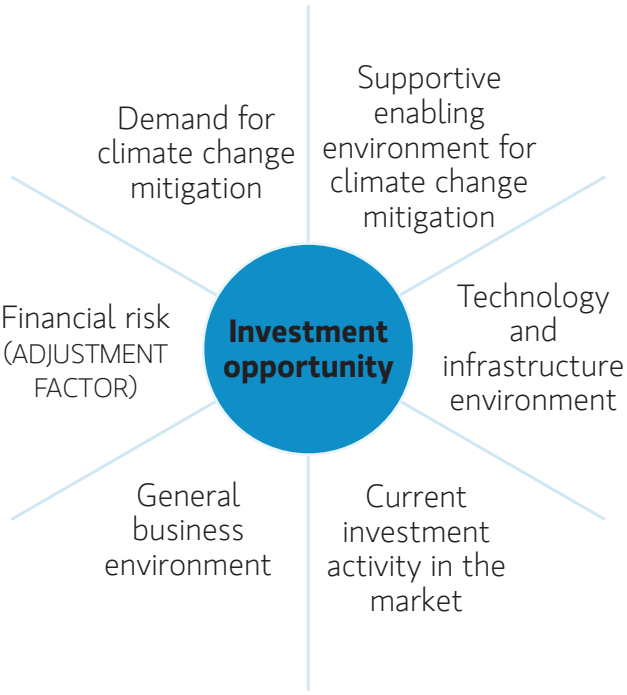
2) Enabling environment (specific to climate change mitigation): the enabling environment category measures the support and commitment to climate change mitigation that influencers, particularly the government, provide in a country. While most indicators are on designed to assess government action, the category also explores activities of multilateral development banks and non-governmental organizations (NGOs) in creating a friendly environment for climate change mitigation technologies, along with support for the green finance market.

3) Technology and infrastructure environment: this category evaluates the development of critical supporting markets that drive technological innovation and capacity, including the population's tech-savviness and the country's innovative capacity, technological infrastructure and usage (eg mobile and internet), physical infrastructure (eg roads, rail, air transport, ports), and energy infrastructure.

4) Business environment: the business environment assesses the ease of doing business in the country. Are there protections and rules in place that make the market navigable and attractive to private investors? Do political and social factors in a country make the business environment unfavorable? This category leverages The Economist Intelligence Unit's proprietary business ranking and operational risk models.

5) Current investment activity: this category aims to measure the current investment activity dynamics in the market. Are investors currently active in the market? The assessment includes general investment market indicators (financial sector size, liquidity, volatility) as well as investment activity specifically connected to climate change mitigation and the green bond market.

6) Financial risk (adjustment factor): a measure of each country's financial risk—including depth of financing, market access, debt, devaluation and capital account—that is used to temper a country's score on the remaining categories. This category provides a "real-world" investment profile to the Climate Change Mitigation Opportunities Index results and gives investors an understanding of where investments might be more or less risky.



Weights

Two sets of weightings are provided in the dashboard tool.

The first, "Base: Expert-derived weightings", is the default weighting scheme used in the model, and the weighting scheme used in Economist Intelligence Unit analysis. In the "Expert-derived weightings", levels of importance were assigned to indicators in the Climate Change Mitigation Opportunities Index based on the assessment and recommendation of The Economist Intelligence Unit project team and Economist Intelligence Unit experts, as well as internal input from Morgan Stanley Institute for Sustainable Investing. The base weight setting is derived from expert input and is the default weight setting in the model. The second option, known as "Demand-centric weight settings", is a weighting framework for investors who prefer to give market demand factors a heavier weighting. In this setting, a lighter weighting is given to investment environment factors (compared with the base, expert-assigned weights). No penalizing adjustment is made for financial risk.

The weighting assigned to each category and indicator can be changed by users to reflect different assumptions about their relative levels of importance. This functionality enables users to create customized weightings that allow them to test their own assumptions about the relative importance

of each category and indicator. Users can also set a weighting to zero to completely remove the

influence of any category, indicator or sub-indicator on the index results and country rankings.

Data modeling

Indicator scores are normalized and then aggregated across categories to enable a comparison of broader concepts across countries. Normalization rebases the raw indicator data to a common unit so that it can be aggregated. All indicators in this model are normalized to a 0 to 100 scale, where 100 indicates the strongest investment opportunity and 0 indicates the weakest investment opportunity.

Most indicators are transformed on the basis of a min/max normalization, where the minimum and maximum raw data values for across the 20 countries are used to bookend the indicator scores.

The indicators for which a higher value indicates a more favorable environment for investment— such as a developed green bond market or readiness to adopt technology—or a greater demand or opportunity for investment (such as high energy consumption forecast growth or a large endowment of renewable energy sources) have been normalized on the basis of:

$$x = (x - \text{Min}(x)) / (\text{Max}(x) - \text{Min}(x))$$

where Min(x) and Max(x) are, respectively, the lowest and highest values in the 20 countries for any given indicator. The normalized value is then transformed from a 0-1 value to a 0-100 score to make it directly comparable with other indicators. This in effect means that the country with the highest raw data value will score 100, while the lowest will score 0 for all indicators in the Index.

Sources and definitions

All of the quantitative and qualitative data in the Climate Change Mitigation Opportunities Index was collected and analyzed by The Economist Intelligence Unit project team. Data was gathered from reputable international, national and industry sources including Economist Intelligence Unit internal databases. In cases where data was incomplete or missing, Economist Intelligence Unit analysts developed custom estimation models to estimate data points, where appropriate.

The main sources used in the Climate Change Mitigation Opportunities Index are The Economist Intelligence Unit, Bank for International Settlements, Bloomberg, Bloomberg New Energy Finance, BP Statistical Review of World Energy (2016), CAIT Climate Data Explorer, Climate Action Tracker, Climate Bonds Initiative, Climate Central, Crunchbase, Food and Agriculture Organization of the United Nations (FAO), Germanwatch, International Energy Agency (IEA), International Finance Corporation, International Telecommunication Union (ITU), National Renewable Energy Laboratory, DOE (sourced from Open EI), OECD, Over Stack, Scimago Journal & Country Rank, Securities Industry and Financial Markets Association (SIFMA), St Louis Federal Reserve, Sustainable Stock Exchanges Initiative, The International Renewable Energy Agency (IRENA), UNESCO Institute for Statistics, United Nations Treaty Collection, World Bank, World Economic Forum, World Federation of Exchanges, World Inequality Database on Education (WIDE), World Intellectual Property Organization (WIPO), national statistical offices and analyst estimations.

Whilst every effort has been taken to verify the accuracy of this information, neither The Economist Intelligence Unit Ltd. nor the sponsor of this report can accept any responsibility or liability for reliance by any person on this report or any of the information, opinions or conclusions set out in the report.

Appendix B: Detailed indicator list

Number	Indicator	Units	Description
1	**DEMAND**	0-100	The category score is the weighted sum of the following indicator scores: 1.1 to 1.12
1.1	**Energy sector**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 1.1.1 to 1.1.3
1.1.1	Energy consumption	0-5	Gross domestic energy consumption (2015 or most recent): production plus imports minus exports minus international marine and aviation bunkers and stock changes. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than 50 Mtoe 1 = Between 50-100 Mtoe 2 = Between 100-200 Mtoe 3 = Between 200-400 Mtoe 4 = Between 400-1000 Mtoe 5 = More than 1000 Mtoe
1.1.2	Energy consumption forecast growth (2015-2020)	0-4	Forecast growth in gross domestic energy consumption, 2015-2020. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = <0% growth 1 = 0-5% growth 2 = 5-15% growth 3 = 15-25% growth 4 = >25% growth
1.1.3	Energy sector emissions (CO2e)	0-5	Total GHG emissions (CO2-equivalent) from the electricity sector, 2012. EIU estimate for Rwanda. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than 50 MT CO2e 1 = Between 50-100 MT CO2e 2 = Between 100-200 MT CO2e 3 = Between 200-400 MT CO2e 4 = Between 400-1000 MT CO2e 5 = More than 1000 MT CO2e
1.2	**Transport sector: Transport sector emissions (CO2e)**	0-5	Total GHG emissions (CO2-equivalent) from the transport sector, 2012. EIU estimate for Rwanda. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than 25 MT CO2e 1 = Between 25-100 MT CO2e 2 = Between 100-200 MT CO2e 3 = Between 200-400 MT CO2e 4 = Between 400-1000 MT CO2e 5 = More than 1000 MT CO2e
1.3	**Industrial sector: Industrial sector emissions (CO2e)**	0-5	Total GHG emissions (CO2-equivalent) from the industrial sector, 2012. EIU estimate for Rwanda. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than 10 MT CO2e 1 = Between 10-30 MT CO2e 2 = Between30-60 MT CO2e 3 = Between 60-150 MT CO2e 4 = Between150-500 MT CO2e 5 = More than 500 MT CO2e

Number	Indicator	Units	Description
1.4	**Agriculture sector: Agriculture sector emissions (CO2e)**	MT CO2e	Total GHG emissions (CO2-equivalent) from the agriculture sector, 2012. EIU estimate for Rwanda.
1.5	**Built environment emissions**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 1.5.1 to 1.5.2
1.5.1	LULUCF emissions	MT CO2e	Total GHG emissions (CO2-equivalent) from the land-use and forestry sector, 2012. EIU estimate for Rwanda.
1.5.2	Residential buildings emissions	MT CO2	Total CO2 emissions from residential buildings and commercial public services, 2014. EIU estimate for Rwanda.
1.6	**Emissions growth: Emissions growth**	0-4	Forecast growth in total domestic emissions from fuel combustion, 2015-2020. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = <0% growth 1 = 0-5% growth 2 = 5-15% growth 3 = 15-25% growth 4 = >25% growth
1.7	**Relative prices, renewables vs hydrocarbons: Gap between renewable energy price index LTM change and hydrocarbons price index LTM change**	Percentage point difference	Price index of oil (Brent), natural gas (generic NYMEX), and thermal coal (Newcastle). Change from December 2015 to December 2016. Price index of solar (BNEF survey polysilicon international spot price), wind (wind turbine unit price), hydro (First Alpine commercial hydropower) and ethanol. Change from December 2015 to December 2016.
1.8	**Energy security: Net energy imports as % of energy use**	%	Net energy imports as % of energy use. 2014 or latest.
1.9	**Age of energy infrastructure**	0-1	Does the age of the country's existing energy infrastructure act as a hindrance to investment in cleaner energy options? 0 = Yes 1 = No Note: This indicator aims to capture whether the age of a country's existing energy infrastructure presents an opportunity or a hindrance to new clean energy investment. A country where the average energy infrastructure age is relatively young (and therefore there are not near-term replacement needs) does not present strong new investment opportunities. A country where the energy infrastructure is relatively old or lacking capacity presents opportunity for newer, cleaner technologies.
1.10	**Endowment of hydrocarbon resources**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 1.10.1 to 1.10.3
1.10.1	Country's ready access to local oil	Thousand million barrels	Proved oil reserves in 2015.
1.10.2	Country's ready access to local coal	Million tons	Proved coal reserves in 2015.
1.10.3	Country's ready access to local natural gas	Trillion cubic feet	Proved natural gas reserves in 2015.
1.11	**Endowment of renewable energy resources**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 1.11.1 to 1.11.6
1.11.1	Country's ready access to nuclear energy	0-1	Does the country have ready access to nuclear energy? 0 = No, the country does not have ready access to nuclear energy 1 = Yes, the country does not have ready access to nuclear energy

Number	Indicator	Units	Description
1.11.2	Country's ready access to wind resources	0-5	Proxied by cumulative installed wind capacity. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than 1 TW h 1 = Between 1-500 TW h 2 = Between 500-100- TW h 3 = Between 1000-4000 TW h 4 = Between 4000-10000 TW h 5 = More than 10000 TW h
1.11.3	Country's endowment of solar resources	TW h per year	Potential solar energy capacity, TWh per year, in 2015. Note: The data represent total potential solar energy per year as a function of land area per solar class (KWh/m²/day). Each solar class correlates to a specific 0.5 kWh/m²/day range. Energy is calculated by multiplying the productive land by the class, conversion efficiency and number of days per year. In this case, a standard calendar year of 365 days was used. The conversion efficiency rate applied was 10%.
1.11.4	Country's ready access to hydro resources	0-5	Proxied by hydroelectricity consumption in 2015, based on gross primary hydroelectric generation and not accounting for cross-border electricity supply. Converted on the basis of thermal equivalent assuming 38% conversion efficiency in a modern thermal power station. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than 1 TW h per year 1 = Between 1-10 TW h per year 2 = Between 10-50 TW h per year 3 = Between 50-200 TW h per year 4 = Between 200-1000 TW h per year 5 = More than 1000 TW h per year
1.11.5	Country's ready access to geothermal resources	0-5	Proxied by cumulative installed geothermal power capacity, 2015. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than 1 TW h per year 1 = Between 1-100 TW h per year 2 = Between 100-500 TW h per year 3 = Between 500-1000 TW h per year 4 = Between 1000-2000 TW h per year 5 = More than 2000 TW h per year
1.11.6	Country's ready access to biofuel resources	0-5	Proxied by biofuels production. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than 1 MWs 1 = Between 1-100 MWs 2 = Between 100-400 MWs 3 = Between 400-1000 MWs 4 = Between 1000-5000 MWs 5 = More than 5000 MWs
1.12	**Vulnerability to and impact of climate change**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 1.12.1 to 1.12.2
1.12.1	Vulnerability to climate change	Score	Country's vulnerability to extreme weather (economic harm, deaths).
1.12.2	Population at risk	%	Percentage of total population at risk from climate-change related flooding. Analysis of expected sea-level rises and population in vulnerable areas.

Number	Indicator	Units	Description
2	**ENABLING ENVIRONMENT**	0-100	The category score is the weighted sum of the following indicator scores: 2.1 to 2.16
2.1	**Government strategy for climate change mitigation**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 2.1.1 to 2.1.3
2.1.1	Climate change mitigation strategy	0-1	Is there a documented national strategy for climate change mitigation? 0 = No 1 = Yes Note: Climate change mitigation must be specifically addressed within the national strategy. Either a distinct section of the strategy must be devoted to mitigation or there must be specific mitigation-related missions included (e.g. emissions targets, renewable energy mandates).
2.1.2	Paris Agreement	0-2	Has the country ratified the Paris Agreement? 0 = Not signed 1 = Signed, but not ratified 2 = Signed and ratified
2.1.3	INDC commitments	0-3	How ambitious are the country's INDC commitments? 0 = Inadequate 1 = Moderate, but inadequate in some way 2 = Moderate 3 = Sufficient
2.2	**Government GHG reduction targets**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 2.2.1 to 2.2.6
2.2.1	GHG emissions targets	0-1	Does the country have specific economy-wide greenhouse gas emissions reduction targets? 0 = No 1 = Yes
2.2.2	Carbon emissions targets	0-1	Does the country have specific economy-wide carbon emissions (not carbon-equivalent) reduction targets? 0 = No 1 = Yes
2.2.3	CFC emissions targets	0-1	Does the country have a specific reduction policy for chlorofluorocarbons (CFCs)? 0 = No 1 = Yes
2.2.4	HCFC emissions targets	0-1	Does the country have a specific reduction policy for hydro-chlorofluorocarbons (HCFCs)? 0 = No 1 = Yes
2.2.5	Methane targets	0-1	Does the country have emissions reduction targets for methane? 0 = No 1 = Yes
2.2.6	Nitrous oxide targets	0-1	Does the country have emissions reduction targets for nitrous oxide? 0 = No 1 = Yes
2.3	**Government policy that harms mitigation targets**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 2.3.1 to 2.3.2
2.3.1	Retail fuel subsidy	0-1	Does the country have a retail fuel subsidy in place? 0 = Yes 1 = No Note: This indicator aims to proxy government policy attitudes to fossil fuel subsidies. Note that total spending on fossil fuel subsidies is included as a separate indicator.

Number	Indicator	Units	Description
2.3.2	Spending on fossil fuel subsidy	0-4	Total fossil fuel subsidies, by country. No data available for Rwanda, Cuba and Kenya. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = US$ 40bn+ 1 = US$ 25-40bn 2 = US$ 10-25bn 3 = US$ 5-10bn 4 = US$ 0-5bn
2.4	**Carbon price**	0-1	Do national-level regulations establish carbon pricing? 0 = No 1 = Yes For example, a uniform carbon tax or an emissions trading scheme. Credit is only assigned for national-level schemes. Sub-national level carbon pricing (e.g. state or territory) does not receive credit under this indicator.
2.5	**Government policy: energy sector**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 2.5.1 to 2.5.2
2.5.1	Energy - emissions standards	0-1	Do national-level regulations set emissions performance standards for the energy sector? 0 = No 1 = Yes Note: A country receives credit for this indicator if it has emissions performance standards for power stations.
2.5.2	Energy - renewables targets	0-1	Are there national-level renewable energy targets? 0 = No 1 = Yes
2.6	**Government policy: transport sector**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 2.6.1 to 2.6.3
2.6.1	Transport - emissions standards	0-1	Do national-level regulations set emissions standards for the transport sector? 0 = No 1 = Yes
2.6.2	Transport - renewables targets	0-1	Do national-level regulations set renewable energy targets for transport sector? 0 = No 1 = Yes
2.6.3	Transport - major public transport initiatives	0-2	Does the country's largest (most populous) city have major initiatives in place to green public transportation (efficiency, clean fuel, hybrid technology)? 0 = No, there are no initiatives 1 = Yes, there are initiatives, but they are planned goals or relatively minor/pilot implementations 2 = Yes, there are major initiatives Note: This indicator aims to capture city-level efforts. A country receives credit if there is a local policy in place in the most populous city to green the public transport system, eg convert public transport vehicles (i.e. buses, trains, metros) to hybrid technology or clean fuel. A country also receives credit if there are major initiatives to increase the number of hybrid/clean fuel vehicles in the city, even if there is no specified policy in place.
2.7	**Government policy: industrial sector**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 2.7.1 to 2.7.2
2.7.1	Industry - emissions standards	0-1	Do national-level regulations set emissions standards for the industrial sector? 0 = No 1 = Yes Note: Industrial production processes account for considerable greenhouse gas emissions. The industrial sector comprises subsectors like manufacturing, chemicals, mineral and petroleum processing, plastics, wood product and paper.

Number	Indicator	Units	Description
2.7.2	Industry - CCS laws and regulation	0-1	Does the country have laws or regulation governing carbon capture and storage (CCS)? 0 = No 1 = Yes Note: Any regulation that establishes a legal framework for the capture and environmentally safe geological storage of carbon dioxide is justifiable for credit.
2.8	**Government policy: landuse, agriculture and buildings**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 2.8.1 to 2.8.3
2.8.1	Landuse - funding for clean buildings	0-1	Is there national-level funding for energy efficient building programs? 0 = No 1 = Yes Note: Focuses on direct government spending at national level to promote energy-efficient buildings.
2.8.2	Landuse - efficiency standards for clean buildings	0-1	Is there national-level energy efficiency standards for new buildings? 0 = No 1 = Yes Note: Credit is given if there are national-level regulations that establish energy efficiency standards for new buildings (even if enforcement is at local level).
2.8.3	Landuse - renewables targets for agriculture	0-1	Does the country have greenhouse gas emission targets for the agriculture sector? 0 = No 1 = Yes Note: Credit is given if country included agriculture carbon emissions mitigation in their intended nationally determined contributions submitted to UNFCCC under Paris Agreement.
2.9	**Supervision and enforcement**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 2.9.1 to 2.9.3
2.9.1	Single regulator (national)	0-1	At the national level, is there a single agency with regulatory and enforcement powers over GHG emissions reductions? 0 = No 1 = Yes Note: This indicator is a reflection of the complexity of the regulatory and compliance environment.
2.9.2	National regulatory complexity	0-1	If there is more than one national-level agency with GHG regulatory and enforcement authority, does this give rise to a complex regulatory compliance environment? 0 = Yes 1 = No Note: This indicator is a reflection of the complexity of the regulatory and compliance environment.
2.9.3	Subnational regulatory complexity	0-1	Where there are both national and subnational agencies with GHG regulatory/enforcement responsibility, does this give rise to a complex regulatory compliance environment? 0 = Yes 1 = No Note: This indicator is a reflection of the complexity of the regulatory and compliance environment.
2.10	**Government funding support**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 2.10.1 to 2.10.2
2.10.1	Govt funding for clean energy	0-1	Does the government provide funding for research and development for clean energy? 0 = No 1 = Yes

Number	Indicator	Units	Description
2.10.2	Govt debt levels (% GDP)	0-4	The public debt/GDP ratio is a prime indicator of a country's spare financing capacity as well as the sovereign's solvency. Public debt comprises gross public external and domestic debt. Foreign exchange reserves are NOT netted out. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = >125% of GDP 1 = >100% up to 125% of GDP 2 = >75% up to 100% of GDP 3 = >50% up to 75% of GDP 4 = Up to 50% of GDP
2.11	**Data and information**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 2.11.1 to 2.11.6
2.11.1	Data: carbon emissions	0-1	Has the government released data on carbon emissions since Jan 2014? 0 = No 1 = Yes Note: Up-to-date and regular data released reflect a degree of government commitment to measuring the problem and tracking progress.
2.11.2	Data: CFC emissions	0-1	Has the government released data on CFC emissions since Jan 2014? 0 = No 1 = Yes Note: Up-to-date and regular data released reflect a degree of government commitment to measuring the problem and tracking progress.
2.11.3	Data: HCFC emissions	0-1	Has the government released data on HCFC emissions since Jan 2014? 0 = No 1 = Yes Note: Up-to-date and regular data released reflect a degree of government commitment to measuring the problem and tracking progress.
2.11.4	Data: methane emissions	0-1	Has the government released data on methane emissions since Jan 2014? 0 = No 1 = Yes Note: Up-to-date and regular data released reflect a degree of government commitment to measuring the problem and tracking progress.
2.11.5	Data: nitrous oxide emissions	0-1	Has the government released data on nitrous oxide emissions since Jan 2014? 0 = No 1 = Yes Note: Up-to-date and regular data released reflect a degree of government commitment to measuring the problem and tracking progress.
2.11.6	Quality of official data	0-4	Does official data provide an accurate, comprehensive and timely picture of the economy? Scoring scheme: 0 = Data fails to meet three of the criteria 1 = Data fails to meet two of the criteria 2 = Data fails to meet one of the criteria 3 = Data meets all criteria 4 = Exemplary data standards Note: Data quality encompasses credibility (eg whether the CPI is a true reflection of changes in the price level), periodicity (availability of monthly, quarterly as well as annual data) and timeliness.

Number	Indicator	Units	Description
2.12	**Enabling environment for PPPs**	0-4	Composite score of regulatory framework, institutional framework, and operational maturity. 1) Regulatory framework: consistency and quality of PPP regulations; efficiency of decision-making process for PPP project selection; fairness/openness of bids and contract changes; dispute resolution mechanisms. 2) Institutional framework: quality of institutional design; PPP contract enforcement and holdup / expropriation risk 3) Operational maturity: Public capacity for project preparation and oversign; methods and criteria for awarding projects; risk allocation and financial enhancement record; experience with transport, water and electricity projects; quality of transport, water and electricity projects. *Scoring scheme:* 0 = EIU Infrascope score between 0-20 (out of 100, where 100=best) 1 = EIU Infrascope score between 20-40 (out of 100, where 100=best) 2 = EIU Infrascope score between 40-60 (out of 100, where 100=best) 3 = EIU Infrascope score between 60-80 (out of 100, where 100=best) 4 = EIU Infrascope score between 80-100 (out of 100, where 100=best)
2.13	**Support for green finance market**		The indicator score is a weighted sum of the following sub-indicator scores: 2.13.1 to 2.13.3
2.13.1	Green bond - regulatory definition	0-1	Is there an established regulatory definition of a green bond within the country (ie does the regulatory require specific criteria to be met in order to attach a "green" label to a bond issuance)? 0 = No 1 = Yes
2.13.2	Green bond - exchange rules	0-1	Has at least one of the main securities exchange/s developed rules and regulations allowing for green bond listings? 0 = No 1 = Yes
2.13.3	Green bond - issuance in country?	0-1	Has there been a green bond issued in the country since September 2015? 0 = No 1 = Yes
2.14	**Financial sector regulation and supervisory quality**	0-4	Assess the financial regulatory framework and the quality of banking supervision. The regulatory framework encompasses banks' solvency (capital adequacy ratios) and liquidity (liquid assets as a % of total liabilities), the bankruptcy code (banks' ability to foreclose on defaulted loans) and deposit insurance schemes. Supervision relates to the authorities' capacity to monitor banks and ensure that they are complying with regulations. *Scoring scheme:* 0 = Failings in regulation and or supervision. No moves to address these 1 = Deficiencies in regulation and/or supervision. Reforms in progress/planned to address these 2 = System works adequately but reforms needed to bring up to OECD standard 3 = Well designed regulatory framework. Sufficient numbers of trained staff engaged in supervision 4 = Regulatory framework and supervision viewed as exemplary
2.15	**Operational track record set by development banks**	0-3	Proxied by IFC's total project investment in the country. This indicator reflects the track record of operations that have been developed by the DFIs over time in emerging markets. Developed markets (with no history or need for IFC investment) score full credit. Note that the raw data has been banded in the indicator transformation, according to the coring scheme below: 0 = Investment is under$500 million 1 = Investment is between $500 million and $1 billion 2 = Investment is between $1 billion and $5 bn 3 = Investment exceeds $5 billion; or the country is a developed market without need for development bank track record

Number	Indicator	Units	Description
2.16	**NGOs on climate change mitigation**	0-2	NGOs can perform multiple functions to promote climate change mitigation, including - Facilitating knowledge transfer (eg cooperation forum) - Policy influence - Grassroots program implementation - Raising awareness - Community outreach - Data collecting and sharing In assessing significance, consider - Collaboration/ partnerships between NGOs and other major actors (government, private, international organizations, university/research institutes, communities) - Is there a policy or influence gap, giving rise to a stark need for NGO activity in the market? For example, there may be more gaps for NGOs to fill in developing countries vs advanced - Do NGO activities fall in line with efforts and positions of other stakeholders, or are they at odds? For example, if there is a powerful hydrocarbons industry, NGO activities might be more important. *Scoring scheme:* 0 = NGO activities to promote climate change mitigation do not impact the market 1 = NGO activities to promote climate change mitigation exist but do not have significant impact on the market 2 = NGO activities promote climate change mitigation and have a significant impact on the market
3	**TECHNOLOGY AND INFRASTRUCTURE ENVIRONMENT**	0-100	The category score is a weighted sum of the following sub-indicator scores: 3.1 to 3.9
3.1	**Technology adoption capacity**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 3.1.1 to 3.1.4
3.1.1	Readiness to adopt technology	0-6	In your country, to what extent do business adopt new technology? [0 = not at all; 6 = adopt extensively]
3.1.2	Technical skills of the workforce	0-4	Qualitative assessment of the technical skills of the country's workforce, based on the following scoring scheme: 0 = Multinationals need to import all but the most basic technical skills 1 = Widespread shortage of technical skills; few technical education opportunities 2 = Technically skilled available but at a high price; training for a fraction of workforce. Older workers resistant to new technology 3 = Reasonable supply of technically skilled labor; some availability of training and development programs 4 = Abundant supply, at a reasonable cost, of technically skilled professionals; full range of training and development programs
3.1.3	Availability of skilled labor	0-4	Availability of skilled labor; mean years of schooling. *Scoring scheme:* 0 = Very poor: if less than 4 1 = Poor: if between 4 and 6.9 2 = Fair: if between 7 and 8.9 3 = Good: if between 9 and 11 4 = Very good: if more than 11
3.1.4	Level of competition index for internet and telephony sectors	0-2	Level of competition index for Internet services, international long distance services, and mobile telephone services on a 0-to-2 (best) scale.
3.2	**Technological innovation capacity**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 3.2.1 to 3.2.3
3.2.1	Innovation capacity	0-6	In your country, to what extent do companies have the capacity to innovate? [0 = not at all; 6 = to a great extent]

Number	Indicator	Units	Description
3.2.2	Availability and quality of local research infrastructure	0-4	Qualitative assessment of the availability and quality of the local research infrastructure. Considers the quality of domestic research institutions; the extent of university-industry cooperation; the availability of scientists and engineers and the availability of skilled researchers. *Scoring scheme:* 0 = Very low 1 = Low 2 = Moderate 3 = High 4 = Very high
3.2.3	Journal impact (the H index)	#	Measures journal impact factor based on the distribution of citations of a given publisher/ publication
3.3	**Technological innovation and adoption developments**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 3.3.1 to 3.3.4
3.3.1	Number of startups in the tech sector	#	Number of tech start-ups in the country. This includes companies founded after the year 2000 that have received at least US$1m in the last round of funding. Post-IPO companies are not included.
3.3.2	Capital raised by startups in tech sector	US$m	Total funding amount of capital raised by start-ups in the country's tech sector. This includes companies founded after the year 2000 that have received at least US$1m in the last round of funding. Post-IPO companies are not included.
3.3.3	Startup funding momentum: last round capital raised as % of total capital raised	%	Momentum of startup funding in the country, proxied by last round capital raised as % of total capital raised.
3.3.4	Development of technology IP: number of technology patents (per 1m people)	#	Sum of patent publications by technology (per 1m people).
3.4	**Energy infrastructure**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 3.4.1, 3.4.2
3.4.1	Electricity access (% of population)	%	Access to electricity is the percentage of population with access to electricity. Electrification data are collected from industry, national surveys and international sources.
3.4.2	Quality of power grid	0-4	What is the risk that power shortages could disrupt business activities? Scores assigned based on the following scoring scheme: *Scoring scheme:* 0 = Very high: Sustained power shortages are the norm 1 = High: There are often power shortages 2 = Moderate: There are occasionally power shortages 3 = Low: Power shortages are rare 4 = Very low: Power shortages are very rare
3.5	**Physical infrastructure**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 3.5.1 to 3.5.6
3.5.1	Port facilities	0-4	What is the risk that port facilities will prove inadequate to business needs? *Scoring scheme:* 0 = Very high: Port facilities are very poor, and inadequate across all three criteria 1 = High: Port facilities are poor, and inadequate across at least two of the three criteria 2 = Moderate: Port facilities are inadequate in some limited respects 3 = Low: Port facilities are adequate across all three criteria 4 = Very low: Port facilities are very good across all three criteria Note: Evaluate the risk based on three criteria: degree of modernity, maintenance and sufficient supply to meet demand.

Number	Indicator	Units	Description
3.5.2	Air transport facilities	0-4	What is the risk that air transport will prove inadequate to business needs? *Scoring scheme:* 0 = Very high: Airport facilities are very poor, and inadequate across all three criteria 1 = High: Airport facilities are poor, and inadequate across at least two of the three criteria 2 = Moderate: Airport facilities are inadequate in some limited respects 3 = Low: Airport facilities are adequate across all three criteria 4 = Very low: Airport facilities are very good across all three criteria Note: Evaluate the risk based on three criteria: degree of modernity, maintenance and sufficient supply to meet demand.
3.5.3	Road network	0-4	What is the risk that the road network will prove inadequate to business needs? *Scoring scheme:* 0 = Very high: The road network is very poor, and inadequate across all three criteria 1 = High: The road network is poor, and inadequate across at least two of the three criteria 2 = Moderate: The road network is inadequate in some limited respects 3 = Low: The road network is adequate across all three criteria 4 = Very low: The road network is very good across all three criteria Note: Evaluate the risk based on three criteria: degree of modernity, maintenance and sufficient supply to meet demand.
3.5.4	Rail network	0-4	What is the risk that the rail network will prove inadequate to business needs? *Scoring scheme:* 0 = Very high: The rail network is inadequate across all three criteria (modernity, maintenance and sufficient supply) 1 = High: The rail network is inadequate across two of the three criteria (modernity, maintenance and sufficient supply) 2 = Moderate: The rail network is inadequate for one of the three criteria (modernity, maintenance and sufficient supply) 3 = Low: The rail network is adequate across all three criteria with only limited/small drawbacks (modernity, maintenance and sufficient supply) 4 = Very low: The rail network is very good across all three criteria (modernity, maintenance and sufficient supply) Note: Evaluate the risk based on three criteria: degree of modernity, maintenance and sufficient supply to meet demand.
3.5.5	Telephone network	0-4	What is the risk that the telephone network will prove inadequate to business needs? *Scoring scheme:* 0 = Very high: less than 2 land lines and less than 35 mobile phone subscriptions per 100 people 1 = High: at least one of 2-10 land lines or 35-67 mobile phone subscriptions per 100 people 2 = Moderate: at least one of 10-20 land lines or 67-95 mobile phone subscriptions per 100 people 3 = Low: at least one of 20-40 land lines or 95-120 mobile phone subscriptions per 100 people 4 = Very low: at least 40 land lines or 120 mobile phone subscriptions per 100 people Note: Evaluate the risk based on three criteria: degree of modernity, maintenance and sufficient supply to meet demand.
3.5.6	IT infrastructure	0-4	What is the risk that the information technology infrastructure will prove inadequate to business needs? *Scoring scheme:* 0 = Very high: IT infrastructure is a major impediment to business 1 = High: IT infrastructure will often be an impediment to business 2 = Moderate: IT infrastructure will sometimes be an impediment to business 3 = Low: IT infrastructure will rarely be an impediment to business 4 = Very low: IT infrastructure is very unlikely to prove an impediment to business
3.6	**Human capital**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 3.6.1 to 3.6.3
3.6.1	Tertiary enrolment in STEM per 100,000	#	Student enrollment at the tertiary level in Science and Engineering, Manufacturing, and Construction per 100,000 people
3.6.2	Tertiary enrolment in the arts per 100,000	#	Student enrollment at the tertiary level in Humanities and Arts per 100,000 people

Number	Indicator	Units	Description
3.6.3	Quality of math and science education	0-4 (%)	Percentage of children taking part in an assessment who achieved an international minimum learning standard in mathematics and science (average). Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = 0-49% 1 = 50-74% 2 = 75-84% 3 = 85-94% 4 = 95-100%
3.7	**ICT access and usage**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 3.7.1 to 3.7.7
3.7.1	Percentage of the population with internet access	%	Percentage of households with access to the internet
3.7.2	Female-to-male gap, internet access	Percentage points	Percentage of male individuals using the internet minus the percentage of female individuals using the internet. Note: Positive values indicate a female gender gap in internet use.
3.7.3	Access to mobile phones	%	Proportion of households with a mobile cellular telephone.
3.7.4	Female-to-male gap in access to a mobile phone	Percentage points	Percentage of male individuals using a mobile phone minus the percentage of female individuals using a mobile phone. Note: Positive values signify a female gender gap in mobile phone use.
3.7.5	Access to smartphones	%	Proxied by percentage of the population covered by at least a 3G mobile network refers to the percentage of inhabitants that are within range of at least a 3G mobile-cellular signal; irrespective of whether or not they are subscribers. This is calculated by dividing the number of inhabitants that are covered by at least a 3G mobile-cellular signal by the total population and multiplying by 100.
3.7.6	Number of secure servers in the country	#	Number of secure servers in the country. Secure servers are servers using encryption technology in Internet transactions.
3.7.7	Number of secure servers in the country, per capita (m)	# per 1m persons	Number of secure servers in the country per 1m persons. Secure servers are servers using encryption technology in Internet transactions.
3.8	**ICT affordability**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 3.8.1 to 3.8.4
3.8.1	Fixed broadband price, % of GNI per capita	%	Fixed-broadband sub-basket price per month as a % of GNI per capita.
3.8.2	Mobile broadband price, % of GNI per capita	%	Mobile-broadband, prepaid handset-based (500 MB) basket price as % of GNI per capita.
3.8.3	Fixed-broadband sub-basket price per month	US$	Fixed-broadband sub-basket price per month.
3.8.4	Mobile-broadband (500MB) price per month	US$	Mobile-broadband (500MB) price per month.
3.9	**ICT literacy**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 3.9.1, 3.9.2
3.9.1	Internet prevalence in schools	0-4	Percentage of schools with internet access. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than 30% of schools have internet access 1 = 30-59% of schools have internet access 2 = 60-79% of schools have internet access 3 = 80-94% of schools have internet access 4 = 95-100% of schools have internet access

Number	Indicator	Units	Description
3.9.2	Programming talent	0-4	Number of programmers in the country with a rating greater than 5000. *Scoring scheme:* 0 = Less than 200 programmers with a rating greater than 5000 1 = 201-500 programmers with a rating greater than 5000 2 = 501-1000 programmers with a rating greater than 5000 3 = 1000-2000 programmers with a rating greater than 5000 4 = 2000+ programmers with a rating greater than 5000
4	**BUSINESS ENVIRONMENT**		The category score is a weighted sum of the following sub-indicator scores: 4.1 to 4.8
4.1	**Political stability**	0-100	Composite of indicator scores for social unrest, orderly transfers, opposition stance, excessive executive authority, international tensions.
4.2	**Government effectiveness**	0-100	Composite of indicator scores for stance of policy formulation, quality of bureaucracy, excessive bureaucracy/red tape, vested interests/cronyism, corruption, accountability of public officials, human rights.
4.2.1	Corruption	0-4	How pervasive is corruption among public officials? *Scoring scheme:* 0 = Very high: Corruption among public officials is the norm 1 = Very high: Corruption among public officials is the norm 2 = High: Corruption is often encountered among public officials 3 = Moderate: Corruption is sometimes encountered among public officials 4 = Low: Corruption among public officials is unusual
4.3	**Legal & regulatory environment**	0-100	Composite of indicator scores for fairness of judicial process, enforceability of contracts, speediness of judicial process, discrimination against foreign companies, confiscation/ expropriation, unfair competitive practices, protection of intellectual property rights, protection of private property, integrity of accounting practices, price controls.
4.3.1	Enforceability of contracts	0-4	Assess the risk that contract rights will not be enforced. *Scoring scheme:* 0 = Very high: Businesses cannot rely on contractual rights being enforced at all 1 = High: Businesses will often find that contractual rights are not enforced 2 = Moderate: Businesses will sometimes find that contractual rights not enforced 3 = Small: Businesses can usually rely on contractual rights being enforced 4 = Minimal: Businesses can rely on all contractual rights being enforced by the authorities
4.3.2	Protection of intellectual property rights	0-4	The protection of intellectual property in this country will be: 0 = Very poor: IP protection is not codified or enforced; 1 = Poor: IP laws have substantial gaps and are often not enforced; 2 = Fair: IP laws are of a moderate standard with some gaps and enforcement may be inconsistent; 3 = Good: A good standard of comprehensive IP laws is generally enforced effectively; 4 = Very Good: A high standard of comprehensive IP laws is strongly enforced.
4.4	**Security environment**	0-100	Composite of indicator scores for armed conflict, terrorism, violent demonstrations, hostility to foreigners, violent crime, organized crime, and kidnapping/extortion.
4.5	**Macroeconomic environment**	0-100	Composite of indicator scores for exchange rate volatility, recession risk, price instability, crowding out, interest rate volatility.
4.6	**Foreign trade environment**	0-100	Composite of indicator scores for trade embargo risk, discriminatory tariffs, excessive protection, excessive procedural trade barriers.
4.7	**Labor market environment**	0-100	Composite of indicator scores for trade union power, labor strikes, restrictiveness of labor laws, skilled labor availability, specialized labor availability, meritocratic remuneration, freedom of association.
4.8	**Tax policy environment**	0-100	Composite of indicator scores for clear tax regime, stable tax regime, risk of discriminatory corporate taxes, level of corporate taxation.

Number	Indicator	Units	Description
5	**CURRENT MARKET**		The category score is a weighted sum of the following sub-indicator scores: 5.1 to 5.6
5.1	**Size of financial sector**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 5.1.1 to 5.1.5
5.1.1	Financial assets	US$bn	Total assets of the financial sector (domestic financial institutions, including the central bank). Equals the sum of total liabilities of the domestic household, government and non-financial sectors.
5.1.2	Equity market capitalization	US$bn	Market capitalization of listed domestic companies (current US$).
5.1.3	Debt securities outstanding	0-4 (US$bn)	Total debt securities, amount outstanding from resident issuers (US$bn) as of 2016Q1. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than $250 billion 1 = Between $250bn and $500bn 2 = Between $500bn and $1 trillion 3 = Between $1 trillion and $5 trillion 4 = More than $5 trillion
5.1.4	Financial assets (% of GDP)	0-4 (%)	Total financial assets of the whole domestic economy (institutional units resident in domestic economic territory), as a % of GDP. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Less than 100% of GDP 1 = Between 100% and 250% of GDP 2 = Between 250% and 500% of GDP 3 = Between 500% and 1,000% of GDP 4 = More than 1,000% of GDP
5.1.5	Institutional investors, assets under management	0-4 (US$bn)	Total assets from all objectives (fixed income, mixed allocation, equity, money market, commodity, real estate, etc.). Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Very low: Assets less than $50 million 1 = Low: Assets between $50-250 million 2 = Moderate: Assets between $250 million and $1 billion 3 = High: Assets between $1-5 billion 4 = Very high: Assets over $5 billion
5.2	**Liquidity of the financial sector**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 5.2.1, 5.2.2
5.2.1	Equity volume traded	0-4 (US$m)	Share monthly turnover (includes exchange traded and reported over-the-counter) (October 2016). Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Low liquidity in market. Monthly turnover under $1 billion 1 = Relatively low liquidity in market. Monthly turnover between $1 billion and $25 billion 2 = Moderately liquid market. Monthly turnover between $25 billion and $50 billion 3 = Relatively liquid market. Monthly turnover between $50 billion and $100 billion 4 = Highly liquid market. Monthly turnover over $50 billion
5.2.2	Bond volume traded	0-4 (US$m)	Bond monthly turnover (includes exchange traded and reported over-the-counter) (October 2016). Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = Low liquidity in market. Monthly turnover under $10 million 1 = Relatively low liquidity in market. Monthly turnover between $10 million and $500 million 2 = Moderately liquid market. Monthly turnover between $25 billion and $50 billion 3 = Relatively liquid market. Monthly turnover between $5 billion and $20 billion 4 = Highly liquid market. Monthly turnover over $20 billion

Number	Indicator	Units	Description
5.3	**Stability of the financial sector**	Standard Deviation	Standard deviation of the average daily price change of major equity index, LTM. Note that the raw data has been banded in the indicator transformation, according to the scoring scheme below: 0 = High volatility. Standard deviation over 1.25 1 = Relatively high volatility. Standard deviation between 1 and 1.25 2 = Moderate volatility. Standard deviation between 0.75 and 1 3 = Relatively low volatility. Standard deviation between 0.5 and 0.75 4 = Low volatility. Standard deviation under 0.5
5.4	**Current investment in climate change mitigation technologies**	0-100	Proxied by number of asset finance investments in clean technologies. Technologies include: energy storage, fuel cells, small hydro, marine, solar, wind, hydrogen, geothermal, biofuels, biomass, gas, nuclear, electrified transport, vehicle efficiency, industry efficiency, supply side efficiency, building efficiency, carbon capture & storage, carbon markets and related service investments. As of 9/1/2016.
5.5	**Green bond market**	0-100	The indicator score is a weighted sum of the following sub-indicator scores: 5.5.1 to 5.5.2
5.5.1	Size of the green bond market	US$m	Green bonds outstanding in the country as of January 2017
5.5.2	Green bond issuance, last 12 months	US$m	Green bond issuance in the country since January 1, 2016 (as of January 2017)
5.6	Green indices in the country	0-2	Does one of country's primary stock exchange provide sustainable-related indices directed at climate-related technologies? *Scoring scheme:* 0 = Does not offer sustainability indices 1 = Offers sustainability indices 2 = Offers sustainability indices, and at least one of those indices has a focus on climate change issues
6	**FINANCIAL RISK**	1-100	The category score is a weighted sum of the following sub-indicator scores: 6.1 to 6.9
6.1	**Devaluation risk**	0-4	What is the risk of a major devaluation? *Scoring scheme:* 0 = Very high: Currency appears significantly overvalued (e.g. over 20%) and devaluation appears highly likely 1 = High: Currency appears moderately overvalued (e.g. over 10%) and devaluation is likely 2 = Moderate: Currency appears slightly overvalued (e.g. over 5%) and devaluation is moderately likely 3 = Low: Currency appears close to fair value (e.g. less than 5% overvalued) and devaluation is unlikely 4 = Very low: Currency appears to be at fair value or undervalued
6.2	**Depth of financing**	0-4	What is the availability and depth of financing in the local market? *Scoring scheme:* 0 = < 15% private claims to nominal GDP 1 = 15% - 27% private claims to nominal GDP 2 = 28% - 39% private claims to nominal GDP 3 = 40% - 70% private claims to nominal GDP 4 = > 70% private claims to nominal GDP
6.3	**Access to local markets**	0-4	Are there restrictions on foreign companies gaining access to local capital markets? *Scoring scheme:* 0 = Very high restrictions: Foreign companies invariably face significantly greater restrictions than local companies in accessing funding from domestic sources 1 = High restrictions: Foreign companies often face significantly higher restrictions than local companies in accessing funding from domestic sources 2 = Moderate restrictions: Foreign companies sometimes face moderately higher restrictions than local companies in accessing funding from domestic sources 3 = Few restrictions: e.g. foreign companies may to a small degree face restrictions which are slightly higher than those for local companies in accessing funding from domestic sources 4 = No restrictions: Foreign companies can rely on funding from domestic sources to the same extent as domestic companies

Number	Indicator	Units	Description
6.4	**Marketable debt**	0-4	Is there a liquid, deep local-currency denominated fixed-rate medium-term (five-years or more) bond market in marketable debt? *Scoring scheme:* 0 = No government securities market in fixed rate financing over 1 year 1 = Government securities only, limited to short maturities (1-2 years) on fixed rate financing 2 = Government is fostering medium-term market and while maturities do not yet exist expect this to be in place soon 3 = Yes, but for government bonds only 4 = Yes, for both private and public sector issuers
6.5	**Banking sector health**	0-4	What is the risk of a systemic crisis in the banking sector? *Scoring scheme:* 0 = Very high: A crisis seems likely 1 = High: There are signs of serious instability and a high risk of a systemic crisis 2 = Moderate: There are reasons for serious concern, and a moderate risk of a systemic crisis 3 = Low: There is little reason to expect that a systemic crisis could develop 4 = Very low: The banking sector appears fully sound
6.6	**Stock market liquidity**	0-4	How liquid is the stock market? *Scoring scheme:* 0 = Very illiquid 1 = Quite illiquid 2 = Average 3 = Quite liquid 4 = Very liquid
6.7	**Financial crisis**	0-4	What is the risk that a financial crisis could curtail access to foreign exchange for direct investors? *Scoring scheme:* 0 = Very high: Financial crisis seems likely 1 = High: Considerable danger of a financial crisis 2 = Moderate: Some indications of a potential financial crisis 3 = Low: Very few indications of a potential financial crisis 4 = Very low: No indications of a potential financial crisis
6.8	**Capital account**	0-4	Can investors move money in and out of the country with ease for financial transactions (capital account)? *Scoring scheme:* 0 = Capital flows are highly restricted 1 = Government approval required for outward capital movements above a low threshold; heavy restrictions on inward flows; high risk of controls being extended during a crisis 2 = Inward/outward capital flows are allowed, but there are significant regulatory restrictions; significant risk of controls being tightened during a crisis 3 = Almost all capital flows are free; minor administrative procedures; little risk of capital controls being imposed during a crisis 4 = Full liberalization and no risk of capital controls being imposed during a crisis
6.9	**Current account convertibility**	0-4	Can investors make payments for goods and services and access foreign exchange without restriction? (current-account convertibility) *Scoring scheme:* 0 = Very restricted 1 = Only partial liberalization; multiple exchange rates 2 = High degree of formal liberalization but significant restrictions remain 3 = Currency almost fully convertible; minor restrictions in place 4 = Full IMF Article 8 convertibility

IMPORTANT DISCLOSURES

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