IRENA
International Renewable Energy Agency

MOBILISING INSTITUTIONAL CAPITAL FOR RENEWABLE ENERGY

ISBN

Citation: IRENA (2020), *Mobilising institutional capital for renewable energy*, International Renewable Energy Agency, Abu Dhabi.

About IRENA

The International Renewable Energy Agency (IRENA) is an intergovernmental organisation that supports countries in their transition to a sustainable energy future, and serves as the principal platform for international co-operation, a centre of excellence, and a repository of policy, technology, resource and financial knowledge on renewable energy. IRENA promotes the widespread adoption and sustainable use of all forms of renewable energy, including bioenergy, geothermal, hydropower, ocean, solar and wind energy, in the pursuit of sustainable development, energy access, energy security and low-carbon economic growth and prosperity. **www.irena.org**

ACKNOWLEDGEMENTS

This report was authored by Sandra Lozo and Costanza Strinati (IRENA). The report benefited from the valuable contributions of Michael Boardman (Sindicatum), Michael Hofmann (CleanTech Methods), Deepak Krishan (The World Resource Institute), Nishant Kumar (GuarantCo), Vivek Mittal (Mirest Capital), Assaad Razzouk (Sindicatum), Cecilia Tam (OECD) and Jan Lynn Weiss (IDB Invest).

Valuable review and feedback were also provided by current and former IRENA colleagues, including Rabia Ferroukhi, Paul Komor, Serkan Ata, Simon Benmarraze, Rafael De Sa Ferreira, Diala Hawila, Joanne Jungmin Lee, Seleha Lockwood, Habone Osman Moussa, Job Mutyaba, Paula Nardone, Michael Renner, Jose Toron, Jef Vincent, Adrian Whiteman and Henning Wuester.

Steven Kennedy edited the text.

CONTENTS

FIGURES

TABLES

BOXES

ABBREVIATIONS

ADFD	Abu Dhabi Fund for Development
AFD	Agence Française de Développement
AUM	assets under management
CAGR	compound annual growth rate
CBI	Climate Bonds Initiative
CEO	chief executive officer
COVID-19	Coronavirus disease
CPI	Climate Policy Initiative
DFI	development finance institution
ESG	environmental, social and governance
EU	European Union
EUR	EU Euro
FONSIS	Senegalese Sovereign Wealth Fund (Fonds Souverain d'Investissements Stratégiques)
GBP	Green Bond Principles
Gt	gigaton
GW	gigawatt
IDB	Inter-American Development Bank
IFC	International Finance Corporation
IGCC	Investor Group on Climate Change
IIGCC	Institutional Investors Group on Climate Change
INR	Indian rupee
IRENA	International Renewable Energy Agency
IRR	internal rate of return
kWh	kilowatt hour
LCOE	levelised cost of electricity
MW	megawatt
NGFS	Network for Greening the Financial System
OECD	Organisation for Economic Co-operation and Development
PHP	Philippine peso
PPA	power purchase agreement
PRI	Principles for Responsible Investment
PV	photovoltaic
SWF	sovereign wealth fund
TCFD	Task Force on Climate-Related Financial Disclosure
TWI	Terawatt Initiative
UK	United Kingdom
UNDP	United Nations Development Programme
US	United States
USD	US dollar
°C	degree Celsius

EXECUTIVE SUMMARY

Institutional investors represent one of the largest capital pools in the world. As such, they should be part of the ongoing discussion on how to align the financial system with the transition to a sustainable, low-carbon economy. This report provides insight into this investors group, focusing on pension plans, insurance companies, sovereign wealth funds, and foundations and endowments. It relies on information collected directly from investors, transactional data collected from online databases and an extensive literature review. It highlights the untapped potential of institutional investors in the financing of renewable energy, analyses the challenges they face and provides actionable recommendations to policy makers and other stakeholders on how to harness the financial might of this important group.

Renewable energy is a rapidly evolving sector marked by steady growth in annual investments over the past decade to the present level of about USD 300 billion per year. Other salient characteristics of the sector's evolution are the dominance of solar photovoltaic and wind in the technology mix, and the growing clout of developing and emerging markets. Private sector involvement and new business and investment instruments, such as corporate sourcing and green bonds, are gaining ground. However, despite the generally positive investment trends, current capital inflows remain far below the amounts required to reach global climate goals. Capital inflows to the power sector must at least double if agreed climate goals are to be reached. These facts point to an urgent need to tap into all underutilised sources of capital.

The group of institutional investors analysed in this report manages about USD 87 trillion in assets split between pension plans (51% of assets), insurance companies (38%), sovereign wealth funds (9%) and endowments and foundations (2%). They form a heterogeneous group operating within very different sectoral and national circumstances. They

are subject to a wide range of investment-related mandates and restrictions, and they differ greatly in their ability to invest in renewable energy assets. Nevertheless, commonalities do exist. As a group, institutional investors, already large, are becoming even larger thanks to their healthy asset growth rate, with markedly faster growth occurring in emerging and developing markets both now and for the foreseeable future. Other trends affecting the group also favour a larger role in the financing of renewables, notably their search for asset diversification and higher yields, as well as mounting demands for good governance and better social and environmental stewardship.

Institutional investment in renewables has a great potential that so far is largely underutilised. Our analysis of a sample of over 5 800 institutional investors and their investments over the past two decades reveals that about 20% of them have made some renewable energy investments indirectly through funds, while only 1% have invested directly in renewable projects. While direct investments have increased fairly steadily over time, in 2018 they amounted to no more than USD 6 billion – just 2% of total global investments in renewable energy projects. Similarly, institutional investment in renewable-focused funds is estimated at about USD 6 billion per year. Together, such renewable investments represent a minuscule share of the capital held by the world's institutional investors.

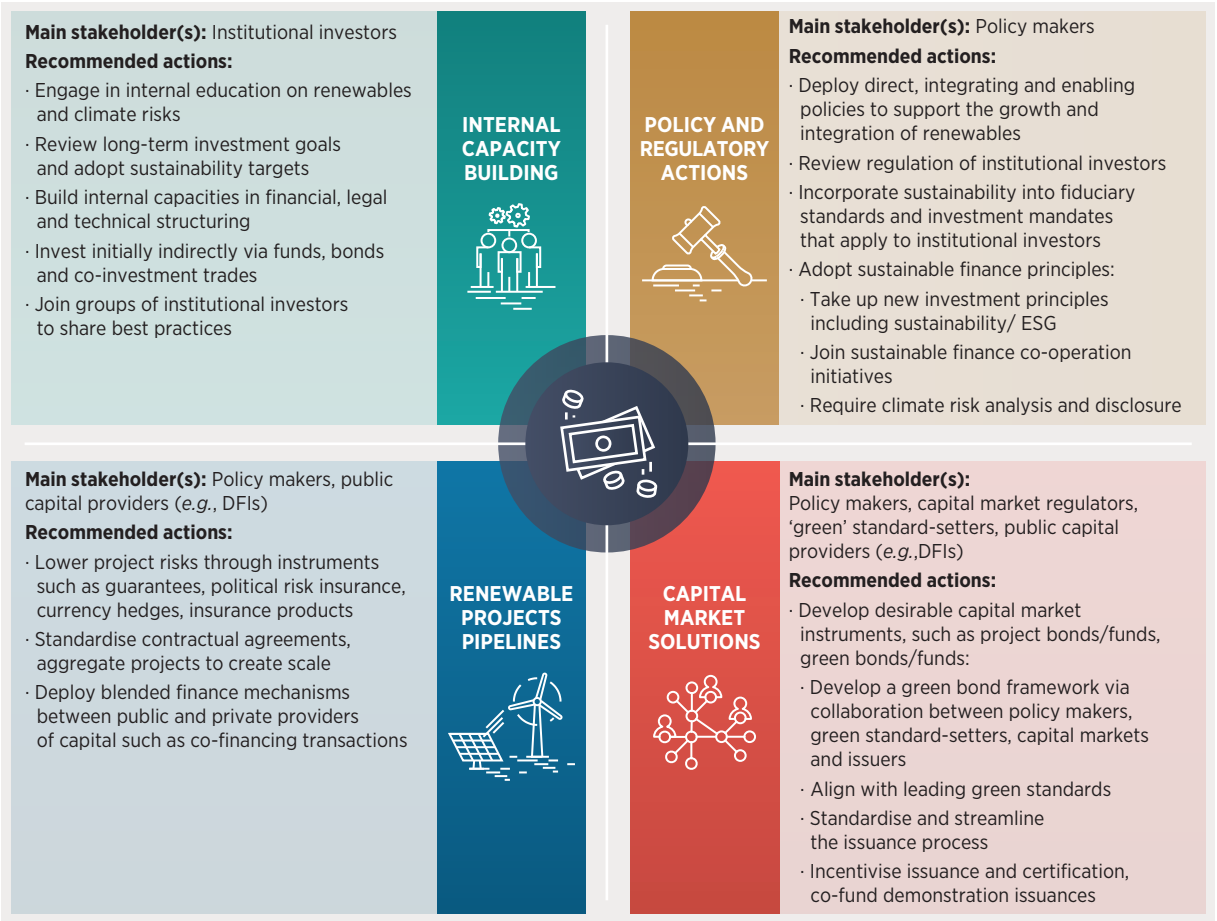
In addition to their strong preference for indirect investments over direct project investments, institutional investors have shown an equally strong preference for projects that are already operating over new ones, which carry construction and structuring risks. Mirroring global trends, solar and wind dominate their preferred technological mix, with wind favouring more strongly than solar owing to its larger transaction sizes. In general, larger transactions are more likely to attract institutional capital because they imply lower transaction costs than smaller projects. At the same time,

larger institutional investors are more likely than smaller ones to develop internal capacities and invest in renewables. Such capacities are especially important for direct investments. Somewhat counter-intuitively, institutional investors from developing markets are more likely to invest directly compared with those from developed markets. This is probably due to the scarcity in the former markets of instruments for indirect investments, such as project bonds or funds.

The investment opportunity for institutional investors represented by renewable energy assets is large – and growing. From the social perspective, redirecting institutional investors' capital toward renewables is important for environmental, social and development reasons. This is true globally but most acute in emerging and developing countries, with large gaps in funding for green infrastructure. More institutional investment in renewables can create a positive feedback loop by lowering the overall cost of financing, thereby attracting other sources of capital to the sector. For institutional investors, renewables present a good economic opportunity to diversify assets and benefit from strong, stable, long-term cashflows that match their liabilities, while minimising the risk of stranded assets. Social sentiment also increasingly favours including considerations of sustainability in fiduciary standards, while regulation of institutional investors is slowly starting to incorporate environmental, social and governance issues into the investment mandates of institutional investors.

Unlocking institutional capital for renewables requires a range of coordinated actions that includes regulatory and policy actions, capital market solutions, creation of bankable project pipelines, and a host of internal changes on the part of institutional investors (Figure ES.1).

Figure ES.1 Recommended actions to mobilise institutional capital in renewable energy



Source: IRENA analysis.

Note: DFI = development finance institution; ESG = environmental, social and governance.

- **Policy and regulatory solutions** that can steer institutional capital toward renewables include policies that support the overall growth of renewable energy and its integration into the economy. Reviews of the investment restrictions faced by institutional investors, the addition of long-term sustainability mandates, development of the sustainable finance sector, and the adoption of frameworks for analysis and disclosure of climate change risks are other important policy levers.
- **Capital market solutions** can link institutional capital with renewable assets by delivering efficient investment vehicles, such as project bonds, project funds and green bonds, thereby providing investors with a desirable scale, simplicity, credit assurance and liquidity. The supply of such instruments can be increased through stakeholder co-operation, adoption of green bond frameworks aligned with climate objectives, and economic incentives to lower the transaction costs of new instruments.
- **Barriers to renewable energy projects can be lowered** – and a pipeline of investable renewable assets created – through expanded use of risk-mitigation instruments, standardisation of contractual agreements, and blended finance initiatives that enable the sharing of know-how and returns between institutional investors and providers of public capital (such as development finance institutions).
- **Building internal capacities** within institutional investors in the areas of governance, financial, technical and legal structuring, and climate change risk analysis should occur in tandem with the above-proposed actions. Collaboration with other institutional investors, indirect investments, and co-financing initiatives can also help institutional investors share best practices and learn to manage new risks while maximising the benefits that renewable energy assets bring.

RENEWABLE ENERGY INVESTMENTS

01

As the global energy transformation progresses, the investment profile of renewable energy is also changing rapidly. The amount of capital invested in renewable energy has grown substantially over the past decade. Capital flows reflect a growing variety of renewable energy sources, the rising clout of emerging markets and a substantial increase in the business models and financial instruments deployed globally to finance or procure renewable power. Even so, the current trends will not deliver results sufficient to meet global climate goals. Meeting those goals requires an urgent scaling up of investment.

1.1 Renewable energy investment trends

Annual renewable power capacity additions grew steadily over the past decade

The energy transformation is most pronounced in the power sector. Renewable energy power costs, expressed as the global weighted-average levelised cost of electricity (LCOE), decreased dramatically over the past decade. The LCOE of solar photovoltaic (PV) power declined by 82% over the 2010-2019 period, of concentrated solar power (CSP) by 47%, of onshore wind by 39% and of offshore wind by 18% (IRENA, 2020a). These rapidly falling costs were driven by technological improvement, competitive procurement, declining financing costs and a growing base of experienced, internationally active developers. Renewable energy is an increasingly competitive way to meet new power generation needs (IRENA, 2018a).

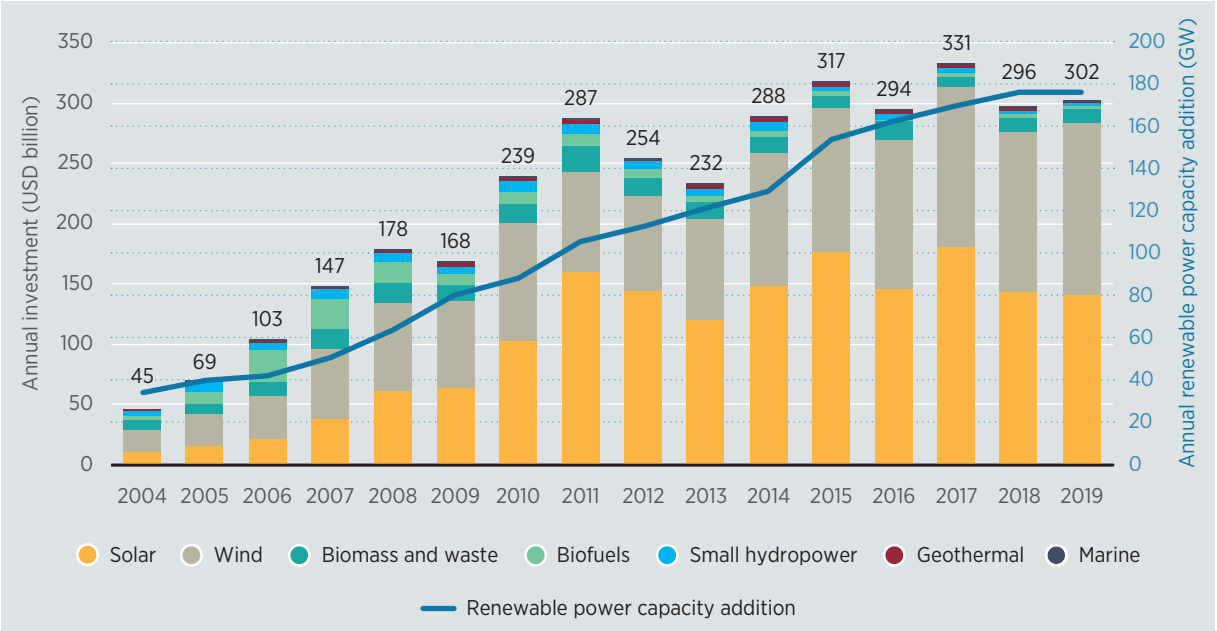
Renewable energy annual power installations have been on a growth path in the past decade, outstripping annual additions of conventional power sources every year since 2014 (IRENA, 2020b). At the end of 2019, global power capacity from renewables amounted to 2 533 gigawatts (GW), the result of 10 years' growth of over 1 300 GW in installed capacity (IRENA, 2020b). **Renewable energy now represents one-third of the world's power capacity and one-quarter of power generation.** That said, its share of the total primary energy supply is only 14%, reflecting the relatively slow progress of renewables in end-use sectors (heating and cooling, transportation and buildings) (IRENA, 2020c).

Annual investments in renewable energy have reached USD 300 billion

The growth in annual additions of power capacity from renewable energy reflects the fact that renewable power has become a compelling investment proposition. Investments in renewable power capacity, expressed in US dollars, grew from less than USD 50 billion per year in 2004 to about USD 300 billion in recent years, exceeding investment in new fossil fuel power by a factor of three in 2019 (REN21, 2020). **In 2019, investment in new renewable energy power capacity was USD 297 billion**. When new equity raised from public markets, corporate and government research and development, venture capital and private equity investments are added to this amount, **global investment in renewable energy in 2019 totalled USD 317 billion** (Frankfurt School-UNEP Centre/BNEF, 2020)[1] (Figure 1.1).

Renewable energy investment fell by 11% between 2017 and 2018, and only slightly recovered in 2019 (Frankfurt School-UNEP Centre/BNEF, 2020). This is partially due to lower capital costs, as the same amount of investment could buy more renewable power capacity. Another causal factor was a policy change in major markets, such as in China, where the government's restriction on the number of solar projects qualifying for a feed-in tariff in mid-2018 prompted a steep fall in solar power investment. A 38% year-on-year drop in investments in China was partially offset by a 45% increase in Europe (Frankfurt School-UNEP Centre/BNEF, 2020).

Figure 1.1 Global renewable energy investment excluding large-scale hydro (>50 MW) (left y-axis), by technology, and renewable energy power capacity additions (right y-axis), 2004-2019



Source: IRENA (2020b) for capacity data (right y-axis), Frankfurt School-UNEP Centre/BNEF (2020) for investment data (left y axis).
Note: GW = gigawatt; MW = megawatt.

Renewable energy investment reached USD 317 billion in 2019 - up 4% compared to 2018 - of which USD 297 billion was invested in renewable power capacity.

1Renewable power investment excluding large-scale hydro was USD 282 billion in 2019. Adding new investment from public markets (i.e., initial public offerings [IPOs]), venture capital, private equity, and research and development brings the total to USD 302 billion. Investment in large-scale hydro is estimated to have been USD 15 billion in 2019, bringing the year's total investment to USD 317 billion. Investment in large-scale hydropower is excluded from Bloomberg New Energy Finance (BNEF) data because hydropower is not considered "new energy" and because of the difficulty of estimating annual investment amounts.

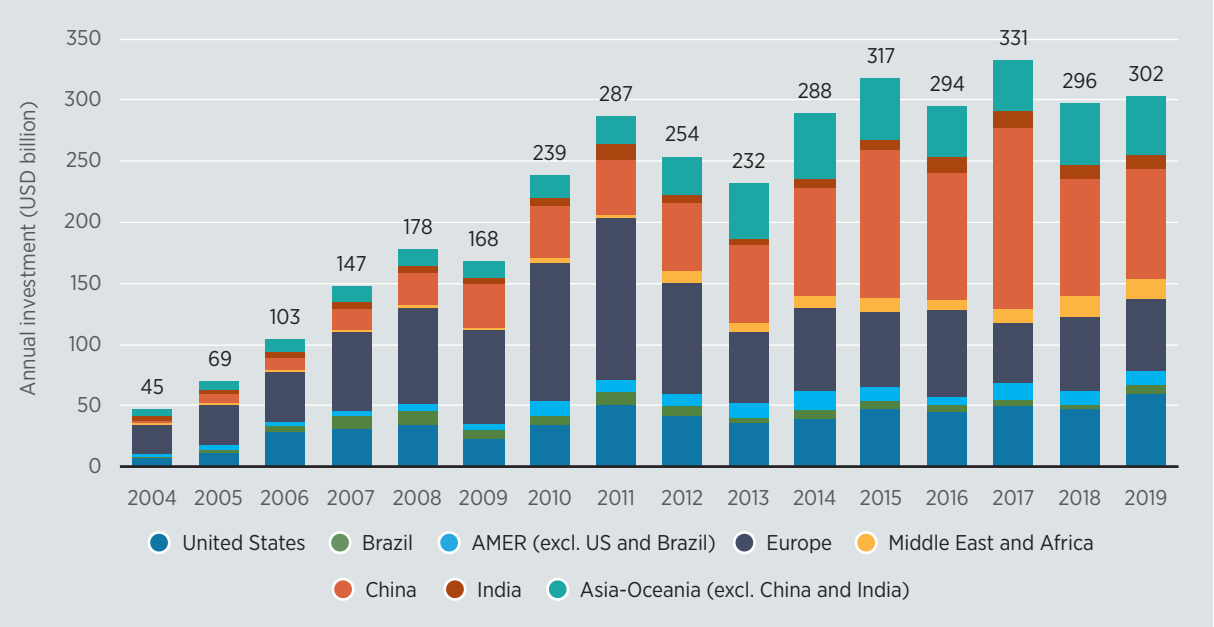
Solar PV and onshore wind take the lead

While hydropower still accounts for the largest share of renewable power capacity (52% of the 2019 cumulative total), solar PV and onshore wind power have accounted for the largest share of annual capacity installations in recent years: 97 GW of solar PV and 55 GW of onshore wind were added in 2019, compared with hydropower's 13 GW. They have also accounted for the largest share of annual investments (IRENA, 2020b). With costs falling rapidly, this trend is expected to continue. **Investment in solar PV and onshore wind power grew from 65% of total renewable energy investments in 2004 to about 94% in 2019** (IRENA and CPI, 2020; Frankfurt School-UNEP Centre/BNEF, 2020). Solar PV investments accounted for about 89% of total solar power investment in 2013-2018, with CSP plants attracting the remaining 11% (IRENA and CPI, 2020). In the case of wind power, onshore wind is still dominant, but less so each year – investment in offshore wind as a share of total wind asset finance grew from 10% in 2013 to 20% in 2018 (IRENA and CPI, 2020).

Emerging market's clout is growing

Capital flows into renewables have undergone a geographic shift in the last decade. While most of the initial growth took place in Western Europe and the US – and these markets remain important – **emerging markets, particularly China, have attracted the bulk of investments each year since 2015, reaching 61% of total investments in 2019** (Frankfurt School-UNEP Centre/BNEF, 2020) (Figure 1.2). Besides China, which alone attracted 30% of the total 2019 investments, other developing markets that experienced significant investments over the past decade (2010-Q2 2019) are India (USD 90 billion), Brazil (USD 55 billion), Mexico (USD 23 billion), South Africa (USD 20 billion) and Chile (USD 14 billion). The year 2018 also saw record renewable investment (USD 16.1 billion) in the Middle East and Africa, mostly in Egypt, Kenya, Morocco and South Africa (Frankfurt School-UNEP Centre/BNEF, 2020). Nevertheless, the renewable energy investment potential of many countries in Africa, the Middle East, Southeast Asia and Southeast Europe is still largely untapped, chiefly because of higher real or perceived risks compared with more developed markets.

Figure 1.2 Global renewable investment, excl. large-scale hydro (> 50 MW), by region, 2004-2019



Source: Frankfurt School-UNEP Centre/BNEF, 2020.

Solar PV and onshore wind are technological leaders, attracting 94% of renewable investments in 2019. Emerging and developing markets are now geographical leaders, accounting for the most renewable investments every year since 2015.

The private sector plays a key role, but public finance and support remain important

Direct investments in renewable energy projects are dominated by the private sector (IEA, 2018; IRENA and CPI, 2020). In the 2013-2018 period, for example, **private sources accounted for about 86% of total investments in renewable energy projects**, averaging about USD 260 billion annually (IRENA and CPI, 2020). The major source of private capital for renewable energy is project developers (averaging 46% of the total over 2013-2018), followed by commercial financial institutions (22%), corporate actors (16%) and households (14%). Institutional investors, on the other hand, accounted for less than 1% of the total in the same period (IRENA and CPI, 2020).

These figures are global averages. In some markets, public direct investment in renewable energy projects is quite substantial. This is the case for Latin America, Sub-Saharan Africa and South Asia, where public capital accounted for an average of 49%, 41% and 24%, respectively, of direct investments in the 2013-2016 period (IRENA and CPI, 2018). In addition, in developed and developing markets, **significant public resources are allocated each year to policies and instruments supporting deployment of renewable energy**, such as grants, reductions in taxes, feed-in tariffs or risk mitigation instruments. Such support can help kick-start new markets, level the playing field with conventional power sources and attract the private sector (IRENA, 2016).

The private sector directly finances the majority of new renewable projects, providing 86% of total investments. However, the global average does not reflect all local realities, as in many emerging and developing markets direct public support for renewable energy projects is quite substantial. Public capital, although limited, remains important to lower real and perceived risks, overcome initial barriers, attract private investors, lower the cost of capital and kick-start new markets.

The variety of financial instruments and business models is expanding

The renewable energy investment landscape is seeing a proliferation of investment models and instruments that can activate different capital pools at different stages of a renewable asset's life. About three-quarters of new renewable power direct investment is in the form of asset finance of utility-scale renewable energy plants, which in turn is largely sourced from companies' balance sheets (65%) or project finance (35% of the 2019 asset finance total). Most of the remaining investment comes from financing small distributed capacity (less than 1 megawatt [MW]) and, to a much smaller extent, from public markets (equity raising), venture capital, private equity and research and development budgets (Frankfurt School-UNEP Centre/BNEF, 2020).

Project finance is increasingly being adopted in developing and emerging markets as well. This is a fairly complex financing mechanism whereby, instead of the project cost being met by the project owners using their balance sheets, a separate legal project entity is formed to own, manage and operate the renewable energy asset. In 2017, Africa, developing Asia and Latin America together accounted for 31% of all renewable energy project finance trade, nearly doubling their share of the total from 16% in 2012 (IEA, 2018).

Primarily used to re-finance already-operating green assets and to attract large investors such as institutional investors, new financing instruments such as **green bonds** grew rapidly from USD 36.6 billion in 2014 to USD 167.6 billion of issuances in 2018 (CBI, 2015; CBI, 2019a). A new record surpassing USD 200 billion of issuances is expected for 2019. New business models are also emerging and gaining ground. These include the **corporate sourcing** of renewable energy, whereby companies such as Alphabet, IKEA or Rio Tinto are directly generating or sourcing their own renewable energy. In 2017, corporate sourcing was occurring in over 75 countries, and companies actively consumed about 465 terawatt-hours of renewable electricity, comparable to the annual electricity consumption of a major economy like France (IRENA, 2018b).

Renewable energy finance landscape is giving rise to an increasing variety of financing modes, investment instruments and business models, such as green bonds and corporate procurement, that can mobilise different capital pools for renewable investments.

1.2 Renewable energy investment needs

Renewable energy investment trends have generally shown a positive trend over the past 15 years. However, much more needs to be done to fulfill the vast potential of renewable energy and to meet the world's clean energy pathway, sustainable development goals and climate commitments. As renewable energy assets prove their resilience in the midst of the global COVID-19 crisis, their attractiveness is becoming increasingly evident among companies and investors. The green recovery packages announced by governments around the world represent an unprecedented opportunity to demonstrate long-term commitments to the renewables-based energy transition and accelerate investments in the sector (see Box 1.1).

Box 1.1 How the COVID-19 crisis has accelerated the global energy transition

The crisis caused by the COVID-19 outbreak had negative repercussions on virtually all sectors of the global economy, including the energy sector. In the first quarter of 2020, global energy demand dropped by 3.8% while electricity demand was down 20% (IEA, 2020a). The brunt of the crisis was felt stronger by the fossil fuel industry, which accounted for most of this reduction in the power sector. Due to their lower operating costs, environmental regulations and long-term purchase agreements, renewables received priority dispatch over costly fossil fuel generators, increasing the share of renewables in the electricity mix of many countries. In the third quarter of 2020, analysis of the energy outlook published by the oil major BP showed that the world has already passed "peak oil" demand (Evans, 2020).

Unlike fossil fuels, renewables have demonstrated considerable resiliency to the disruption caused by the COVID-19 pandemic. While 2020 is set to be, overall, a negative year for the energy sector – global energy demand is projected to decline by 5% – renewables are the only energy sources whose demand is expected to grow in 2020, with new capacity additions projected to already rebound in 2021 led by solar PV installations (IEA, 2020b).

Recent climate pledges and multi-billion-dollar green stimulus packages laid out by major economies to drive their post COVID-19 recovery provided clear signals on the direction of governments' ambition, and are set to accelerate the transition toward a global low-carbon, renewables-based, energy system. In September 2020, China announced its intent to become carbon neutral before 2060, while the European Union raised its 2030 emission-reduction target from 40% to 55% over 1990 levels and pledged to achieve climate neutrality by 2050 (BNEF, 2020; European Commission, 2020). Few weeks later, the UK raised its target for the offshore wind industry – now set to reach 40 GW by 2030 – and earmarked about USD 207 million to support the creation of tens of thousands of jobs along the value chain, boost investors' confidence and attract private capital in the sector (Government of UK, 2020). In October 2020, Japan ramped up its climate ambition and pledged to reduce its emissions to zero and become carbon-neutral by 2050 through a combination of new solar cells, carbon recycling and the decommissioning of coal power (Lies, 2020).

Governments have also allocated considerable financial resources to green recovery plans. For example, in July 2020, EU Members agreed to allocate around EUR 550 billion to green projects, including renewables, for the period 2021-2027 (Abnett and Green, 2020). The European Commission announced its intention to fund about a third of the EUR 750 billion recovery fund through green bonds; this would be roughly equivalent to global annual green bond issuance in 2019 – at USD 274.2 billion (Ainger and Pronina, 2020). Similarly, the Republic of Korea announced a Green New Deal to support a green economic recovery, worth about USD 135 billion to be allocated for the green transition of sectors such as energy, and digital technologies (Kim, S. *et al.*, 2020).

With governments backing green infrastructure development and placing the energy transition at the core of their COVID-19 recovery plans, capital markets are also shifting. Clean energy investments outperformed the market in the first three quarters of 2020 and their revenues are expected to continue to grow in the coming years (The Economist, 2020; Winkler, 2020).

As returns from fossil fuels drop and uncertainty regarding a rebound in demand rises, investors – including institutional investors – are re-evaluating their portfolios and shifting their attention toward sustainable assets, including renewables. Many institutional investors, including world's largest asset manager BlackRock, Sweden's Första AP-fonden, UK's National Employment Savings Trust and Dutch Robeco, have announced their intention to divest from fossil fuel assets to reduce their exposure to sustainability-related risk and the risk of stranded assets (Keating, 2020; IEEFA, 2020a, IEEFA, 2020b; Tuck, 2020). Exxon Mobil dropped from the Dow Jones after its market value decreased to USD 175 billion (after peaking at just over USD 400 billion in 2011), plagued partly by claims that the company concealed the environmental damage of its activities. Moreover, while fracking helped revive and grow the sector, demand for fossil fuels has dropped during the COVID-19 economic slowdown. The role of oil in the US economy has decreased considerably. After Exxon's exit from the Dow, energy accounts for only 2% of the index, down from a quarter in the 1980s (Gandel, 2020).

Growing competitiveness of renewable energy and tighter climate policies around the world are also pushing major European oil and gas companies to revise their business strategies. The British giant BP announced plans to reduce its oil and gas production by 40% by 2030 and increase its renewable energy capacity by 95% to reach 50 GW. BP is not alone. Other companies – including Shell, Total and Eni – are also cutting their oil and gas production and integrating more renewables, as well as batteries and electric vehicles infrastructures in their business (Mills, 2020).

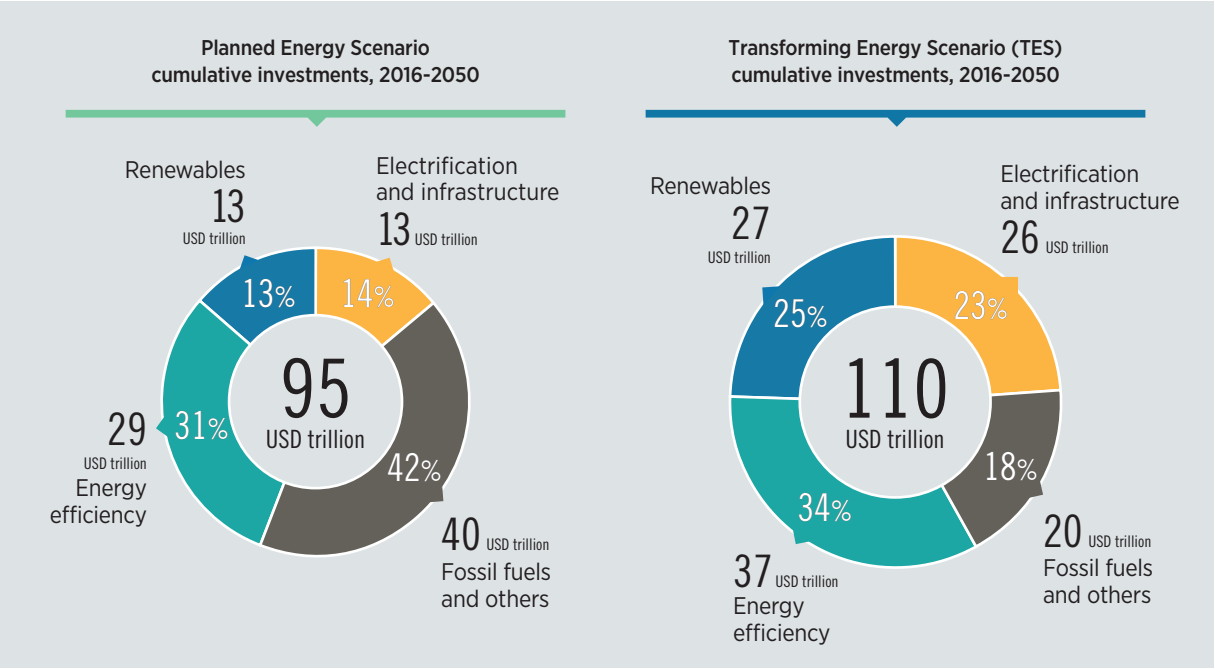
The COVID pandemic has unveiled the limitations of the current energy system and made it clear that a global energy transition is not only possible, but unavoidable. The green stimulus packages represent a key opportunity to signal governments' long-term commitment to renewables to investors, increasing their confidence and attracting additional investments in the sector. By focusing recovery plans on the energy transition, policy makers can leverage on the socio-economic benefits to overcome the current economic downturn, including considerable gains in terms of jobs. According to IRENA's analysis, annual energy transition investments need to reach nearly USD 2 trillion in the recovery phase (2021-2023) and then grow further to, on average, USD 4.5 trillion through 2030. This could create 5.5 million additional jobs in renewables and other energy transition-related technologies than is possible with a conventional and more "muted" policy response and an additional 19 million energy transition-related jobs by 2030. (IRENA, 2020d).

Climate targets require the urgent scaling up of renewable investments

The latest climate science reports provide a stark warning. If the current pace of global emission trends continues, the planet's carbon budget would be largely exhausted by 2030, setting us on track for a temperature increase of more than 3°C above pre-industrial levels and associated catastrophic climate change effects (IPCC, 2018). To limit warming to 1.5°C above pre-industrial levels (IRENA's Transforming Energy Scenario) requires a 70% decline in annual emissions from 34 gigatons (Gt) to at least 9.8 Gt between 2016 and 2050.

IRENA estimates that a large-scale shift to renewable energy and increased energy efficiency can deliver 75% of required emission reductions. Coupled with increased electrification, a total reduction in emissions of 90% can be achieved (IRENA, 2020c). This implies that the share of renewable energy in total primary energy supply rises from the current 14% to at least 65% in 2050, while the share of renewables in the power sector grows from the current 24% to 86% in 2050.

Figure 1.3 Cumulative energy sector investment needs: Planned Energy Scenario and Transforming Energy Scenario, 2016-2050, USD trillion



Source: IRENA, 2020c.

*Note: * includes nuclear, carbon capture and storage; ** includes investments in power grids, energy flexibility, electrification of heat and transport applications, and renewable hydrogen; "Energy efficiency" includes efficiency measures deployed in end-use sectors (industry, buildings and transport) and investments needed for building renovations and structural changes (excluding the modal shift in transport); "Renewables" include investments needed for deployment of renewable technologies for power generation, as well as direct end-use applications (e.g. solar thermal, geothermal).*

IRENA has estimated that investment in the energy system needs to reach a cumulative USD 110 trillion in the 2016-2050 period to keep the world on an energy transformation path (IRENA, 2020c). This is USD 15 trillion more than the energy investment level set out by current and planned policies (IRENA, 2020c) (Figure 1.3). New renewable power capacity generation alone would require a USD 22.5 trillion investment to stay on the energy transformation path (IRENA, 2020c). This implies annual investment of almost USD 800 billion, or almost three times the current levels (IRENA, 2020c). There is both an urgent need and a large opportunity for institutional capital to fill some of this gap.

In addition to the fact that the return on such investment is positive, there are compelling short- and longterm benefits. Every USD 1 spent on the energy transition would result in fuel savings of USD 3 to USD 7, lower net energy subsidies and reduced health externalities. Although the impacts vary by country, benefits also include a 2.5% improvement in the gross domestic product by 2050, and 14% more energy sector jobs (an additional 12.5 million jobs) by 2050 (IRENA, 2020c). However, there is a significant gap in funding; the question of the moment is where the capital for the energy transition will come from.

The chapters that follow provide an overview of the capital pool represented by institutional investors, including IRENA's analysis of how such investors invest in renewable energy and how they can be supported in increasing their investment.

For the energy transformation to be achieved, investment in renewable energy must urgently increase. Renewable power investment alone needs to more than double from current annual flows. All "deep pockets" should be activated to fund energy transformation solutions.

INSTITUTIONAL INVESTORS AND RENEWABLES

02

Although each is distinctive, the four types of institutional investors analysed in this report have common characteristics and show broadly similar trends: strong asset growth over the last decade, fast growth in emerging and developing markets, a search for greater asset diversification and higher yields, and growing regulatory and social scrutiny. Most of the trends favour increased investments in renewables, but to date the great potential for renewable energy investments among institutional investors remains largely underutilised.

2.1 Understanding institutional investors

Institutional investors are large-scale entities which pool money to purchase securities, real property, or assets, or to make loans (IRENA, 2016). What this means in practical terms is not easy to pinpoint, as there is **no universally accepted definition** of an "institutional investor". Common definitions often group together institutions that are heterogeneous in their investment behaviour, including in their investment restrictions, mandate, size, targets and internal capacities. Often included in this category is a broad array of financial institutions such as pension funds, insurance companies, sovereign wealth funds (SWFs), foundations and endowments, asset managers, wealth managers, commercial and investment banks, and sometimes funds (*e.g.*, mutual funds, hedge funds, funds of funds, exchange-traded funds, and private equity funds)[2].

The heterogeneity of this asset pool should not stop us from probing the investment behaviour of its constituents, which are far too big to be ignored or left on the sidelines of the ongoing energy transition. To limit the scope of the qualitative analysis and avoid double-counting assets in the quantitative analysis, this report focuses on the group of institutional investors composed of **pension funds, insurance companies, SWFs, foundations and endowments**.

2 *According to the definitions used by Bloomberg New Energy Finance, the Climate Policy Initiative (CPI), Preqin, Ceres, the Organisation for Economic Co-operation and Development, and the International Organisation of Securities Commissions, among others.*

Types of institutional investors

Pension funds manage liabilities made up of a stream of payments made to pension beneficiaries over time. The pension funds industry is estimated to have held about USD 44 trillion in assets at the end of 2018 (WTW, 2019). Pension plans are usually divided into public and private, and further into defined-contributions vs. defined-benefit plans. Public pension plans accounted for 68% of all pension assets at the end of 2016 (WTW, 2017). In defined-contribution plans, beneficiaries (typically individual employees) bear the investment risk and usually can switch between investment options. They also have the right to exit the plan before retirement (for example, upon change of employer), a right that raises the fund's need for liquidity. In defined-benefit plans, investment risk remains with the plan sponsor (*e.g.*, the employer) and options to switch investments or exit the plan are more limited; hence the plan's liabilities tend to have longer terms, in some cases more than 40 years.

Insurance companies issue products (policies) that cover risks that may be short-term (travel or accident insurance), medium-term (property) or long-term (life insurance, annuities). The insurance market managed about USD 33 trillion in assets in 2018 (WTW, 2019). At the end of 2017, life insurance accounted for the largest share of global premiums (46%), followed by property and casualty insurance (30%), and then health insurance (23%) (McKinsey, 2019). While property insurers require liquidity for their short-term obligations, life insurers generally purchase long-term assets and are less sensitive to liquidity issues. Their investment horizon is therefore well matched to longer-term assets like renewable energy projects.

SWFs are special-purpose investment funds owned by governments and fed by taxes, central bank reserves and, especially, commodity sales. SWF assets have nearly doubled in the past decade largely due to the commodity price boom of 2000-2007. Currently, the world's 81 largest SWFs manage about USD 8 trillion in assets (SWFI, 2019). Compared with other types of institutional investors, individual SWFs can be very large, with Norway's Government Pension Plan, for example, exceeding USD 1 trillion in assets. As a group, SWFs are very diverse in their investment mandates, which can include fiscal stabilisation, preservation of intergenerational wealth, strategic investments, as well as economic and social development. These mandates, in turn, influence the SWF's investment behaviour. Another defining characteristic of SWFs is their lack of transparency, with many funds providing hardly any disclosure, making analysis of their investment behaviour a difficult exercise.

Endowments and foundations receive their capital in the form of donations, which are used to capitalise a trust. The trust fund is replenished by further contributions or investment returns. Foundations are typically established by individuals, families or companies to support a general goal (*e.g.*, social, health, environmental). The world's largest foundation, the Bill & Melinda Gates Foundation, with USD 42 billion in assets as of 2017, focuses on poverty and health in developing countries, and on education in the United States (GF, 2018). The Azim Premji Foundation was established by Indian businessman Azim Hashim Premji to improve the quality of education in India; it has estimated assets of about USD 10 billion (Azim Premji Foundation, 2017; World Atlas, 2017). Endowments, typically established by universities and non-profit organisations, are tied to a particular entity as opposed to a social or environmental goal. The best-known examples are those of American universities such as Harvard, which held USD 39 billion in assets at the end of the 2018 fiscal year (Fabrikant, 2018). Together, some 2 000 foundations and endowments globally are estimated to hold about USD 2 trillion in assets (Preqin, 2019). Compared to SWFs, individual funds tend to be on a much smaller scale, which affects their ability to invest in relatively new asset classes like renewables. At the same time, most endowments and foundations have long-term investment horizons and often seek to align their interests with their donors, who are often sensitive to environmental and social governance issues.

Table 2.1 Institutional investor categories and their characteristics

Investor category	Assets under management (2018 or 2019)	Investment horizon	Return requirement / Risk tolerance	Asset allocation	Theoretical fit for renewable energy investments
Pension plans	USD 44 trillion	Long	Defined benefit: Low Defined contribution: Mid	Tilted toward equities	Defined-benefit: Well suited for renewable energy assets Defined-contribution: Liquidity required to allow switching between different investment options
Insurance companies	USD 33 trillion	Life insurance: Long Property and casualty insurance: Short to mid	Life insurance: Low-Mid Property and casualty insurance: Mid	Dominated by bonds	Life insurance: Active participants in renewable energy project finance, given low liquidity and long horizon Property and casualty insurance: Liquidity required for short-term policies
Sovereign wealth funds	USD 8 trillion	Long (except fiscal stabilisation funds)	Context dependent	Tilted toward equities	Well suited for renewable energy assets, except for funds with fiscal stabilisation mandates
Foundations and endowments	USD 2 trillion	Long	Low	Tilted toward equities	Large entities are well suited for renewable energy assets. Smaller ones may need to rely on external managers.

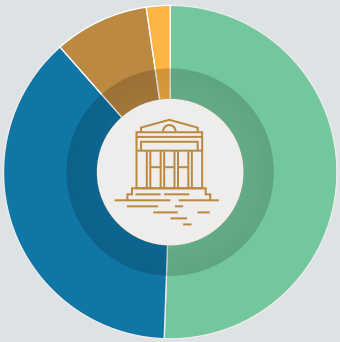
Source: Adapted from CPI (2013); assets under management from Preqin (2019), SWFI (2019), and WTW (2019).

Institutional investors with long-term and relatively predictable liabilities, seeking long-term and relatively stable investments, are a good fit for renewable energy assets. Also important are the individual institution's internal capacities, the availability of desirable projects and appropriate investment vehicles in a given market, and the overall regulatory framework for institutional investors' activities.

Growing assets – especially in emerging and developing countries

Estimates of institutional investors' total assets under management (AUM) vary widely and depend on the definition of institutional investor used, with the "over USD 100 trillion" valuation commonly quoted and usually applicable to "pension funds, insurance companies, sovereign wealth funds, investment funds, and others" (OECD, 2016). For the group of institutional investors analysed in this report (*i.e.*, pension funds, insurance companies, SWFs, foundations and endowments), the latest valuations suggest a combined AUM of **about USD 87 trillion** split among different investor types as shown in Figure 2.1. This lower valuation compared with the USD 100 trillion figure reflects the exclusion of investment funds and other asset managers. While such investors are significant, they are quite diverse as well, with few common investment behaviours. In addition, such investors often manage assets owned by our "focus group" of institutional investors (*i.e.*, pension plans, insurance companies, SWFs, foundations and endowments), which results in double-counting of assets in the quantitative analysis.

Figure 2.1 Assets under management of institutional investors, USD trillion, 2018-2019 average



Endowments and foundations
USD 2 trillion

Sovereign wealth funds
USD 8 trillion

Insurance companies
USD 33 trillion

Pension plans
USD 44 trillion

Source: Preqin, 2019; SWFI, 2019; WTW, 2019.

Note: The total assets under management is based on the following estimates: for endowments and foundations, about USD 2 trillion, per Preqin (2019), accessed in September 2019; for pension plans, USD 44 trillion, and insurance companies, USD 33 trillion at the end of 2018, per WTW (2019); for sovereign wealth funds, USD 8 trillion as of September 2019, per SWFI (2019).

The breakdown of assets under management by type of institutional investor shows that global pension plans (public and private) account for the largest share of the total (about 51%); insurance companies for 38%; SWFs for about 9%; and endowments and foundations for about 2%.

Most institutional assets are currently concentrated in developed markets, although the momentum is shifting toward emerging and developing markets, reflecting their faster-growing economies and populations. In the case of pension plans, the seven largest markets (Australia, Canada, Japan, the Netherlands, Switzerland, the United Kingdom and the United States) account for 84% of global pension plan assets, with US pension plans alone managing USD 24.7 trillion at the end of 2018 (out of the total USD 44 trillion) (WTW, 2019). However, the fastest growth in the recent past has come from emerging markets, and this trend is expected to continue. While global pension plan assets grew by an average of 6.4% per year (in US dollar terms) in the 2008-2018 period, double-digit growth rates were recorded in many emerging and developing markets. These include China, with an estimated compound annual growth rate (CAGR) of pension plan assets of 19.1% over the past five years. Over the past 10 years, Mexico boasts a CAGR of 11.5%; South Africa, 9.2%; and Chile, 8.6% (WTW, 2019, 2018). Kenya's pension funds grew at a 17% annual rate in the 2011-2015 period (Dalberg, 2018).

Similarly, in the insurance industry, North America and Western Europe accounted for a combined 60% of the global insurance market in 2018. However, that share decreased from 70% in 2008, while that of China nearly tripled from 4% in 2008 to 11% in 2018 (Allianz and Euler Hermes, 2019). Insurance markets in Africa, Asia-Pacific and Latin America together accounted for 57% of the growth in insurance premiums over 2014-2017 (McKinsey, 2019). For SWFs, too, the centre of gravity has shifted, as Asian SWFs now top the charts (accounting for 45% of total SWF assets), having overtaken those based in the Middle East, which now account for 36% (SWFI, 2018). In Africa, SWFs have grown in number and asset sizes as well. Ten of the continent's 20 SWFs were established in the six years from 2010 to 2016 – in Angola, Ghana, Kenya, Nigeria, Rwanda, Senegal, South Sudan, Tanzania and Zimbabwe (Quantum Global, 2017).

Institutional investors already hold a vast amount of assets, widely estimated at well over USD 100 trillion. Institutional assets in emerging and developing markets are growing more rapidly than those in the developed world, holding out the promise of bridging the funding gap for local green infrastructure and supporting long-term sustainable development.

A history of conservative investment patterns – yielding slowly to a quest for diversification and higher returns

Most institutional assets are currently managed fairly conservatively, although this is changing. Institutional investors, like other investors, seek to maximise risk-adjusted returns while maintaining their business activities (*e.g.*, paying out insurance claims, pension benefits, making strategic or socially driven investments, etc.). But unlike other investors, institutional investors often face more stringent regulatory restrictions in terms of the asset classes in which they can invest, in addition to other limitations related to local capital markets and internal capacities (discussed in the next chapter) – all of which can result in very conservatively managed portfolios. In the case of emerging and developing markets, in particular, the fund's own government bonds often represent the largest portion of assets held by institutional investors, leaving little room for investments in "real" assets like renewable energy.

While pension plans as a group invest most of their assets in equities (42% at the end of 2017), followed by bonds (37%), and alternatives and cash (21%), those based in the Asia-Pacific region invest mostly in bonds (52%) (WTW, 2017). Pension plans in the Dominican Republic had 99.9% of their assets in government bonds as of the end of 2017; the corresponding figure was 94.7% in Albania, 92.1% in Costa Rica, and 91.1% in Maldives (OECD, 2018). Insurance companies as a group invest most of their assets in bonds, which represent half of the portfolios of life insurers in 29 of the 39 countries of the Organisation for Economic Co-operation and Development (OECD), with some countries (Greece, Hungary, Mexico, and Portugal) having more than 85% of their assets in bonds, of which the large majority was government bonds (OECD, 2019a; McKinsey, 2018). In Turkey, life insurers held 61.5% of their assets in cash and deposits, and 33.4% in government bonds in 2017 (McKinsey, 2018).

There is, however, a growing need for institutional investors to seek higher returns and increase their asset diversification. Owing to the historically low interest rates of the recent past, many institutional investors are now exposed to a reinvestment risk as older bonds offering higher yields mature and are replaced with new bonds offering lower yields (OECD, 2019a). In addition, institutional investors are looking to diversify their portfolio to include more "real" assets in addition to traditional bond and equity holdings, to acquire assets that display a low correlation with current holdings, and to invest within a wider geographic range. In 2018, 58% of SWFs had investments in natural resource assets, up from 55% in 2017 and 47% in 2016 (Preqin, 2018). Such a trend bodes well for increased renewable investments.

Institutional assets are currently managed fairly conservatively – but there is a growing trend to diversify assets and participate more in the "real" economy. Renewable energy assets can help meet such demands.

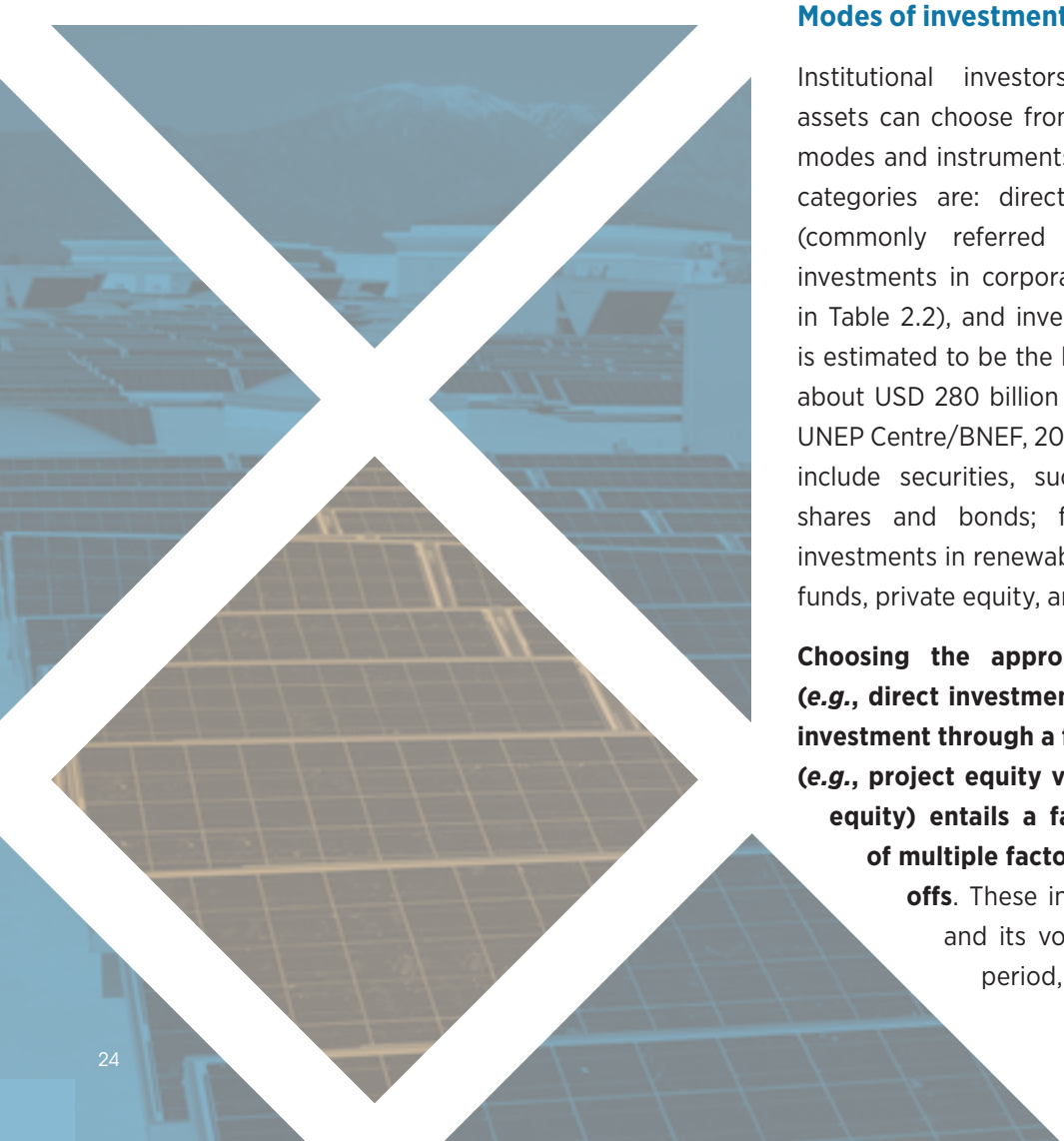
Growing regulatory and social scrutiny

In addition to mounting pressure to diversify portfolios and finance "real" assets, regulatory and social scrutiny are also growing. To protect the public interest and prevent another economic collapse, regulators have monitored global asset managers and owners more closely since the financial crisis of 2007-2009. Internationally active banks, for example, have been subject to growing capital reserve requirements, through regulations such as Basel III, which was agreed upon in 2010 (BIS, 2019). Similarly, insurance and reinsurance companies headquartered in the European Union (EU) are now subject to the Solvency II supervisory regime, implemented in 2016. The new regime fundamentally altered how insurers are regulated by increasing requirements for capital reserves and strengthening internal risk management and reporting processes (Insurance Europe, 2017; NRF, 2015). While such changes are generally beneficial, asset managers and other institutional investors have also noted that they may "penalise" long-term financing, potentially disincentivising investments in long-term assets like green infrastructure (NRF, 2015; Seekings, 2019). Other regulatory actions

have shown a clearer focus on sustainability, as in the case of the Energy Transition for Green Growth Act (Energy Transition Law), passed in 2015, which requires French institutional investors (insurance companies, pension plans, SWFs, asset managers, and banks) to disclose the effects of climate change on their assets (Mazzacurati, 2017a).

Social scrutiny increasingly favours the inclusion of **environmental, social and governance (ESG)** issues in investment decisions (Box 2.1). Currently more than 125 foundations around the world have joined the Divest-Invest movement, which calls for divestment from fossil fuels and increased investment in renewable energy (Murray, 2016). This trend is also clearly favouring greater renewable investments.

While recent regulatory changes have sometimes had mixed effects on institutional investment in assets such as renewables, social demands increasingly ask for better performance on sustainability.



2.2 How much do institutional investors currently invest in renewables?

Despite industry-specific trends that generally seem to favour renewable energy investments, institutional investors have so far played a very minor role in financing the sector. Our analysis suggests that, in the aggregate, institutional investors invest only modest shares of their assets in renewable energy and participate in very few renewable energy transactions, either directly or indirectly through renewable-focused funds. Only one-fifth of institutional investors have made indirect renewable energy investments through funds, while a mere 2% have invested directly in renewable energy projects. Institutional investors appear to prefer indirect transactions, larger transaction sizes, more established renewable technologies and already operating assets. Implications for policy makers and other stakeholders point to an urgent need for more internal capacity building, more investment vehicles, all within a more enabling regulatory framework.

Modes of investment in renewable energy

Institutional investors in renewable energy assets can choose from among several financing modes and instruments. The three most common categories are: direct investments in projects (commonly referred to as "asset finance"), investments in corporate equity or debt (shown in Table 2.2), and investments in funds. The first is estimated to be the largest category, attracting about USD 280 billion in 2019 (Frankfurt School-UNEP Centre/BNEF, 2020). Corporate investments include securities, such as company common shares and bonds; fund investments include investments in renewable energy or infrastructure funds, private equity, and venture capital firms.

Choosing the appropriate investment mode (*e.g.*, direct investment in a project vs. indirect investment through a fund) and then the vehicle (*e.g.*, project equity vs. renewable energy fund equity) entails a fairly complex assessment of multiple factors and a number of trade-offs. These include the expected return and its volatility, the typical holding period, liquidity (*i.e.*, ability to exit

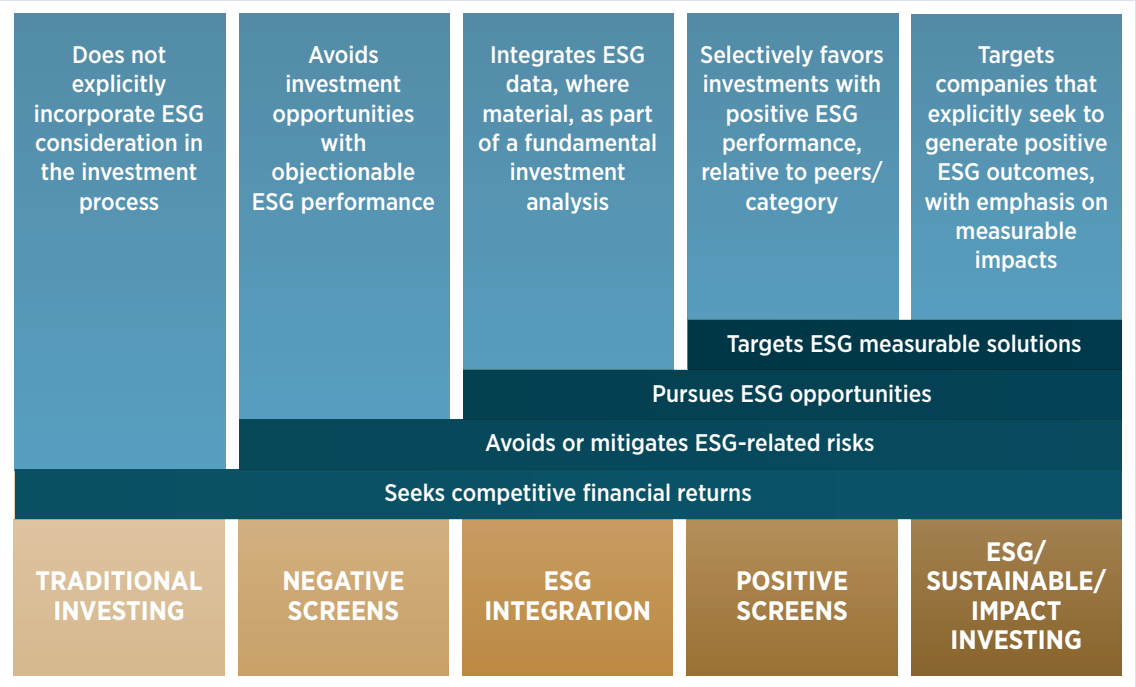
Box 2.1 ESG investing

ESG investing refers to an approach to investment that takes into account the environmental, social and governance aspects of a given investment asset (such as a company or project), in addition to its financial performance (Cambridge Dictionary, 2019). Other terms sometimes used by market participants are "sustainable investing" and 'impact investing".

Environmental aspects may include the environmental impacts of a given project or company, such as its effect on climate change or resource scarcity. **Social** aspects include the company's labour practices, product safety and effects on the local community. **Governance** matters typically include executive compensation, board diversity and general business ethics.

Sustainable investment strategies can take many forms, some of which are shown in Figure 2.2. "Negative screening" aims to exclude certain industries deemed unethical or undesirable, such as tobacco or coal. "ESG integration" aims to build ESG factors into traditional investment activity. "Positive screening" favours companies with a positive ESG record. "ESG investing" (also known as "sustainable" or "impact" investing) has ESG aspects as the leading driver of the investment activity (WRI, 2016). Of these five modes, negative screening is currently the most prevalent option, with about USD 19.8 trillion in assets managed as of 2018, followed by ESG integration, with about USD 17.5 trillion in assets (GSIA, 2018).

Figure 2.2 Traditional and ESG investing strategies



Source: Adapted from WRI, 2016.
Note: ESG= environmental, social and governance.

Investors are increasingly evaluating the ESG credentials of organisations to assess which companies act as good corporate citizens, contribute to solutions to major global problems, and thus have a long-term competitive advantage. As of 2018, sustainably invested assets in the five main capital markets (Australia, Canada, Europe, Japan, New Zealand and the United States) amounted to USD 30.7 trillion, a considerable increase from USD 13.3 trillion in 2012 (GSIA, 2018; WRI, 2016).

The rate of growth of ESG investing is likely to hinge on the provision of adequate ESG data and disclosures, the availability of investable ESG assets, and the ability of investors and reporting companies to overcome the status quo – that is, traditional investment approaches that focus only on financial risks and returns.

Source: Cambridge Dictionary, 2019; GSIA, 2018; WRI, 2016.

the investment), the required minimum investment, the fee structure, control over underlying assets, and the time and resources needed for the investment. Local regulation and capital market development are important, too. In emerging and developing markets, for example, restrictions on institutional investment often forbid or severely restrict investments in infrastructure assets; where such investments are permitted, few capital market instruments are generally available.

From the investor's point of view, choosing the right mode and vehicle inevitably entails trade-offs. In general, indirect investments in projects or in corporate equity and debt can be done relatively rapidly and with fewer in-house resources compared with direct investments in projects. When such indirect investment is done through an instrument listed on a stock exchange (*e.g.*, a company's common shares, infrastructure fund shares, listed green bonds, etc.), investors also get the benefit of higher liquidity and more frequent pricing. However, indirect investment also provides little control over underlying projects and often results in higher management fees. Direct investments in renewable energy projects demand more time and internal expertise, but also provide investors with more control over the assets and the structuring process (financial and legal), which can lower overall risks and increase return.

Choosing an investment mode entails multiple trade-offs: indirect investments often require less internal effort and offer greater liquidity, while direct investment in projects offers greater control and potentially higher risk-adjusted returns. Regulatory investment restrictions and the limited availability of market instruments also influence investors' thinking on whether to invest and which mode/vehicle to use.

The renewable energy sector benefits from both direct investments into new projects and indirect investments into new or already operating assets through funds, bonds and other instruments. For investors new to renewables, indirect investments into portfolios of operating renewable assets help build confidence and familiarity with new asset classes, paving the way for direct and early-stage investments later on. Available evidence suggests that institutional investors who are new to renewables tend to start with a strong preference for indirect investments via funds or bonds, where such instruments are available on the market. In the European context, for example, more experienced institutional investors have ventured more frequently into direct financing of renewable projects as their confidence and internal capabilities grew. This trend has been noted in

Table 2.2 Primary vehicles for institutional investments in renewable energy and their key attributes

Asset type	Project		Fund		Corporate	
	Equity	Debt	Equity	Debt	Equity	Debt
Securities/ vehicles included	• Unlisted project equity • Public-private partnerships (PPPs)	• Senior term loans • Bridge loans • Project bonds • Mezzanine debt • Securitised project debt	• Renewable energy/ infrastructure funds • Listed renewable energy project fund (yieldco) • Exchange-traded funds (ETFs) • Private equity (PE) • Venture capital (VC)	• Senior term loans • Mezzanine, debt or hybrid debt funds • Asset-backed securities (ABS) • Bonds, including green bonds	• Publicly listed equity • Private placement	• Corporate bonds • ABS • Green bonds • Mezzanine finance • Securitised corporate debt

Asset type	Project		Fund		Corporate	
	Equity	Debt	Equity	Debt	Equity	Debt
Typical investor type	Project developers, commercial financial institutions, public capital, some institutional investors	Banks and other financial institutions, public capital, some institutional investors	Institutional investors, for PE and VC funds; high-net-worth individuals, family offices	Fixed-income investors, including institutional investors	Diversified equity investors (retail and institutional)	Fixed-income investors
Target returns [a]	8-20% (higher in high-risk countries)	3-10% (from senior to mezzanine, higher in high-risk countries)	7-15% (infrastructure/ PE), >20% VC	3-10%	5-15%	3-6% public debt and green bonds; higher for mezzanine
Typical investment period	5-40 years		5-12 years (open-ended funds may be longer)		Variable	
Return volatility	Low-Medium (potentially bond-like cash flows; higher risk for early-stage equity investors)		Low-Medium		Medium-High (for listed equity, in line with equities markets; otherwise lower than for projects)	
Scale / typical investment range	High (USD 50 million – USD 1 billion) (smaller-scale projects are typically not interesting for institutional investors)		Medium-High (USD 10 million – USD 500+ million)		Low-High USD 0 – USD 500 million	
Liquidity	Low (long duration and difficulty in replacing investors)		Limited (investors must match fund duration to preferences)		Variable (ranges from highly liquid stocks to unlisted corporate debt)	
Control	High (ability to control investment structure and ongoing strategy)		Medium-High (wide range of fund mandates; co-investment may increase control)		Limited (investment mandate may shift)	
Fees and other costs	Low-Medium (no external management fees; up-front due diligence; structuring and exit fees; break fees)		High (Management, carry, transaction and other costs)		Variable (generally lower transaction costs and fees; lower corporate overhead/expenses)	
Time and resources required	Can be very high (initial transaction and ongoing management; in-house expertise required)		Low-Medium (Initially, relatively high levels of time and due diligence required; lower for ongoing portfolio management; less in-house expertise needed)		Low-Medium (lower initial due diligence in some cases; may rise to achieve required diversification and track underlying investment activities)	
Overall ease of investment	Low		Medium-High		Medium-High	

Source: Adapted from Ceres (2018); WEF (2016).

a. Target return is not the same as a realised return. This is a general observation only and applicable to "hard currency" returns (i.e., USD, EUR). Individual returns depend on the individual security and the asset's overall risk/return profile.

the European wind sector. Drawn by steady and predictable returns from long-term wind assets, as well as the large transaction sizes of wind projects, institutional investors helped finance nearly half of onshore wind projects and about a quarter of offshore wind projects in 2018, respectively, with a growing demand for wind assets under construction (WindEurope, 2018).

A higher level of financing of already operating assets (*i.e.*, re-financing activities) and the ability to exit assets also help the renewable sector attract more capital. A market in which first-movers having well-developed internal capacities – such as private equity companies, other asset managers or developers – can invest in renewable energy projects directly, build a portfolio of operating renewable assets and then sell that portfolio to longer-term investors – such as institutional investors or utilities with renewables mandates – liberates the resources of the first-movers to invest in new renewable energy assets. Thus, the option of selling assets makes initial financing more likely. In IRENA's roundtable discussion with investors in South-East Asia, for example, asset managers expressed renewed interest in renewable energy projects following the successful USD 5 billion sale in 2018 of Equis Pte. Ltd, Asia's largest independent power producer of renewable energy, with over 180 renewable assets in Asia-Pacific. Buyers included Global Infrastructure Partners (a US infrastructure fund) and other co-investors, including some institutional investors, such as a unit of the China Investment Corporation (Chinese sovereign wealth fund) and Canada's Public Sector Pension Investment Board (CPPIB) (Acuris, 2018; GlobeNewswire, 2019).

All modes of investment benefit renewables: direct investments channel new capital in new renewable projects, indirect investments via funds build investors' capacities making project investments more likely, while the re-financing and "resale" market liberates early-mover's capital for new investments.

Direct vs. indirect investments by institutional investors

Data sources and sample analysed. In the sections that follow, we have relied on secondary data (including a literature review), direct communication with institutional investors and a quantitative sample of 5 820 institutional investors (pension plans, insurance companies, SWFs, endowments and foundations). That sample included the investors' transaction data from the Preqin database[3]. The sample's AUM was around USD 65 trillion, and the transaction data were from 1990 through the second quarter of 2019 (Q2 2019). The sample represents about 77% of the total estimated population (which holds assets of about USD 87 trillion, as shown in Figure 2.1). It also includes a smaller share of pension plans than the estimated population; pension plans make up 36% of AUM in our sample vs. 51% for the total estimated population. Transactions included were investments in renewables either directly via projects (also referred to as "deals") or indirectly via renewable-focused funds (closed-ended funds offering a fixed number of shares during the initial offering period) (Table 2.3).

The split between indirect and direct investments for the sample overall. In the period under study (1990-Q2 2019), **37%** of institutional investors made investments in infrastructure assets, either directly or indirectly; a **quarter** made investments in energy funds; and a **fifth made investments in renewable-focused funds**. The proportion of investors with direct investments in projects is far lower for energy projects generally and renewable energy projects specifically: only about 1% of institutional investors invested directly in energy projects; similarly, **1% of institutional investors invested directly in renewable energy projects**. These findings match the feedback we received from institutional investors. At least for those new to the renewables sector, indirect investments (where available) are typically the preferred way to test the waters and start building internal capacities. As mentioned earlier, indirect investments are also typically easier and quicker to make, and, when done through listed and rated instruments, can offer investors more liquidity and credit assurance.

3 Preqin is a provider of data on alternative assets. A subscription is required to access the database. Our last access for this study was in October 2019.

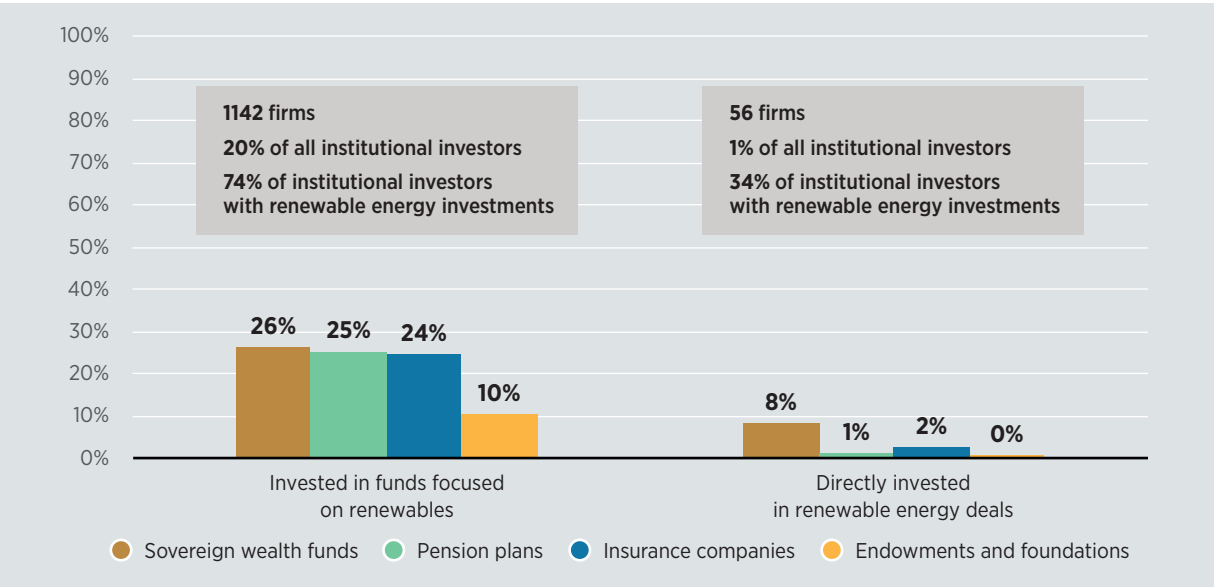
Table 2.3 Institutional investors in the sample, with investments in infrastructure, energy and renewable energy, by investor type

Type of Investor	Number of firms	AUM (USD billion)	Firms with investments in infrastructure	Firms with investments in energy funds	Firms with direct energy investments	Firms with investments in renewable energy funds	Firms with direct renewable investments
Pension plans	2 898	23 630 (36%)	1 169 (40%)	826 (28%)	43 (1%)	725 (25%)	31 (1%)
Insurance companies	711	31 123 (48%)	315 (44%)	183 (26%)	20 (3%)	174 (24%)	17 (2%)
Sovereign wealth funds	84	8 697 (13%)	54 (64%)	24 (29%)	11 (13%)	22 (26%)	7 (8%)
Foundations	1 416	1 112 (2%)	353 (25%)	267 (19%)	0 (0%)	151 (11%)	0 (0%)
Endowments	711	873 (1%)	25 (36%)	140 (20%)	1 (0%)	70 (10%)	1 (0%)
Total	**5 820**	**65 399**	**2 147 (37%)**	**1 440 (25%)**	**75 (1%)**	**1 142 (20%)**	**56 (1%)**

Source: IRENA analysis based on Preqin data (2019).

The split between indirect and direct investments, by investor type. **Institutional investors in the sample are more likely to have made indirect investments in renewable funds, as opposed to direct investments in projects.** In total, 26% of sovereign wealth funds, 25% of pension plans, and 24% of insurance companies had made investments in renewables-focused funds. For direct investments in renewable energy projects, all the figures are extremely low: 8% of SWFs, 2% of insurance companies, and 1% of pension plans (Figure 2.3). Foundations and endowments trail the group with respect to both modes of investment, possibly due to their smaller average size and hence lower internal capacity for investments in renewables.

Figure 2.3 Number of institutional investors with investments in renewables (directly in projects and/or indirectly via renewable energy funds), 1990-Q2 2019, by investor type



Source: IRENA analysis based on Preqin data (2019).

In descending order by investment, pension plans from Canada, Denmark and Brazil have the most known direct investments in renewable projects. They are closely followed by insurance companies from the United States and Canada, and SWFs based in Asia. In indirect investments via renewable funds, pension plans located in the United States, the United Kingdom and Denmark top the charts, followed by insurance companies based in the United States and Canada (Preqin, 2019).

The split between indirect and direct investments: by investor location. Most institutional investors in the sample are located in developed markets, with North America and Europe accounting for 84% of institutional investors (by number of firms). Even though as a portion of the overall sample they are small, institutional investors in developing and emerging markets seem more likely to invest directly in renewable energy projects. Institutional investors in Asia are 7% of the sample as a whole (by number of firms) but 23% of institutional investors who have made direct investments in renewables projects. Africa and South America show the same pattern, though to a smaller extent (Table 2.4). This somewhat counter-intuitive finding is most likely due to the fact that capital market instruments needed for indirect investments (such as renewable energy funds or green bonds, for example) are less available in such markets.

Table 2.4 Institutional investors in the sample, with indirect and direct renewable energy investments, by investor location

Location	Number of firms		No. of firms with investments in energy funds		As a % of inst. investors with investments in renewable energy funds	No. of firms with direct renewable energy investments		As a % of inst. investors with direct renewable energy investments
Africa	75	(1%)	6	(8%)	0%	2	(3%)	3.6%
Asia	393	(7%)	56	(14%)	4.9%	13	(3%)	23.2%
Central America and the Caribbean	10	(0.2%)	0	(0%)	0%	0	(0%)	0%
Eurasia	11	(0.2%)	1	(5%)	0%	0	(0%)	0%
Europe	1608	(27%)	379	(24%)	33.2%	16	(1%)	28.6%
Middle East	58	(1%)	16	(28%)	1.4%	1	(2%)	1.8%
North America	3 307	(57%)	603	(18%)	52.8%	17	(1%)	30.4%
Oceania	171	(3%)	52	(30%)	4.6%	4	(2%)	7.1%
South America	187	(3%)	29	(16%)	2.5%	3	(2%)	5.4%
Total	**5 820**		**1142**	**(20%)**	**99.4%** (rounding error)	**56**	**(1%)**	**100.1%** (rounding error)

Source: IRENA analysis based on Preqin data (2019).

Split between indirect and direct investments, by investor size. Those **institutional investors that hold renewable energy assets tend to be larger than average.** While the average AUM for all institutional investors in the sample analysed was USD 12 billion, this figure swells to USD 30 billion for institutional investors holding renewable energy investments. Furthermore, **institutional investors that hold only direct renewables investments are larger than those that hold only indirect investments** (USD 34 billion in AUM vs. USD 24 billion). Finally, the 43 institutional investors that hold both direct and indirect investments in renewables are significantly larger than those that have invested only directly or indirectly, with average AUM about five times higher (USD 166 billion) (Figure 2.4).

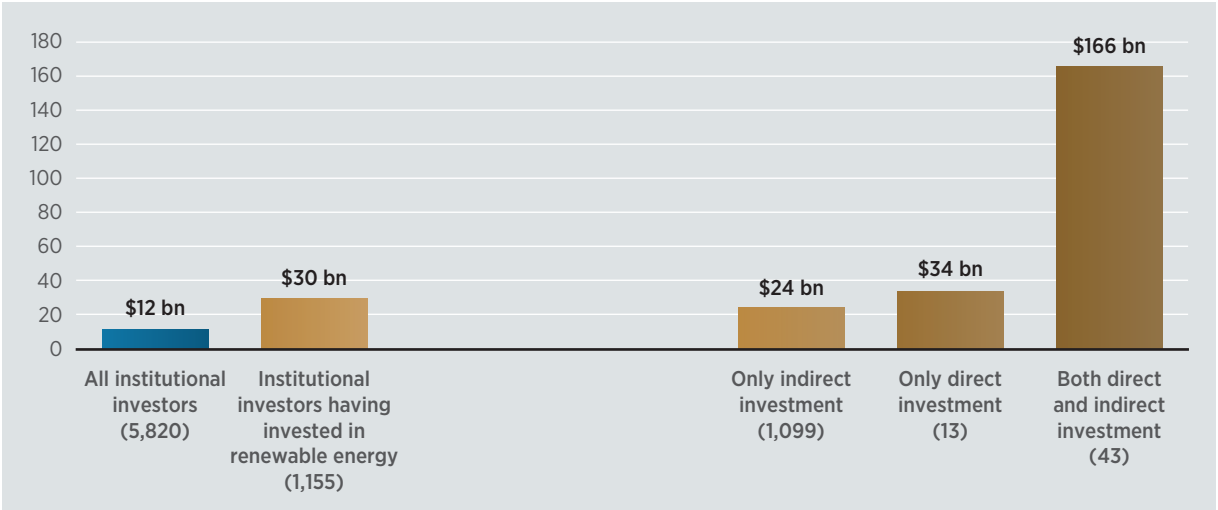
It is difficult to establish a statistical correlation between investor size and the likelihood of holding renewable assets, as larger investors are more likely to hold any given asset. However, from our interactions with market participants, it seems clear that larger investors do have an edge over smaller ones by having greater financial and human resources at their disposal to develop the capacities needed to invest in renewables. Developing such internal capacities is particularly important when it comes to direct investments in projects. Smaller institutions often rely almost exclusively on third-party asset managers for indirect investments, if they make such investments at all.

Findings suggest that institutional investors are more likely to be involved in larger renewable energy transactions. The average deal size increases from USD 199 million to USD 434 million when institutional investors are involved. Our discussions with institutional investors also support a hypothesis that the larger the transaction's "ticket size", the more likely it is to attract institutional investors. This is especially true for exceptionally large investors like SWFs, for example, or larger-than-average pension plans, insurance companies and endowments, which seek to minimise per-unit transaction costs by engaging in larger trades.

Institutional investors are more likely to invest in renewables indirectly through funds than to make direct investments in projects: 20% of investors in the sample had made at least one indirect investment, compared with only 1% that had invested directly in renewable projects. Larger investors are more likely to develop internal capacities and invest in renewables.

The inverse relationship also holds: larger transactions are more likely to attract institutional investors.

Figure 2.4 Average AUM of institutional investors in the sample, by renewable investment mode, USD billion



Source: IRENA analysis based on Preqin data (2019).

Direct investment in projects

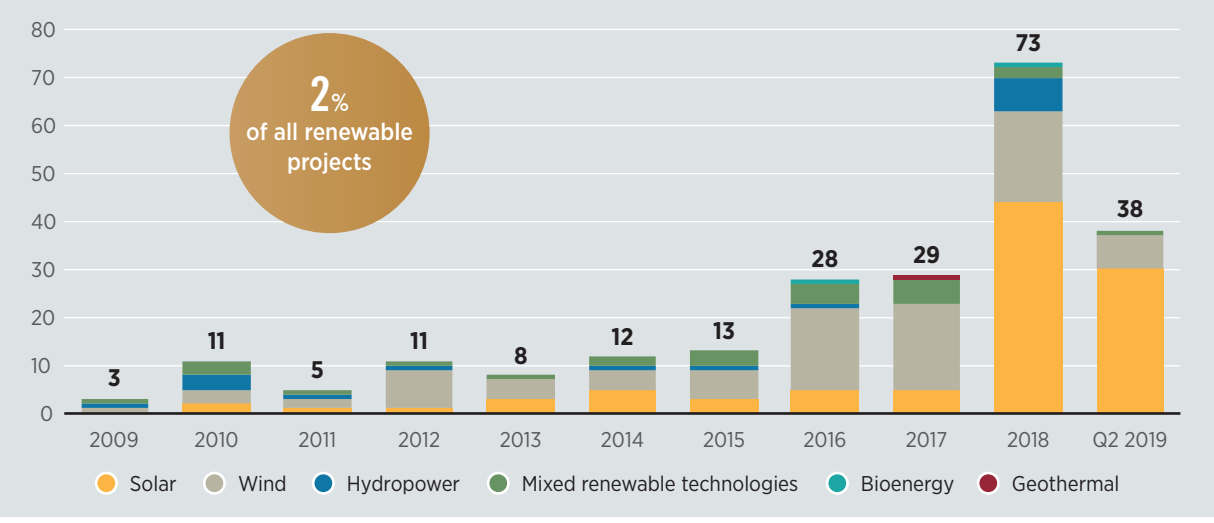
Institutional investors invested nearly USD 6 billion in renewable energy projects in each of 2017 and 2018[4] (CPI, 2019). This marks an increase from about USD 2 billion invested in each of 2015 and 2016, though it is still only about **2% of total renewable project investments,** which in 2018 amounted to USD 296 billion (Frankfurt School–UNEP Centre/BNEF, 2020; CPI, 2019; IRENA and CPI, 2018).

Direct investments over time. In the sample analysed, institutional investors were involved in 231 direct transactions involving renewable energy in the 2009-Q2 2019 period. There has been **an increase over time** from as few as three recorded transactions involving institutional investors in 2009 to 73 in 2018 and 38 for the first two quarters of 2019 (Figure 2.5). On a cumulative basis, however, this represents only **2% of all renewable energy projects in the dataset** analysed.

Breakdown by technology. **About 81% of all renewable energy deals in which institutional investors took part in the 2009-Q2 2019 period involved wind and solar** technologies, reflecting the global technological trend in the renewable sector as a whole. In the first half of 2019, these two technologies made up 97% of the total. During the period, the share of hydropower deals has dropped steadily. Since 2015, institutional investors have shown interest in other technologies such as bioenergy and geothermal (Figure 2.6).

Of all renewable technologies, institutional investors have favoured wind most strongly. For the 2009-2019 period, global investments in solar projects represented about half of all renewable energy investments, followed by wind at 39% (Frankfurt School-UNEP Centre/BNEF, 2020). But considering only institutional investments in renewable projects, wind accounted for 45% of transactions over the same period, and solar for 24%. This is likely due to the fact that wind is a more established renewable technology offering the large transaction sizes that tend to appeal to institutional investors. In our sample, the average transaction size for a wind project was USD 211 million, compared with solar's USD 124 million (Preqin, 2019).

Figure 2.5 Number of renewable energy project transactions involving institutional investors, by technology, 2009-Q2 2019

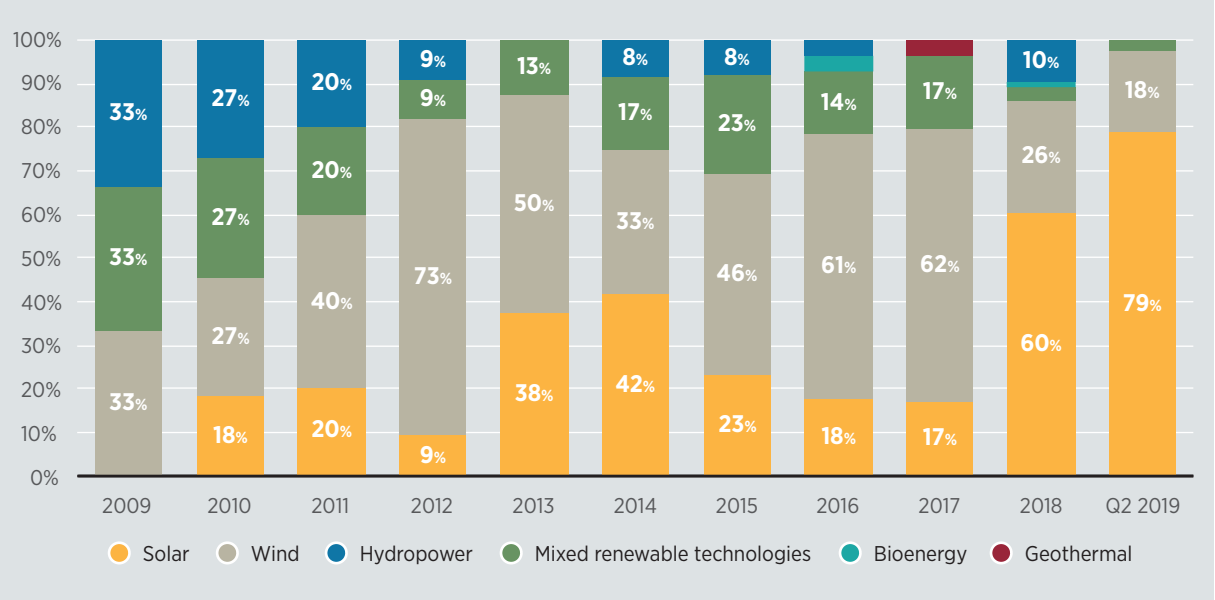


Source: IRENA analysis based on Preqin data (2019).

Note: "Mixed renewable technologies" include more than one type of renewable energy technology.

4 Based on CPI (2019) data, institutional investors have invested an average of USD 9 billion in project-level climate finance flows in each of 2017 and 2018, of which "nearly two-thirds" went to renewable energy (i.e., nearly USD 6 billion). CPI's definition of institutional investors, however, is different from the definition used in this report, and includes pension plans, insurance companies and asset managers.

Figure 2.6 Share of new renewable energy transactions involving institutional investors, by technology, 2009-Q2 2019



Source: IRENA analysis based on Preqin data (2019).
Note: "Mixed renewable technologies" include more than one type of renewable energy technology.

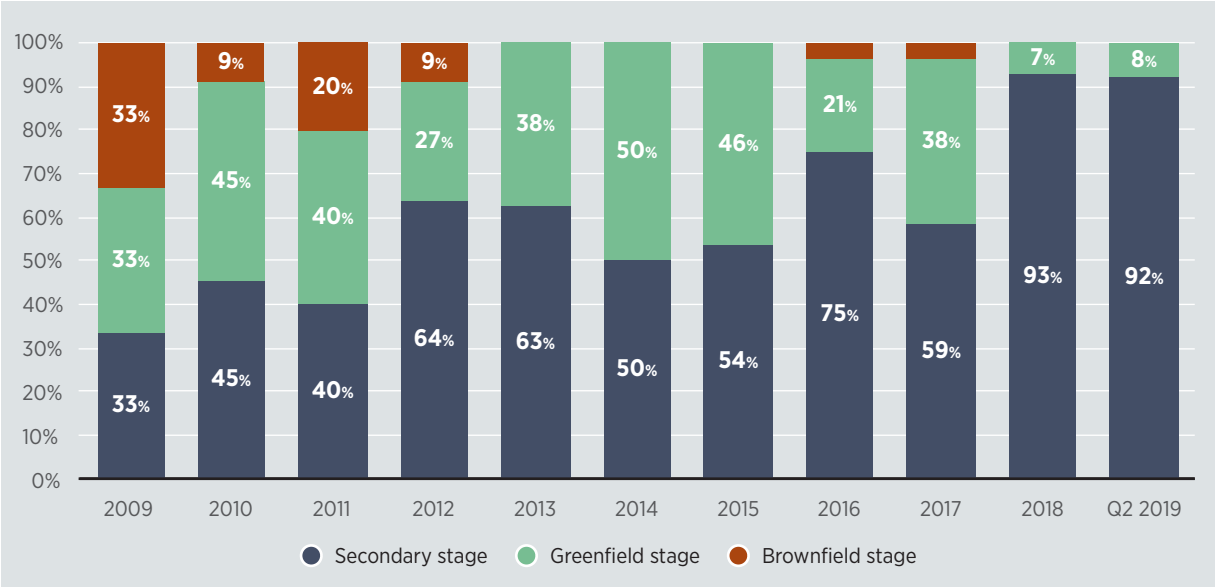
Breakdown by investment stage. Direct investments in renewable energy projects can be made in any of three stages. The "greenfield stage" refers to an asset or a structure that does not yet exist and which needs to be designed, constructed and maintained. The "secondary stage" involves an already operating asset or a structure that requires no further development. The "brownfield stage" refers to an already operating asset or structure which may be already generating income but which requires further improvement, repairs or expansion (Preqin, 2019).

Over 75% of all renewable energy deals involving institutional investors during the 2009-Q2 2019 period were secondary-stage transactions, while about 22% were for the construction of new assets (*i.e.*, greenfield stage) (Figure 2.7). Over time, the predominance of secondary-stage transactions has grown, accounting for 92% of all deals involving institutional investors in the first half of 2019. This finding may be partially due to the growing number of already operating assets on the market compared with earlier years.

Our finding also matches feedback from many institutional investors, especially those who are new to renewables, that they have a strong preference for already operating assets, which allow them to avoid the early-stage risks associated with the greenfield stage (*e.g.*, construction, structuring risks).

Although they have grown over time, direct investments by institutional investors into renewable energy projects still amount to just 2% of total direct renewable investments over the past decade. Institutional investors have shown a preference for wind, followed by solar PV, most likely due to wind projects' larger transaction sizes. They have also preferred already operating projects in order to avoid early-stage risks.

Figure 2.7 Share of new renewable energy transactions involving institutional investors, by project stage, 2009-Q2 2019



Source: IRENA analysis based on Preqin data (2019).
Note: bars may not add up to 100% due to rounding errors.

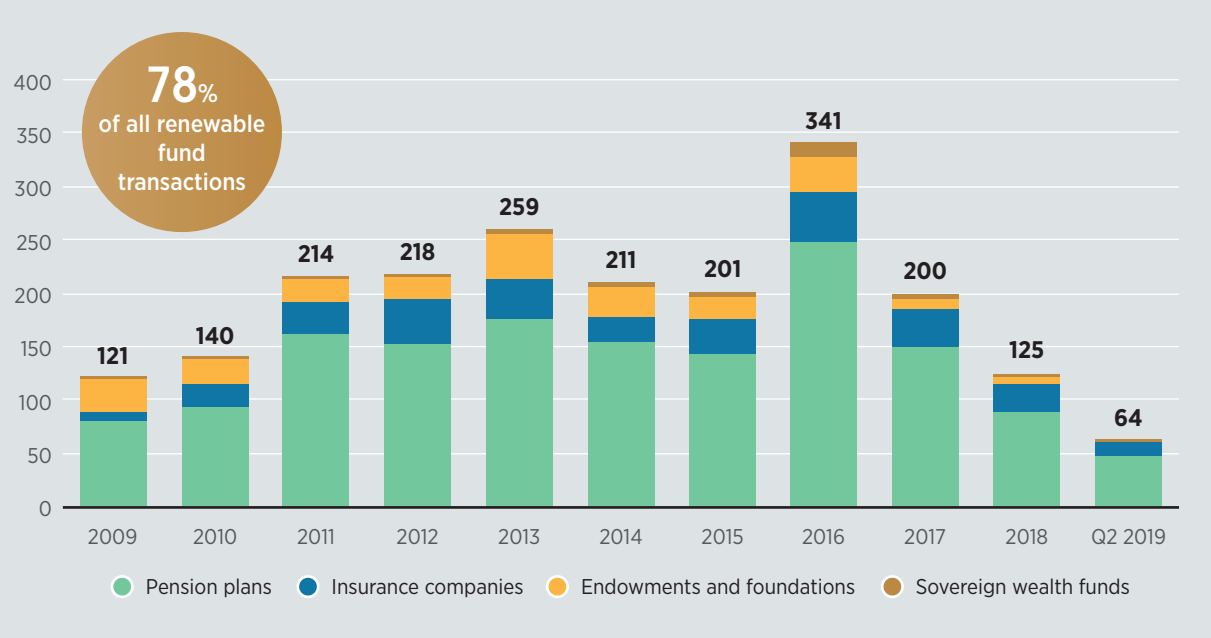
Indirect investments through renewable-focused funds

In the decade from 2009 until the end of 2018, institutional investors made about 2 030 investments in renewable energy-focused funds, with an additional 64 investments in the first half of 2019. Although no information is available on the amounts invested, or whether investments financed new vs. already operating renewable assets, the number of fund investments grew fairly steadily between 2009 and 2016, before declining gradually in 2017 and 2018. This drop is most likely due to deteriorating market conditions in the later period, which is also reflected in the overall drop in the supply of renewable-focused funds on the market.

Institutional investors accounted for 75% to 85% of new investment in renewable-focused funds each year in the 2009-Q2 2019 period, with an average of 78% (Figure 2.8). During the period, about 30 new renewable-focused funds were formed each year, raising about USD 7.4 billion in capital annually (Preqin, 2019). If we can assume that institutional investments in US dollar terms were comparable to their investments as a percentage of new investment transactions, then institutional investment in renewable funds can be roughly estimated at about USD 6 billion per year (*i.e.*, 78% of USD 7.4 billion).

Breakdown by investor type. **Pension funds accounted for the majority of new investments in renewable energy funds each year**, with shares between 66% and 76%. This may be partly due to the fact that pension plans are a majority of the firms (by number) in the sample (49%), and partly to pension plan investment restrictions, which sometimes forbid or strictly limit investments that can be made directly in projects, leaving indirect investments as investors' only option.

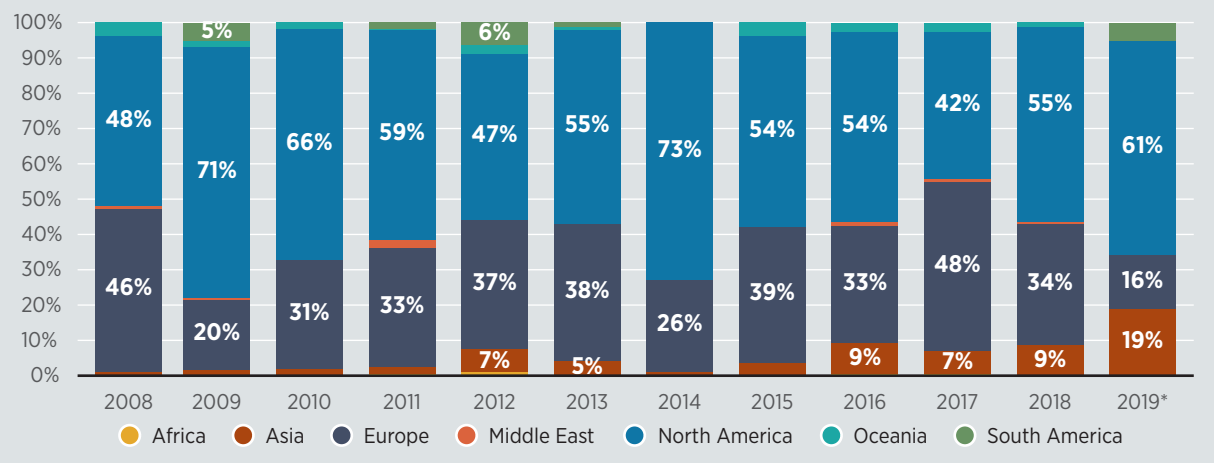
Figure 2.8 Number of new investments in renewable energy funds, by investor type, 2009-Q2 2019



Source: IRENA analysis based on Preqin data (2019).

Breakdown by investor location. **Institutional investors from North America and Europe accounted for most of the institutional investment in renewable funds** (Figure 2.9). As noted earlier, such investors also represent the majority (84%) of the sample by number of firms. In recent years, Asian investors have started to play a more significant role, having invested in 7-9% of renewable energy funds in each 2017 and 2016. This may be due to the growing availability of renewable-focused funds in this region, coupled with stronger demand from Asian investors for renewable assets.

Figure 2.9 Share of new investments in renewable energy funds, by investor location, 2009-Q2 2019



Source: IRENA analysis based on Preqin data (2019).

Institutional investments in renewable projects – directly and through renewable-focused funds – total about USD 12 billion annually (for the sample analysed). If we estimate that 1% of the USD 87 trillion in total institutional assets of the investor types analysed in this report should be available each year for new investments, then actual renewable investments via the two modes analysed here represent only about 1% of the theoretically available annual amount.

As outlined earlier (Table 2.2), there are other vehicles for investment in renewable energy besides direct investments in projects and investments through renewable-focused funds. These include other types of funds (*e.g.*, general energy or infrastructure funds, private equity, venture capital), as well as corporate investments (*e.g.*, common shares, corporate bonds, green bonds), to name a few. Of these instruments, **green bonds are a potentially important vehicle used by institutional investors to fund renewable assets.** IRENA's analysis of over 4 300 green bonds issued since 2007 indicates that half included renewable energy among their use-of-proceeds categories (along with clean transportation, energy efficiency and other categories), while 16% were issued for renewable energy exclusively (IRENA, forthcoming). In 2019, green bonds dedicated to renewables attracted about USD 38 billion of investment (Environmental Finance Bond Database, 2020). Data on what portion of such capital was contributed by institutional investors specifically was, however, not available.

Among other investment modes for renewables are common share issuances via initial public offerings (IPOs) which amounted to USD 6 billion in 2018 for renewable energy, while venture capital and private equity together attracted another USD 2 billion in renewable capital in 2018 (Frankfurt School-UNEP Centre/BNEF, 2020). For these modes, as well, data on what portion of such capital was contributed by institutional investors specifically was not available.

Institutional investment in renewable-focused funds has accounted for 75%-85% of total new investment in renewable-focused funds over the past decade, with an average of 78%. This is estimated to translate to an annual amount of about USD 6 billion flowing through such funds into new or already operating renewable assets.

2.3. Why raise institutional capital for renewables?

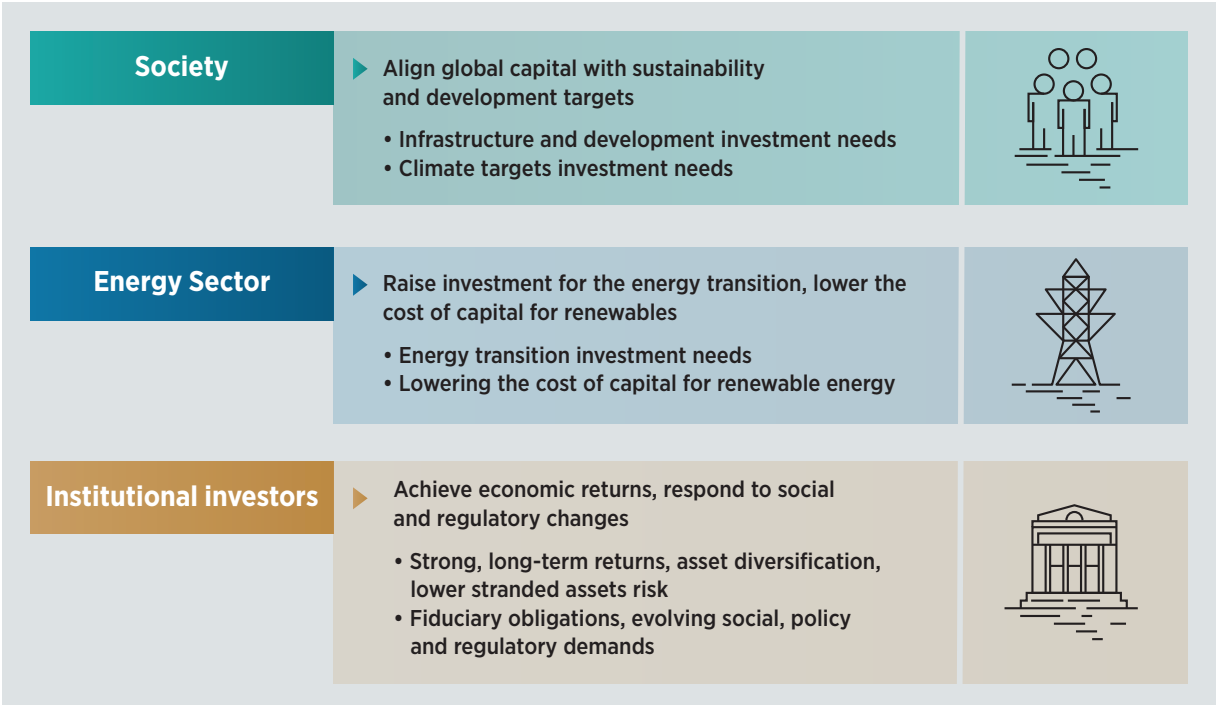
Because of the sheer size of their balance sheets, institutional investors clearly have a fundamental role to play in allocating global capital to sustainable economic sectors. As we have seen, this potential is largely unrealised when it comes to renewables. Activating the institutional capital pool in emerging and developing markets is particularly important for the purpose of financing the growing demand for green power and infrastructure to fuel sustainable economic development. Greater institutional investments in renewable energy can create a positive feedback loop by increasing the low-cost capital invested in the sector. This would reduce financing costs for the sector as a whole, thus helping to attract other sources of capital.

For institutional investors, rising investment in renewables offers appealing opportunities while promising to lower the risks presented by certain growing threats. Several studies have shown that the main drivers of investment in renewable energy by institutional investors are economic – stable long-term cash flows and portfolio diversification – with sustainability and ethical standards ranking low on their agenda (Aquila Capital, 2019; Schroders, 2019). However, the growing social and regulatory scrutiny of institutional investors' actions is likely to affect their priorities. Similarly, the likelihood of financial losses from unmitigated exposure to climate change looms large, while the investment case for renewable energy is already strong and becoming more so each year, as costs fall, technologies are perfected, and sector stakeholders gain experience.

Institutional capital is needed to meet climate targets and green infrastructure needs

An energy transition that meets global climate targets set out in the 2015 Paris Agreement requires a massive reallocation of capital toward renewables, energy efficiency, electrification and the associated energy infrastructure. Because the amount required is USD 15 trillion more than the levels set out in current and planned policies (IRENA, 2020c), the institutional capital pool is simply too large and too important to remain on the sidelines of the energy transformation.

Figure 2.10 Drivers of mobilisation of institutional capital in renewables



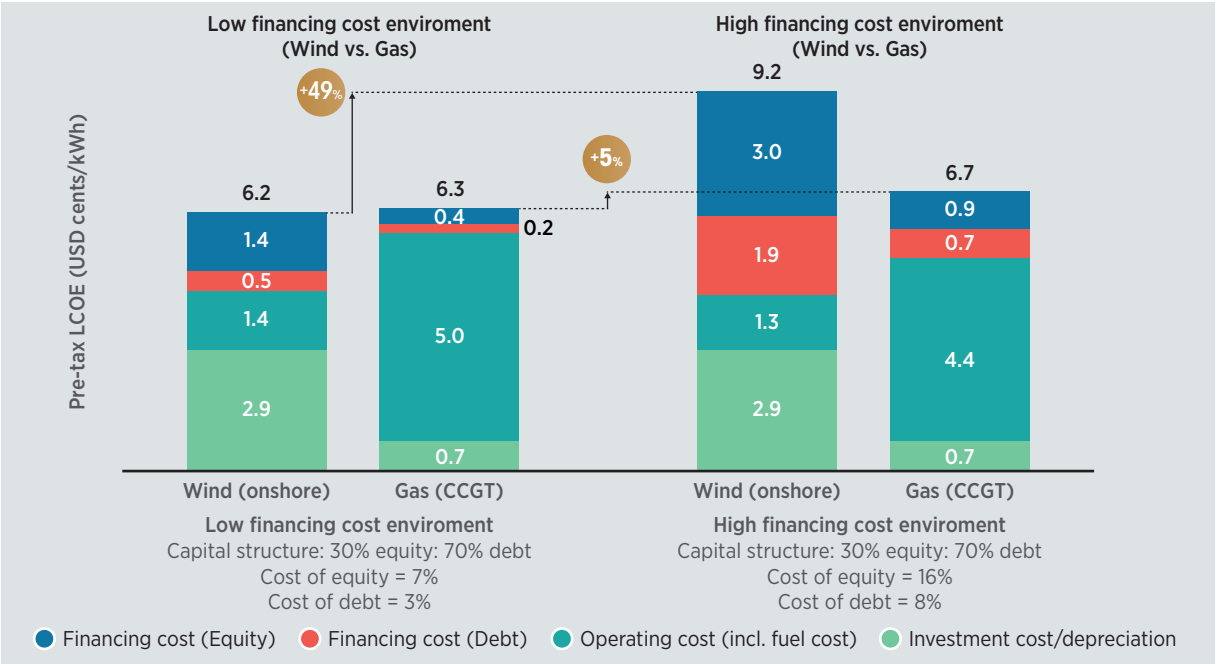
Source: IRENA analysis.

Beyond their obvious contribution to the fight against climate change (through provision of clean and sustainable energy), renewables also help sustainable economic development through the buildout of new green infrastructure. The need for additional infrastructure investment is particularly acute in developing and emerging markets because of past underinvestment, growing populations and economies, and the rise of the middle class. The African Development Bank estimates that Africa's annual infrastructure needs are in the range of USD 130-170 billion, with a financing gap of USD 68-108 billion per year (AfDB, 2018). At the same time, the assets of institutional investors in emerging and developing markets are increasing at a rapid rate. Pension plans and insurance companies in Africa, Asia-Pacific and Latin America have experienced double-digit growth rates not seen in the more developed markets. Aside from Botswana's Pula Fund, all African sovereign wealth funds have been created in the past 20 years (African Business Magazine, 2018a). Local institutional capital is well placed and also sorely needed to bridge the green infrastructure funding gap and to support local long-term sustainable economic development.

Institutional capital is needed to lower the cost of capital for renewable energy

By injecting more cash into the renewable sector, long-term and relatively "patient" institutional capital can also help lower the sector's cost of financing, making sustainable energy more affordable. Given the up-front nature of renewable energy investments compared with conventional energy sources, lowering the cost of financing is key to the broader deployment of renewables. Again, this is especially important in developing and emerging markets, where real or perceived risks can prevent projects from being undertaken and inflate the financing costs of those that are undertaken, resulting in high power prices for consumers. The United Nations Development Programme (UNDP, 2017) has estimated that higher financing costs in developing markets increase the life-cycle cost of wind energy by about 50% over the cost in developed markets (Figure 2.11). By providing long-term and lower-cost capital to renewable energy projects, institutional investors can create a positive feedback loop, helping to reduce the overall cost of renewable energy and thereby attracting other investors.

Figure 2.11 Comparison of the levelised cost of utility-scale wind and gas in environments of high and low financing costs



Source: UNDP, 2017.

Note: CCGT = combined cycle gas turbine; kWh = kilowatt-hour; LCOE = levelised cost of electricity.

Renewables can help institutional investors access strong, bond-like returns matching their liabilities

Although returns vary depending on the chosen investment vehicle and its risks, cash flows from renewable energy projects typically last 20-30 years, with an average life span of about 25 years. Thanks to low volatility of input costs, low and stable operating expenses, and revenues usually supported by long-term power purchase agreements, cash flows from renewable projects are relatively stable and predictable compared with conventional power, owing to the volatility in the price of fossil fuels. This makes renewables' cash flows similar to the payouts from fixed-income investments such as bonds. As such, they match the long-term investment horizons and liabilities of most institutional investors, such as defined benefit pension plans, life insurance companies, some SWFs, and foundations and endowments.

Data on the internal rates of return (IRRs) of various projects are not easily found, as investors rarely disclose such information. But secondary data suggest that the IRR for renewable energy projects is about 8-9%, with an initial dividend yield of about 6% and positive real dividend growth (IEEFA, 2017; Edwardson, 2019; Tweed, 2016). Returns depend on many factors, such as 1) how the investment is made (via equity, debt, direct project investment, fund investments, etc.); 2) risks linked to the location and size of the project (political, economic, currency, regulatory); 3) the cost of capital; 4) the quality of legal documentation; and 5) the credibility of the offtaker and project size. Projects in emerging and developing markets usually bring higher returns than projects in developed markets owing to their higher risks and lower competition. Based on data from the Mercatus' platform of more than 80 GW of renewable energy projects, the average return (expressed as unleveraged IRR) on solar projects was 10.4% in the Middle East, 10.3% in Africa, 9.3% in South America and 8.4% in Asia. In North America and Europe, by contrast, the average IRR was 8.2% and 4%, respectively, in 2016 (Tweed, 2016). Projects in developing and emerging markets also have tended to be larger than projects in developed markets, with average sizes of 64 MW in South America, 45 MW in Africa, 34 MW in the Middle East and 22 MW in Asia. In North America and Europe, meanwhile, average nominal capacity was 11 MW and 3 MW, respectively (Tweed, 2016). Provided that risks are efficiently mitigated, such larger projects can be attractive to institutional investors, who favour larger transaction sizes that lower their per-unit transaction costs.

Renewables help institutional investors decrease losses due to climate change

Climate change risks are becoming ever more real and affecting investors' portfolios. As the negative effects of climate change increase and the energy transition gathers speed, fossil fuel-related assets are expected to lose value and increasingly become stranded assets. While the estimates of the value at risk vary widely, the figures are alarming. IRENA (2020c) estimated stranded assets to total between USD 11.8 trillion and USD 19.5 trillion by 2050, depending on the speed of the global energy transition. The "delayed action" case, based on current policies, could increase the value at risk of stranding by USD 7.7 trillion. The Economist Intelligence Unit estimated the value at risk to be between USD 4.2 trillion in the best case (early action) and USD 43 trillion in the worst case (delayed action) (EIU, 2015). In 2018, 215 of the world's 500 biggest corporations estimated that the bulk of the approximately USD 1 trillion in financial risks from climate change and the energy transition could begin to materialise in the next five years or so (Plumer, 2019).

The economic sectors impacted by the energy transition are not limited to coal, oil and gas. They also include capital goods (*e.g.*, gas turbines), transportation infrastructure (*e.g.*, coal ports), the automotive sector, banking and stocks in "petro states", among others (CTI, 2018). Mercer (2019) estimated the impact per sector depending on the temperature increase by 2030 and 2050 (2°C, 3°C or ≥4°C) and found that although returns to asset classes vary significantly by scenario and sector, a temperature increase of no more than 2°C would bring better projected returns for the global economy. Under such a scenario,

significant losses are estimated for coal, oil, gas and electric utilities, while renewable energy and sustainability-themed investments gain the most (Mercer, 2019). Developing climate resilience in their investment portfolios is therefore important for institutional investors seeking to protect their assets and meet their long-term liability obligations. The task of building resilience should start sooner rather than later.

A significant carbon exposure is embedded in institutional portfolios owing to a combination of factors, including available investment instruments, investment regulations and organisational preferences. Expanding investments in renewable energy is likely to help these institutions rebalance their current exposure to fossil fuels and lower the risk of being left with stranded assets.

Renewable investments can help institutional investors meet evolving fiduciary obligations

There has been some debate on the question of whether taking climate change and ESG considerations into account when making investment decisions complements or conflicts with institutional investors' fiduciary duty (see Box 2.2). That the debate has not been resolved can be traced largely to the absence of regulation of non-traditional financial risks such as those related to the climate change, environmental, governance and social consequences. However, a consensus is slowly emerging that consideration of ESG aspects complements the fiduciary duty of institutional investors, which further strengthens the argument for sustainable investments and for reducing activity in polluting sectors.

In 2017, the OECD set out to evaluate the regulatory frameworks that apply to pension funds, insurance companies and asset managers in various jurisdictions. It found that those frameworks do permit ESG factors to be taken into account, although they rarely make explicit reference to such factors. This is beginning to change, however, as **the regulation of institutional investment is increasingly focusing on governance, risk-based controls and prudential standards**, and moving away from quantitative constraints (OECD, 2017). The OECD further found that pension funds and insurance companies are subject to similar investment standards in all jurisdictions, which consist of investing prudently, acting in the best interest of beneficiaries, taking a long-term view, avoiding conflicts of interest and diversifying their portfolio (OECD, 2017).

Box 2.2 Fiduciary duty

The English word "fiduciary" originates from Latin word "fiducia", meaning "trust" and "confidence". Fiduciary duty is imposed upon a person or an organisation (the "agent") who exercises discretionary power in the interest of another person or entity (the "beneficiary"), within a relationship that is built on trust and confidence. Such a relationship is often asymmetrical, in the sense that the beneficiary has limited ability to oversee the agent's actions and avoid harm in a timely manner. The agent is therefore bound by fiduciary duty to act in the best interest of the beneficiary, guided by standards of loyalty and prudence.

The precise meaning of fiduciary duty, the breadth and types of obligations that it imposes upon the agent, where those obligations are set out, and how they are enforced have varied over time and from one legal system to another. Hence, a single global definition of fiduciary duty does not exist. Moreover, fiduciary norms are constantly evolving in response to social and economic changes. But common fiduciary duties in most jurisdictions address:

- Fidelity to beneficiaries and impartiality with respect to their different interests (*e.g.*, across generations)
- Prudence and care in managing investments, diversification and risks
- Control of costs and management of conflicts of interest
- Transparency and accountability
- Compliance with applicable laws and operating documents.

Source: IISD, 2014; UNPRI, 2015.

Renewable energy can help institutional investors lower regulatory and litigation risks related to climate change

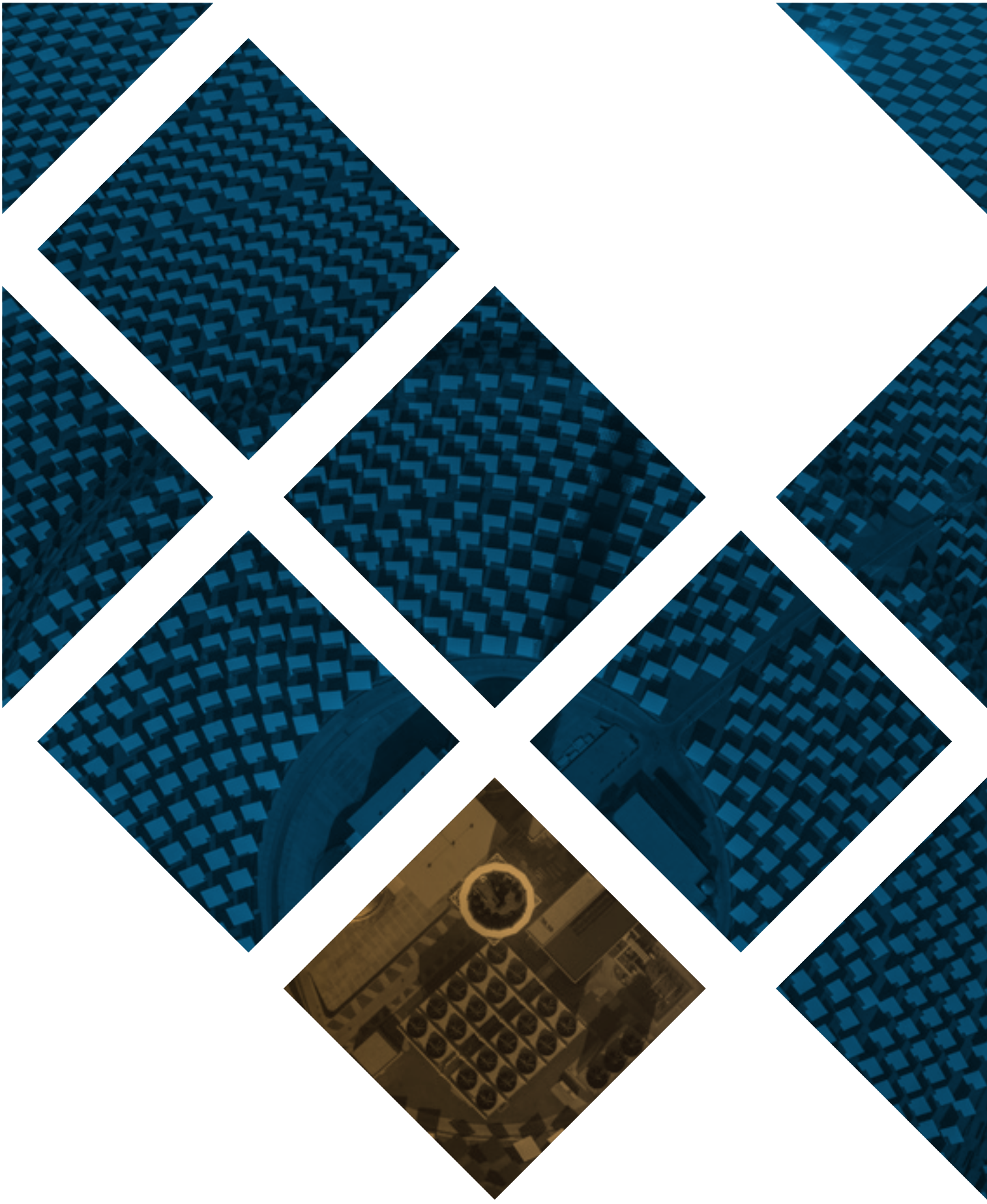
Regulations governing institutional investors are starting to mention or even require disclosure of risks related to ESG factors and climate change. Regulators in the European Union, the United Kingdom, the United States and South Africa, for example, have taken steps to clarify that regulations do not prohibit including ESG aspects in investment decisions, as long as doing so does not jeopardise returns (OECD, 2017). In Canada, the province of Ontario requires pensions to disclose how ESG factors are considered in investment decisions, while insurance regulations in the US state of the California now require disclosure of fossil-fuel investments (Mercer, 2019). New regulatory steps can be seen in emerging markets, as well. China's securities regulator requires all listed firms to disclose environmental impact information by the end of 2020 (Mercer, 2019).

France passed a pioneering regulation in fall 2015. Article 173 of the Energy Transition Law requires French institutional investors (insurance companies, pension funds and SWFs), as well as asset managers and banks, to disclose their greenhouse gas emissions, and to explain how climate change and policy risks related to the implementation of climate targets will affect their assets (Mazzacurati, 2017a). Mirroring the French law, a European Union (EU) Directive on Institutions for Occupational Retirement Provision 2016/2341 ("IORP II"), approved in December 2016, requires 14 358 registered EU pension funds to include risks related to climate change, resource use and the environment in their overall risk assessments (Mazzacurati, 2017b).

Pressure to divest from fossil-fuel assets is increasing for institutional investors too. In a ground-breaking move, Ireland's parliament passed the Fossil Fuel Divestment Bill in July 2018, requiring its public pension fund, Ireland Strategic Investment Fund, to divest itself of its EUR 8.9 billion investments in oil, gas and coal within five years and not to make future investment in the fossil fuel industry (Chestney, 2018). Norway's USD 1.1 trillion SWF will over time divest from all crude oil producers (Holter, 2019). For the USD 210 billion State of New York pension plan, the New York State Common Retirement Fund, a Decarbonization Advisory Panel has recommended that the fund's investments are better aligned with the goals of the Paris Agreement, though it stopped short of calling for fossil fuel divestment (IEEFA, 2019). Early movers who shift assets to sustainable sectors can get ahead of such regulatory actions by taking a pro-active approach.

Lawsuits related to climate change risks are on the rise. By the end of March 2019, the number of cases had reached 1308, most of them filed in Australia, Canada, the European Union, New Zealand, the United Kingdom and the United States (de Wit *et al.*, 2019). To date, the main targets have been companies seen as contributing the most to climate change, namely fossil fuel companies and associated entities, but institutions that fail to disclose climate-related financial risks and the effects of those risks on underlying investors or beneficiaries also face a risk of litigation (de Wit *et al.*, 2019). A case in point is the lawsuit initiated in 2018 by 23-year-old Mark McVeigh against Australia's USD 50 billion pension fund, Retail Employees Superannuation, for failure to sufficiently disclose risks related to investments that contribute to climate change which may erode the fund's ability to meet its obligations to future generations (Slezak, 2018).

Larger institutional investments in renewables can help steer the world toward the path set out in climate targets, fuel sustainable economic growth and help lower the financing costs of renewables, thereby broadening their deployment. Renewables can provide institutional investors with stable long-term returns that match their liabilities and minimise their climate-related losses. Investors aligned with a climate-safe future will also be better equipped to anticipate new regulatory demands, evolving fiduciary standards and growing social sentiment.



ACTIONS TO MOBILISE INSTITUTIONAL CAPITAL

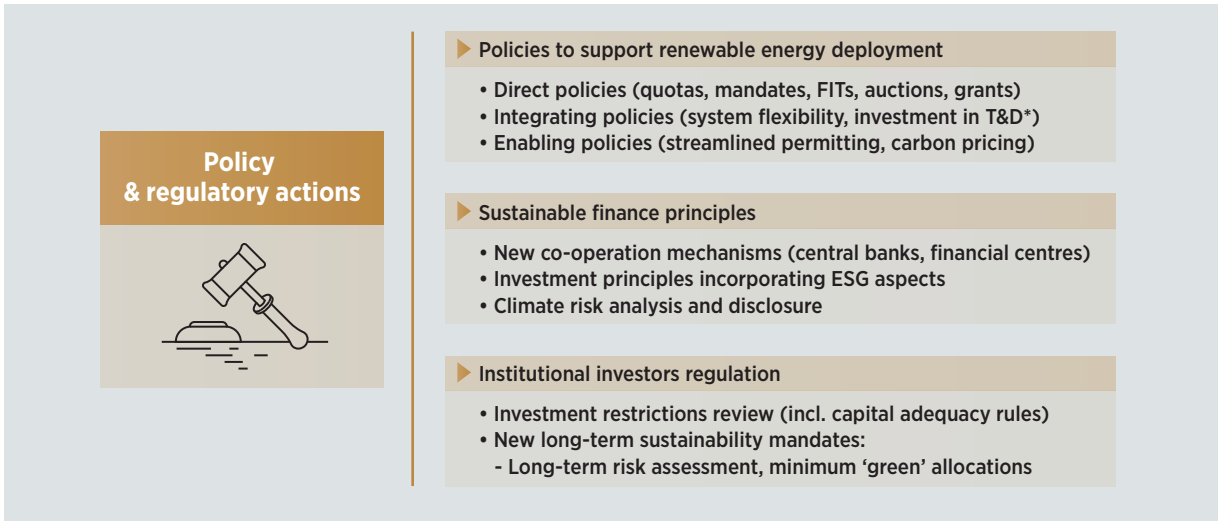
03

Scaling up institutional investment in renewable energy requires a comprehensive effort on multiple fronts. Renewable assets generate significant social and economic benefits, and lower the risks of climate change and adverse regulatory actions. But they also come with their own risks that need to be mitigated. Meanwhile, many institutional investors operate within regulatory frameworks and capital markets that are not conducive to renewable investment. Some institutional investors lack internal capacities required for increased renewable investments. This section discusses the main obstacles to institutional investments in renewables and provides actionable recommendations for how policy makers, public and private providers of capital, institutional investors and other sector stakeholders can overcome them.

3.1 Building supportive policy and regulatory frameworks

An enabling policy framework is a fundamental pre-condition for increased investments. To set the stage for greater investment in renewable assets, policy makers and regulators would do well to tackle macroeconomic and regulatory barriers to such investment (Figure 3.1). As they further develop renewable energy policies, it would also be helpful to review existing institutional investor regulations, and consider how these are affecting investment. Sustainable finance initiatives offer a powerful way to align capital flows with sustainability goals through the adoption of new investment principles, co-operation initiatives and climate risk disclosure requirements.

Figure 3.1 Policy and regulatory actions to mobilise institutional capital



Source: IRENA analysis.

*Note: *T&D refers to energy transmission and distribution networks. ESG = environmental, social and governance; FIT = feed-in tariff.*

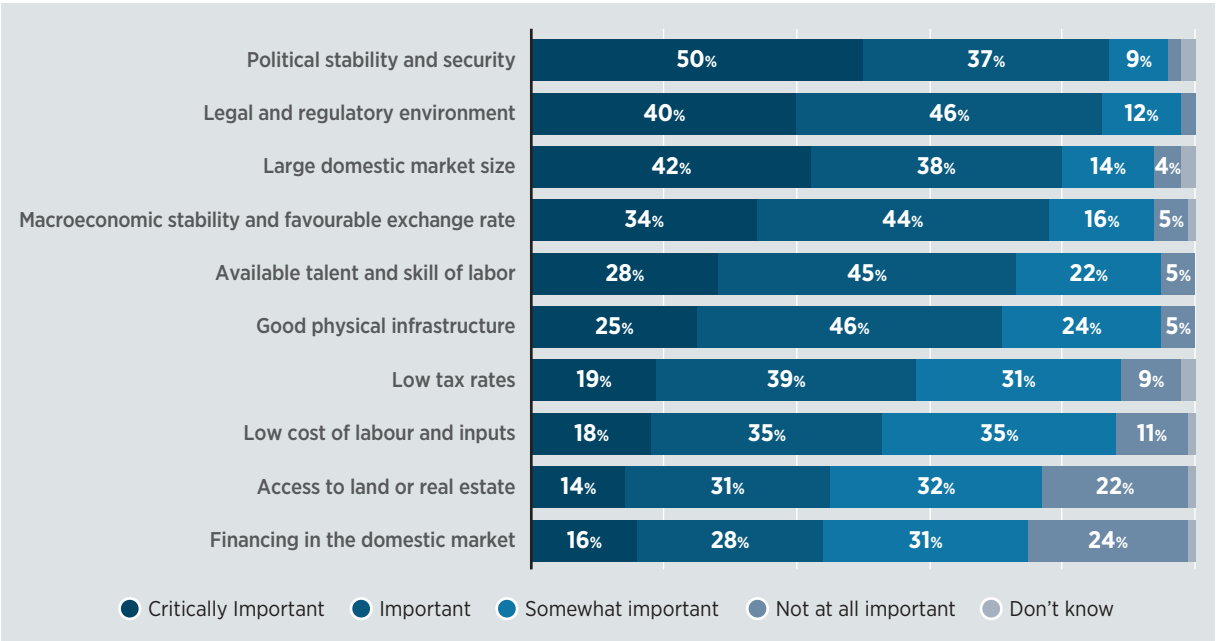
Policies to support renewable energy deployment

Domestic and foreign investors consider a wide range of factors when investing in a particular sector in a given country or region. As can be seen in Figure 3.2, political stability and security, together with the legal and regulatory environment are often listed as most important to investors (World Bank, 2018a). Unclear or unstable regulations and economic or political uncertainty in target markets were also named as crucial barriers by institutional investors interviewed by IRENA. In developing and emerging markets, infrastructure capacity constraints, noncreditworthy utilities and the absence of cost-reflective tariffs are also cited as major impediments to renewable investments.

Policy makers and regulators have a critical role to play in lowering such real or perceived barriers, by putting in place comprehensive, supportive and clear policies that attract investors to the renewable energy sector, speed up the energy transition and ensure that the benefits of this transition are widely shared across society. Policies in support of the energy transition can be grouped in the following three broad categories (Table 3.1):

- **Direct policies and instruments:** used to support the development and deployment of renewable energy via "push" policies such as renewable energy quotas and mandates, "pull" policies which include feed-in tariffs, auctions and net billing, and fiscal and financial policies such as tax incentives, grants and subsidies;
- **Integrating policies:** incorporate renewables used in the heating and cooling, transport and power sectors into the larger energy and economic system (*e.g.*, by improving transmission and distribution networks, building electric vehicle charging stations, enhancing system flexibility);
- **Enabling policies:** contribute to a wider environment for renewable energy development and include policies that level the playing field for renewables (*e.g.*, fossil fuel subsidy reform, carbon pricing), manage land use, ensure reliability of technology (*e.g.*, quality and technical standards), build supportive governance and institutional architecture (*e.g.*, streamlined permitting, dedicated institutions for renewables), and incorporate energy transition in industrial, trade and social protection policies to address possible disruptions due to the energy transitions (IRENA, IEA, REN21, 2018).

Figure 3.2 Factors affecting investment decisions, share of respondents (percent)



Source: World Bank, 2018a.
Note: From responses to a World Bank survey of over 750 business executives on factors affecting their investment decisions.

Table 3.1 Policies that support the energy transition

Policies to achieve the energy transition		Deployment (installation and generation) of renewables in the general context	Deployment (installation and generation) of renewables in the access context (including energy services)	Maximisation of socio-economic development from renewable energy deployment
Direct policies	Push	■ Binding targets for use of renewable energy ■ Electricity quotas and obligations ■ Building codes ■ Mandates (*e.g.*, solar water heaters, renewables in district heating) ■ Blending mandates	■ Rural electrification targets, strategies, programmes ■ Clean cooking strategies, programmes ■ Biogas digester programmes	Deployment policies designed to maximise benefits and ensure a sustainable transition (*e.g.*, communities, gender) including requirements, preferential treatment and financial incentives provided to installations and projects that help deliver socio-economic objectives
	Pull	■ Regulatory and pricing policies (*e.g.*, feed-in tariffs and premiums, auctions) ■ Tradable certificates ■ Instruments for self-consumption (*e.g.*, net billing and net metering) ■ Measures to support voluntary programmes	■ Regulatory and pricing policies (*e.g.* legal provisions, price/tariff regulation)	
	Fiscal and financial	■ Tax incentives (*e.g.*, investment and production tax credits, accelerated depreciation, tax reductions) ■ Subsidies ■ Grants	■ Tax incentives (*e.g.*, reduction) ■ Subsidies ■ Grants ■ Concessional financing ■ Support for financial intermediaries	
Integrating policies		■ Measures to enhance system flexibility (*e.g.*, promotion of flexible resources such as storage, dispatchable supply, load shaping)	■ Policies for integration of off-grid systems with main-grid ■ Policies for mini-grids and smart distributed energy systems ■ Coupling renewable energy policies with efficient appliances and energy services	
		■ Policies to ensure the presence of needed infrastructure (*e.g.*, transmission and distribution networks, electric vehicles charging stations, district heating infrastructure, road access) ■ Policies for sector coupling ■ RD&D support for technology development (*e.g.*, storage)		
		■ Better alignment of energy efficiency and renewable energy policies ■ Incorporation of decarbonisation objectives into national energy plans ■ Adaptation measures of socio-economic structure to the energy transition		
Enabling policies		■ Policies to level the playing field (*e.g.*, fossil fuel subsidy reforms, carbon pricing policies) ■ Measures to adapt design of energy markets (*e.g.*, flexible short-term trading, long term price signal) ■ Policies to ensure the reliability of technology (*e.g.*, quality and technical standards, certificates)	■ Industrial policy (*e.g.*, leveraging local capacity) ■ Trade policies (*e.g.*, trade agreements, export promotion) ■ Environmental and climate policies (*e.g.*, environmental regulations)	
		■ National renewable energy policy (*e.g.*, objectives, targets) ■ Policies to facilitate access to affordable financing for all stakeholders ■ Education policies (*e.g.*, inclusion of renewable energy in curricula, coordination of education and training with assessments of actual and needed skills ■ Labour policies (*e.g.*, labour-market policies, training and retraining programmes)		
		■ Land-use policies ■ RD&D and innovation policies (*e.g.*, grants and funds, partnerships, facilitation of entrepreneurship, industry cluster formation) ■ Urban policies (*e.g.*, local mandates on fuel use) ■ Public health policies		
Enabling and integrating policies		■ Supportive governance and institutional architecture (*e.g.*, streamlined permitting procedures, dedicated institutions for renewables) ■ Awareness programmes on the importance and urgency of the energy transition geared toward awareness and behavioural change ■ Social protection policies to address disruptions ■ Measures for integrated resource management (*e.g.*, the nexus of energy, food and water)		

Source: IRENA, IEA, REN21, 2018.

Note: RD&D = research, development and demonstration.

In addition to the above listed categories of policies, the public sector can encourage institutional investors by providing risk mitigation instruments for political, currency or off-taker credit risks, in a manner that makes such instruments accessible and affordable to industry participants. Risk mitigation instruments are further discussed in Section 3.3.

A strong, clear and supportive policy framework is key, as noted by stakeholders in Uruguay, Singapore and Senegal who were part of successful transactions involving institutional investors (as described in Section 3.5).

Sustainable finance principles

Beyond efforts aimed at the renewable energy sector and institutional investors, policy makers can work to align the financial system as a whole with sustainability objectives. Sustainable finance initiatives, which are gaining ground across the world, can help in this regard.

Sustainable (or "green") finance generally takes into account ESG considerations, leading to increased capital flows in long-term and sustainable activities (European Commission, 2019). Several new co-operative initiatives facilitate the exchange of best practices and know-how in sustainable finance. For example, the Central Banks and Supervisors Network for Greening the Financial System (NGFS) is a global forum that was launched in December 2017 during the One Planet Summit (Mainstreaming Climate, 2019). As of August 2019, 42 members and 8 observers[5] were participating in the network, whose objective is "to exchange experiences, share best practices, contribute to the development of environment and climate risk management in the financial sector, and to mobilise mainstream finance to support the transition toward a sustainable economy" (Banque de France, 2019; Mainstreaming Climate, 2019). In April 2019 the NGFS published *"A Call for Action"* with recommendations on how the financial sector can help achieve the Paris Agreement objectives (NGFS, 2019). As well, the Financial Centres for Sustainability (FC4S) Network, convened by the United Nations Environment Programme in September 2017, currently has 27 members and 5 partner institutions[6] (FC4S, 2019). Objectives include the development of new "green" investment vehicles and a sustainable finance skills base; agreement on common "green" definitions, standards and rules; and the fostering of financial innovation.

5 Members include the Abu Dhabi Financial Services Regulatory Authority, Banca d'Italia, Banco de España, Banco de México, Banco de Portugal, Bank Al Maghrib, Bank of Canada, Bank of England, Bank of Finland, Bank of Greece, Bank Negara Malaysia (Central Bank of Malaysia), Bank of Thailand, Banque centrale du Luxembourg, Banque de France / Autorité de Contrôle Prudentiel et de Résolution (ACPR), Bundesanstalt für Finanzdienstleistungsaufsicht (BaFin), Central Bank of Hungary, Central Bank of Ireland, Central Bank of Malta, Commission de Surveillance du Secteur Financier (Luxembourg), Danmarks Nationalbank, De Nederlandsche Bank, Deutsche Bundesbank, Dubai Financial Services Authority, European Banking Authority, European Central Bank, European Insurance and Occupational Pensions Authority (EIOPA), Finansinspektionen (Swedish FSA), Finanstilsynet (Norwegian FSA), Hong Kong Monetary Authority, Japan FSA, Monetary Authority of Singapore, National Bank of Belgium, Norges Bank, Oesterreichische Nationalbank, People's Bank of China, Reserve Bank of Australia, Reserve Bank of New Zealand, South African Reserve Bank, Superintendencia Financiera De Colombia, Sveriges Riksbank, Swiss Financial Market Supervisory Authority (FINMA) and Swiss National Bank. Observers include the Bank for International Settlement, Basel Committee on Banking Supervision, European Bank for Reconstruction and Development, European Investment Bank, International Association of Insurance Supervisors, Organisation for Economic Co-operation and Development, Sustainable Insurance Forum, World Bank and International Finance Corporation.

6 Members include the Abu Dhabi Global Market, Astana International Financial Centre, Barcelona Centre Financier Europeu, Beijing Green Finance Association, Cairo Financial Regulatory Authority, Casablanca Finance City Authority, Dublin Sustainable Nation Ireland, Frankfurt Green and Sustainable Finance Cluster Germany, Geneva Sustainable Finance Geneva, Guernsey Green Finance, Hong Kong Green Finance Association, Lagos Financial Centre for Sustainability, Liechtenstein Banker's Association, City of London Green Finance Initiative, Luxembourg for Finance, Mexico Consejo Consultivo de Finanzas Verdes, Milan Centro Financiario Italiano per la Sostenibilita, Nairobi International Finance Centre Authority, New York U.S. Alliance for Sustainable Finance, Paris Finance for Tomorrow, Seoul Metropolitan Government, Shanghai Lujiazui Financial City, Shenzhen Green Finance Committee, Stockholm Green Digital Finance, Tokyo Metropolitan Government, Toronto Finance International and Zurich Swiss Sustainable Finance. Partners include the Sustainable Stock Exchanges Initiative, Climate Bonds Initiative, UNEP Finance Initiative, Principles for Responsible Investment and EIT Climate-KIC.

Sustainable finance also includes adoption of new investment principles that incorporate ESG aspects.

A well-known example of such an initiative is the Principles for Responsible Investment (PRI). This investor initiative was launched by the United Nations, alongside 20 investors, in 2006. The number of signatories grew from an initial 100 to over 2 300 by 2019, and represented nearly USD 70 trillion of assets as of 2017 (UNPRI, 2019, 2017). Voluntary principles adopted by the PRI signatories include 1) incorporating ESG considerations in investment analysis, decision-making processes and ownership practices; 2) seeking relevant information from any entities being considered for investment; 3) working together to enhance effectiveness in implementing related principles; and 4) reporting on progress toward implementing the principles (UNPRI, 2019).

Embracing sustainable finance principles can also include new requirements for investors, such as the calculation and disclosure of climate change risks. Climate risk reporting is fairly new but can have dramatic effects on the portfolios of institutional investors. A diverse group of stakeholders is promoting disclosure by developing reporting standards, and aggregating and analysing related information from companies across the world. The Task Force on Climate-Related Financial Disclosure (TCFD), for example, provides recommendations for climate-related disclosure useful to decision makers (TCFD, 2017) (see Box 3.1). Several entities are working to integrate TCFD's recommendations in their accounting standards, and also aligning their requirements with one another (Enochs, 2018; SASB and CDSB, 2017). These include the Sustainability Accounting Standards Board, Climate Disclosure Standards Board, Global Reporting Initiative and CDP (formerly the Carbon Disclosure Project), to name a few.

Sustainable finance initiatives are slowly gaining ground across the world. The Kenyan banking industry adopted the Sustainable Finance Guiding Principles in March 2015 to balance the industry's business goals with socio-economic priorities (KBA, 2015). In fall 2015, France passed an Energy Transition Law, of which Article 173 requires French institutional investors (insurance companies, pension funds and SWFs), as well as asset managers and banks, to disclose their greenhouse gas emissions and the way climate change and policy risks related to the implementation of climate targets will impact their assets (Mazzacurati, 2017a). In May 2018, Indonesia launched the Indonesia Sustainable Finance Initiative to promote stakeholder co-operation and sustainable finance practices (WWF, 2018). In March 2019, Australia established the Australian Sustainable Finance Initiative to set out a roadmap to align the financial sector with positive ESG outcomes (ASFI, 2019). In July 2019, the UK government announced, as part of its Green Finance Strategy, that it expects all listed companies and large asset owners (including institutional investors) to disclose climate-related information in line with the TCFD recommendations by 2022 (CDSB, 2019; Government of UK, 2019).

Action at the regional level includes the European Commission's launch of a High-level Expert Group on Sustainable Finance in December 2016, which published its Action Plan in March 2018 featuring establishment of the EU Sustainable Finance Taxonomy requiring institutional investments and asset managers to "take into account environmental sustainability as a trustee" and encourage investors to improve climate-related information disclosure (European Commission, 2019).

While the overall trend is positive, sustainable finance is still in its infancy in many regions. Its development should be supported and further strengthened through regional and international co-operation and a move toward more clearly defined terms and targets aligned with global sustainability and climate goals.

Box 3.1 Task Force on Climate-Related Financial Disclosure

The Task Force on Climate-Related Financial Disclosure (TCFD) was launched by the Financial Stability Board (FSB), the global banking regulator convened by the G20 countries in the wake of the 2008 financial crisis "to promote stability of the financial system" (FSB, 2019). The task force has 31 members that include both users and preparers of climate disclosures, including organisations such as the Canada Pension Plan Investment Board, Daimler, HSBC, Principles for Responsible Investments, Swiss Re, Tata Steel, ratings agencies (Deloitte, EY, KPMG, PwC, Standard & Poor's) and others (TCFD, 2019a). Prominent figures within the TCFD are its Chairman, Michael Bloomberg, former Mayor of New York, and Mark Carney, Governor of the Bank of England and Chairman of the Financial Stability Board.

The TCFD set out recommendations regarding what "decision-useful" climate-related disclosure looks like in 2017 and also provides frequent updates and analysis of companies' disclosures to date (TCFD, 2017, 2019b). Table 3.2 lists key categories of disclosures recommended by the TCFD.

Table 3.2 TCFD recommendations

Governance	Strategy	Risk Management	Metrics and Targets
Disclose the organization's governance around climate-related risks and opportunities.	Disclose the actual and potential impacts of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning where such information is material.	Disclose how the organization identifies, assesses, and manages climate-related risks.	Disclose the metrics and targets used to assess and manage relevant climate-related risks and opportunities where such information is material.
a) Describe the board's oversight of climate-related risks and opportunities	a) Describe the climate-related risks and opportunities the organization has identified over the short, medium, and long term.	a) Describe the organization's processes for identifying and assessing climate-related risks.	a) Disclose the metrics used by the organization to assess climate-related risks and opportunities in line with its strategy and risk management process.
b) Describe management's role in assessing and managing climate-related risks and opportunities	b) Describe the impact of climate-related risks and opportunities on the organization's businesses, strategy, and financial planning.	b) Describe the organization's processes for managing climate-related risks.	b) Disclose Scope 1, Scope 2, and, if appropriate, Scope 3 greenhouse gas (GHG) emissions, and the related risks.
	c) Describe the resilience of the organization's strategy, taking into consideration different climate-related scenarios, including a 2°C or lower scenario.	c) Describe how processes for identifying, assessing, and managing climate-related risks are integrated into the organization's overall risk management.	c) Describe the targets used by the organization to manage climate-related risks and opportunities and performance against targets.

Source: TCFD, 2019b.

The work being performed by the TCFD is a potential game-changer in helping to move financial flows toward more sustainable businesses, but only if enough companies disclose their climate-related risks in accordance with TCFD guidelines. So far, even as support for the TCFD has grown rapidly, companies' climate-related disclosures are still mostly unsatisfactory.

As of May 2019, 785 companies and organisations had announced their support for the TCFD, up from 101 in June 2017 (TCFD, 2019b). However, in its second status report review, which analysed the climate-related disclosures of over 1000 companies across the world over three years, the TCFD found that even though more companies were disclosing, the overall disclosure rate remained low. Only 1 in 4 companies disclosed information aligned with more than 5 of the 11 recommendations, and only 4% of companies made disclosures aligned with at least 10 of these. Overall, the average number of disclosure recommendations followed was 3.6 out of 11 in 2018 (CDSB and SASB, 2019).

To improve disclosure rates, the TCFD intends to continue to promote its recommendations and support their implementation by providing additional guidance on how to conduct climate-related scenario analysis, identify business-relevant scenarios and highlight good disclosure practices in collaboration with other institutions (TCFD, 2019b; CDSB and SASB, 2019).

Institutional investor regulation and investment mandates

In addition to general "macro" conditions and the development of sustainable finance frameworks, **policies and regulations specific to institutional investors should also be reviewed for their effect on long-term investments in "real" assets like infrastructure in general and renewable energy in particular.** Even where there are no restrictions on investments in renewables, explicit mandates requiring institutional investors to take into account environmental or sustainability concerns are largely missing.

An Organisation for Economic Co-operation and Development (OECD, 2019b) survey of pension plan investment regulations found that, although regulatory limits have softened over time and pension plans are allowed greater discretion over their investments, only nine countries do not impose any limits on the main asset classes[7]: Australia, Belgium, Canada, the Netherlands, New Zealand, the United Kingdom and the United States in the OECD, and Guernsey and Malawi outside the OECD. Pension plans in other countries must cope with various restrictions such as a maximum allocation to equities (with a typically lower limit for unlisted equity assets than listed ones); a maximum allocation to corporate bonds with much lower limits, if any, for investment in government bonds; strict limits on investments in alternative asset classes such as infrastructure assets; and restrictions on investments abroad, among others. Such restrictions may make it difficult, if not altogether impossible, to invest in real assets such as renewable energy.

In developed countries, stricter capital adequacy rules, such as the Solvency II regulation applicable to insurance and reinsurance companies headquartered in the European Union, implemented in 2016, have increased the amount of capital that insurers and reinsurers must hold against their assets. This may have inadvertently hurt insurers' ability to invest in long-term assets, including renewable energy (NRF, 2015; Seekings, 2019).

Needless to say, investment restrictions and capital adequacy rules are put in place for valid reasons: to safeguard long-term assets against misuse and to prevent allocation to asset classes that may not provide adequate safety

7 *These are equity, real estate, public bills and bonds, private bonds, retail investment funds, private investment funds, loans and bank deposits.*

or returns to the fund's underlying investors or beneficiaries. Revisions to investment restrictions should, therefore, be accompanied by safeguards against misappropriation, adoption of leading risk management standards and internal capacity building to train staff for investments into new asset classes or sectors such as renewable energy. At the same time, new capital adequacy rules should be examined for unintended consequences, such as decreased lending for long-term green projects. Appropriate carveouts or capital breaks can be considered to enable greater investments in sustainable sectors.

The Government of Norway has, for example, changed the investment restrictions of its trillion-dollar sovereign wealth fund, the Government Pension Fund, in April 2019 to permit investments in unlisted renewable energy projects. This change effectively doubles the investment the fund can make in such assets to USD 14 billion. It also comes on top of other significant changes made to steer the fund towards sustainable assets, such as the planned divestment from oil and gas exploration companies worth about USD 8 billion and the already-executed divestment from coal companies worth about USD 6.5 billion (Carrington, 2019; Government of Norway, 2019).

In addition to the evaluation of investment restrictions, policy makers and regulators can incorporate sustainability aspects in institutional investors' mandates to promote long-term green investments within the economy. Actions can include explicit mentions of environmental and sustainability risk and return considerations in investor's investment guidelines, incorporation of long-term risk assessment and investment horizons as well as the setting of minimum asset allocation targets for "green" sectors. For example, the Government Employees Pension Fund of South Africa and the Government Pension Fund of Namibia both have explicit mandates to support positive environmental outcomes and green economic development (IFC and UNEP 2015; GEPF, 2019). Since the adoption of the 2015 Energy Transition Law, French institutional investors are required to disclose both how climate change impacts their investments as well as how they contribute to climate change via disclosure of their greenhouse gas emissions (Mazzacurati, 2017a). Minimum asset allocation targets for green sectors are, however, extremely rare.

Policy makers can exert a powerful influence on institutional investors by lowering real and perceived risks in target markets, and by creating an enabling environment for increased investments in renewables. A review of institutional investment restrictions, the inclusion of explicit sustainability mandates and the adoption of sustainable finance principles, including enhanced climate risk disclosure, can steer institutional capital toward green sectors.

3.2 Creating capital market solutions

Even where the general macroeconomic, political and regulatory environment may be conducive to renewable energy investments, or at least not a barrier to them, investment instruments that are suitable and attractive to institutional investors may still be lacking. This is particularly common in countries with nascent capital markets that may not provide many ways to finance renewable assets besides bank loans or concessionary funding by development finance institutions. **Greater provision of desirable investment vehicles such as project bonds, project funds, green bonds and green bond funds, can help attract a greater share of institutional capital to renewable assets (Figure 3.3).**

As noted in Section 2, institutional investors have a strong preference for indirect investments in renewable energy. This is especially true for those investors who are new to renewables. Indirect investments are often easier and faster to execute than direct investments in projects, while potentially offering desirable scale, liquidity and credit risk assurance if an instrument is rated and listed on an exchange. In addition, if the instrument is managed by a high-quality asset manager, indirect investments provide the institutional investor with an additional layer of security.

As discussed earlier, indirect investments can occur through a variety of instruments, such as listed shares (common stock) or corporate bonds of renewable energy companies, listed or unlisted project bonds, and project funds as well as green bonds and green funds. **Project bonds** have featured prominently in European renewable energy deals, as illustrated by the largest offshore wind project, the Hornsea 1 wind farm in the United Kingdom, for which Global Infrastructure Partners raised more than British Pound (GBP) 3.5 billion through multiple project bonds, some of which were sold to institutional investors like Aviva Investors, an asset management arm of Aviva plc, a British insurance company (McCrone, 2019; IPE, 2018). Project bonds, however, are not commonly available in emerging and developing markets and their supply should be increased.

A similar situation surrounds the availability of **project funds**, such as listed renewable energy project funds, also known as "yieldcos" in North America. These group together multiple renewable energy assets, distributing their cash flows to shareholders and enabling access to a diversified portfolio of operating renewable energy structures via a vehicle that is listed and traded on a stock exchange (IRENA, 2016). Even though the American yieldco market experienced a near collapse following SunEdison Inc.'s bankruptcy in 2016 due to overly aggressive pay-out targets and investors' doubts about yieldcos' growth prospects, UK yieldcos – which focus on lower but stable payments through dividends – have performed rather well. In the 2013-2016 period, they generated greater risk-adjusted

Figure 3.3 Capital market actions to mobilise institutional capital

Source: IRENA analysis.
Note: CBI = Climate Bond Initiative; GBP = Green Bond Principles.

returns than did the broad UK equity market (Hirtenstein, 2018; Imperial College Business School, 2019; Singleton, 2018). The London Stock Exchange has over 20 green funds, many of which specialise in renewable energy, with a market capitalisation of over USD 10 billion (LSEG, 2019).

Green bonds and green bond fund structures for the grouping of green assets have proven successful in attracting investments, including from institutional investors, into green assets and are gaining ground globally, including in emerging and developing markets. The green bond market grew from USD 37 billion in 2014 to USD 167 billion in 2018, with a new record expected for 2019 (CBI, 2015; CBI, 2019a). Nevertheless, there is a lot of growth potential; the cumulative issuances of green bonds are still below USD 1 trillion, which is estimated to be less than 1% of the global bond market. (For more on green bonds, see Box 3.2).

Box 3.2 Green bonds

What are green bonds? Green bonds are fixed income instruments whose proceeds fund "green" projects related to renewable energy, buildings, transport, water management, waste and pollution control, nature based assets, industry and information and communication technology (CBI, 2019b). Organisations and jurisdictions which have a bonding authority (*i.e.*, right to raise capital by issuing bonds), such as federal and local governments, and corporations can issue green bonds. Green bonds help issuers attract investors with sustainability targets while providing investors with greater transparency over the use of proceeds within an instrument that is typically rated and listed on an exchange.

The green bond market started about a decade ago, with the European Investment Bank's issuance of its first Climate Awareness Bond in July 2007, which allocated EUR 600 million to 14 renewable energy and energy efficiency projects in 6 countries over 2007-2008 (EIB, 2017). In 2008, the World Bank launched its Green Bonds Programme, effectively coining the term "green bond" (Chasan, 2019). Since then the market has grown significantly and its reliance on multilateral development banks has lessened, with issuances occurring in more than 50 countries and growing from USD 36 billion in 2014 to USD 179 billion in 2018, and further to USD 271 billion in 2019, a new record (Figure 3.4) (IRENA, forthcoming).

The success of the green bond market has motivated the development of other socially and environmentally conscious debt products, such as **social bonds** that are issued to finance projects that improve social welfare, **blue bonds** whose proceeds are used for marine and ocean-based projects and **sustainable bonds** which combine environmental and social objectives.

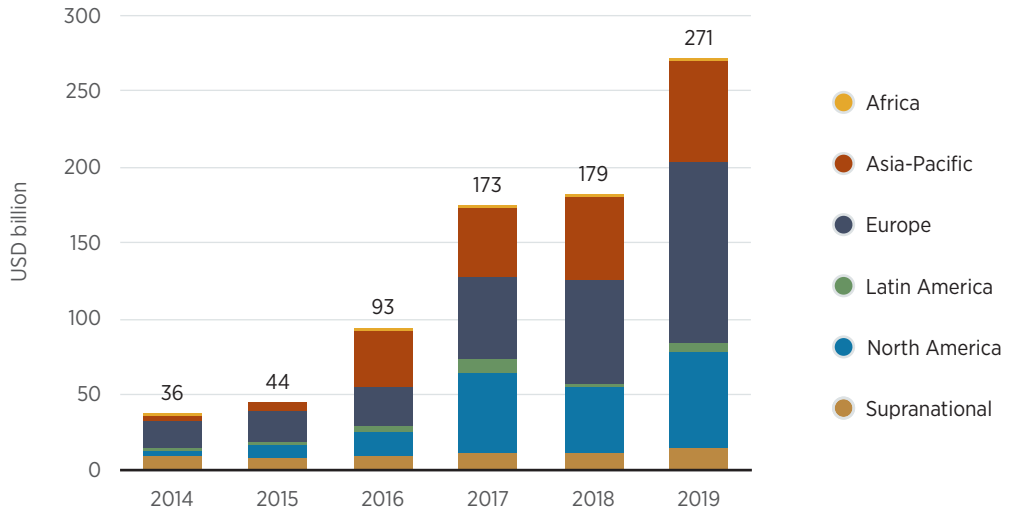
Market overview. While Europe is the largest regional green bond market, with a cumulative USD 190 billion of issuances since 2007, the United States is the country with the most issuances, and the Asia-Pacific is the fastest growing market, recording a growth rate of 35% between 2017 and 2018. Among emerging economies, the most active are China (USD 109 billion cumulative issuances in 2012-2018), India (USD 7.7 billion), Mexico (USD 7 billion) and Brazil (USD 4.2 billion), but green bond issuances also occurred in Chile, Fiji, Indonesia, Kenya, Nigeria and South Africa (IFC, 2019a).

Most bonds finance assets in multiple "green" categories. IRENA's analysis of over 4 300 green bonds issued over the past decade indicates that about 50% of green bonds (by volume, in US dollars) included renewable energy, while 16% were solely earmarked for renewable assets. (IRENA, forthcoming).

Who defines green? There is no simple answer to this crucial question. While there is no one universal standard or agency defining "green", there are several international standards commonly used in the market. These are accompanied by many third-party verifiers and certifying agencies attesting to a bond's green credentials, while some issuers opt to self-label their green bond issuances.

The Green Bond Principles (GBP) are voluntary guidelines monitored by the International Capital Market Association (ICMA), a self-regulatory organisation of European-based capital markets. The guidelines have four components: use of proceeds, project evaluation and selection, management of proceeds and reporting (ICMA, 2018). GBP does not explicitly define what a "green" project is but sets out "the most commonly used types of projects supported or expected to be supported by the Green Bond market" (ICMA, 2018). In the case of the energy sector, for example, GBP guidelines include renewable energy (production, transmission, appliances and products); fossil fuels are neither included nor explicitly excluded (ICMA, 2018).

Figure 3.4 Annual global green bond issuance, by region, 2014-2019, USD billions



Source: IRENA, forthcoming; based on data from the Environmental Finance Bond Database (2020)
Note: "Supranational" refers to institutions such as the European Investment Bank, World Bank, Asian Development Bank and others.

The **Climate Bonds Standard** (and the associated Climate Bonds Certified scheme) is also frequently used. This was developed by the Climate Bonds Initiative (CBI), an international-investor-focused non-governmental organisation working to mobilise the global bond market for climate solutions. To obtain the Climate Bonds Certified mark, the bond issuer must show full alignment of the issuance with GBP, projects to be financed by the bond must fall within specific categories deemed by the CBI to be consistent with the 2°C global warming target set via the Paris Agreement, independent third-party pre-issuance and post issuance verifications must be obtained and certification must be approved by the Climate Bonds Standards Board (comprised of large institutional investors and environmental non-governmental organisations), among other requirements (CBI, 2017, 2018).

There are also various **regional and country-specific green bond standards**, in addition to **external reviews** which serve to assure investors that green bonds are aligned with the chosen standard. The external review can be pre- or post-issuance review and may be conducted by institutions such as rating agencies, or organisations like Cicero, Sustainalytics and CBI, to name a few. In 2018, 89% of green bond deals (by issuance amount) received an external review, with a pre-issuance second-party review being the preferred method and Cicero being the leading provider of such reviews, followed by certification under CBI's Climate Bonds Standard (CBI, 2019a).

Green bond funds managed by a highly qualified third-party asset manager are another attractive way for institutional investors to access renewable assets. Public finance providers can support the creation of such vehicles by providing seed capital, for example. In March 2018, the International Finance Corporation (IFC) and Amundi (Europe's largest asset manager) announced a successful launch of the world's largest green bond fund focused on climate-aligned investments inemerging markets, the Amundi Planet Emerging Green One. With a USD 256 million cornerstone commitment from IFC, the fund closed at USD 1.42 billion and aimed to deploy USD 2 billion into emerging markets' green bonds over its lifetime by 2025 (Amundi Asset Management, 2018). By the end of 2018, the fund had invested in 14 green bonds in 7 emerging countries and 5 sectors: renewable energy, energy efficiency, green transport, green building and water management (Amundi Asset Management, 2019).

To increase issuances of new investment instruments such as green bonds – that can in turn help attract additional capital from institutional investors toward sectors like renewable energy – policy makers can take the following actions:

- **Collaborate with standard-setting agencies and capital markets to put in place a green bond framework.** Nigeria offers a successful example of such collaboration. It was the first nation in Africa to issue a sovereign green bond in December 2017, raising USD 29 million (CBI, 2019c). In June 2018, the FMDQ OTC Securities Exchange (the stock exchange), Financial Sector Deepening (FSD) Africa (a non-governmental organisation) and Climate Bonds Initiative (CBI) partnered to form the Nigerian Green Bond Market Development Programme (FMDQ, 2018). To support the development of a domestic corporate green bond market, the programme facilitates market education workshops for capital market operators and regulators. The offerings range from an introduction to green bonds and the certification process, to training in how to develop a green bond framework and project identification methodologies (CBI, 2019c; FMDQ, 2018). Benefiting from the programme, in March 2019, Nigerian-based Access Bank plc issued the first certified corporate green bond in Nigeria for Nigerian Naira (NGN) 15 billion (USD 41 million) to finance renewable energy, irrigation and flood defence projects (Access Bank, 2019a, 2019b; CBI, 2019c). The five-year, 15.5% bond was fully subscribed and certified by the Climate Bonds Initiative (CBI, 2019c).
- **Align the national green standard with leading international standards**, such as the CBI's Climate Bond Standard whereby covered projects must fall within categories consistent with the 2°C global warming target set via the Paris Agreement.
- **Help create a standardised and streamlined issuance process and cut the costs of external reviews and certifications.** In the early stages of market development, consider offering grants or subsidies to help issuers with the additional costs of review, certification, monitoring and reporting processes. Singapore's central bank, the Monetary Authority of Singapore, for example, introduced a Green Bond Grant scheme in 2017, applicable until 31 May 2020, to offset up to 100% of the cost of an external review for green bonds, up to Singapore dollar (SGD) 100 000 per issuance (Hui, 2017). Hong Kong launched a similar scheme in 2018, valid for three years, to cover the full cost, up to Hong Kong dollar (HKD) 800 000, of obtaining certification for eligible green bonds listed in Hong Kong (GovHK, 2018).
- **Kick-start the domestic green bond market with a demonstration issuance, co-financing or derisking funded by national treasuries or international development finance institutions.** A green bond issued by Sindicatum in 2018 that offers institutional investors exposure to renewable energy assets in India and Philippines, described in Section 3.5, is a successful example of co-operation with a development institution (GuarantCo Ltd) which provided an unconditional guarantee to investors, thus making the green bond more attractive.

Capital market instruments such as project bonds, project funds, green bonds and green funds can attract a greater share of institutional capital to renewables. Their supply can be increased through co-operation between policy makers, "green" standard setters, capital markets and issuers; adoption of green frameworks aligned with leading standards; blended finance and provision of economic incentives to lower issuance costs.

3.3 Supporting project pipeline development

With enabling policy frameworks in place and investment vehicles that help channel capital to green solutions, investors still need a continuous pipeline of investable projects. To achieve this, **policy makers and providers of public capital can address key barriers through targeted actions that help de-risk renewable energy projects, standardise processes and documentation and mobilise institutional investments through blended finance initiatives (Figure 3.5).**

De-risking renewable energy projects

Like all infrastructure or energy projects, renewable energy projects are subject to a plethora of real or perceived risks, which if not properly allocated, mitigated or transferred, translate to higher financing costs for renewable energy projects and/or higher prices for end consumers. Emerging and developing markets are particularly hurt by high financing costs. As mentioned earlier, UNDP (2017), for example, estimated that higher financing costs in developing markets result in about 50% higher life-cycle costs for wind energy than in developed markets. High financing costs may also prevent many projects from ever seeing the light of day or result in high energy prices for the final consumers. Table 3.3 lists the main types of risks that renewable energy projects are exposed to, along with tools that investors can use to lower or alleviate the risks.

For emerging and developing markets, political risk, policy or regulatory risk, currency risk and off-taker non-payments are often the most acute and difficult to mitigate. Guarantees issued by international financial institutions (*e.g.*, multilateral, regional and national development banks), development finance institutions (DFIs) or governments can cover such risks and are a very efficient way to leverage private investment such as that potentially originating from local institutional investors. According to an OECD and Milken Institute (2018) study, guarantees are the most effective leveraging instrument, achieving 45% of all private capital mobilisation while representing only 5% of development finance commitments. Providers of public capital, including multilateral banks and DFIs, should therefore consider increasing their provision of risk mitigation instruments to grow the uptake of renewable energy.

In addition to guarantees, there are other alternatives that countries and providers of public capital can deploy. These include letters of comfort and letters of support issued by ministries of finance, local or mixed currency power purchase agreements (PPAs), treaties issued by export credit agencies covering political risks as well as a host of actions to improve the creditworthiness of the off-taker (typically, the local utility) (IRENA, 2020e).

Difficulty accessing instruments for risk mitigation, rather than a lack of instruments per se, is often the main impediment to the

Figure 3.5 Actions to create renewable energy project pipelines

Source: IRENA analysis.
Note: MDBs = multilateral development banks; DFIs = development finance institutions.

Table 3.3 Key investment risks and financial risk mitigation tools to address them

Risk	Definition	Risk mitigation tools
Political risk	Risks associated with political events that adversely impact the value of investment (*e.g.*, war, civil disturbance, currency inconvertibility, breach of contract, expropriation, non-honouring of government obligations).	Government guarantee, political risk insurance, partial risk/ credit guarantee, export credit guarantee
Policy or regulatory risk	Risks associated with changes in legal or regulatory policies that have significant, adverse impacts on project development or implementation (*e.g.*, incentive programmes, taxes, interconnection regulations, permitting processes).	Government guarantee, potentially backed by partial risk/ credit guarantee, export credit guarantee
Currency risk	Risks associated with changing or volatile foreign exchange rates that adversely impact the value of investments and arises when there is a mismatch between assets (revenues) and liabilities (debt financing).	Government guarantee, currency risk hedging (swap, forward), loans in local currency or covered in the power purchase agreement (PPA)
Counter-party (power off-taker risk)	Credit and default risk by a counter-party in a financial transaction. For renewable energy investments, it is related to the risk of default or non-payment by the power off-taker, typically the electric utility.	Government guarantee, political risk insurance, partial risk/credit guarantee, export credit guarantee, liquidity facility, put option/ termination clause in the PPA
Grid and transmission risk	Risks associated with limitations in interconnection, grid management and transmission infrastructure (including curtailment risk).	Government guarantee, partial risk/credit guarantee
Resource risk	Risks associated with uncertainties around the availability, future price and/or supply of the renewable energy resource (*e.g.*, resource risks related to geothermal projects).	Government guarantee/grant/ convertible grant, geothermal exploration insurance
Technology risk	Risks associated with use of nascent technology or unexperienced labour deploying it.	Specialised insurance products
Liquidity risk	Possibility of operational liquidity issues arising from revenue shortfalls or mismatches between the timing of cash receipts and payments.	Government guarantee, letter of credit, escrow account, liquidity guarantee, put option
Re-financing risk	Risk that a borrower is unable to re-finance the outstanding loan during the life of the project due to inadequate loan terms (high cost of borrowing, the maturity of the loan is mismatched with the lifetime of the asset).	Greater supply of capital market instruments used for re-financing (*e.g.*, green bonds/funds)
Natural disasters	Risk that a natural disaster will impact the ability of a counter-party to fulfil its obligations (*e.g.*, produce power, make payments).	Property and casualty insurance

Source: Adapted from IRENA (2016).

greater use of such instruments by market participants. According to IRENA's estimates, over 100 companies and institutions provide or support risk mitigation for the renewables sector. Public finance institutions cover a broad array of political risks, as shown in Table 3.3. The largest public provider of such coverage is the Multilateral Investment Guarantee Agency, a member of the World Bank Group. Other providers of political risk insurance include the Overseas Private Investment Corporation, a US development finance institution, as well as multilateral and development banks such as the World Bank and the African Development Bank, for example. Liquidity risk, *i.e.*, the risk that the power off-taker (usually, the utility) delays or misses the payment, can be managed through escrow accounts or letters of credit issued by a bank and which can be drawn on in case of a non-payment. The costs of such instruments are typically borne by the off-taker but can also be supported by

public capital providers. For example, the Regional Liquidity Support Facility, a joint initiative of KfW (the German development bank) and Africa Trade Insurance (a multilateral insurer active in 15 African countries) provides collateral to banks that issue letters of credit to offset liquidity risks (ATI, 2019). Other risk mitigation products include support provided by export credit agencies (*e.g.*, in case of default on debt service), local currency lending (*e.g.*, with the use of currency hedges from the TCX Currency Fund), currency swaps and forwards provided by development or commercial financial institutions. Full or partial credit, currency and other risk guarantees are provided by entities such as GuarantCo, a unit of the Private Infrastructure Development Group funded by the governments of Australia, Germany, the Netherlands, Sweden, Switzerland and the United Kingdom, and the IFC.

Despite a large number of risk mitigation instruments and providers available for renewable energy projects, their uptake remains low as such instruments are often seen as difficult to understand, access, compare and combine, or else they are expensive and may require too much time from project developers. To improve access to and uptake of risk mitigation instruments, IRENA is adding such instruments and providing reference materials for them on the **Risk Assessment and Mitigation Platform (RAMP)**, a free public platform available to all registered users of IRENA's project facilitation interface.

Standardisation and aggregation

Prevailing market practices for developing and financing renewable energy have unfortunately been mostly inherited from large-scale and technically complex conventional power generation projects which require customised and fairly complex legal and financial solutions. But renewable projects are typically smaller, intrinsically less complex and more rapidly implemented. Thus, project development and contractual agreements that work for conventional power do not fit renewables and often result in unnecessarily high transaction times and costs.

Policy makers and regulators can adopt initiatives to simplify and standardise renewable energy project documentation, which can reduce both transaction costs and the time required for project development and financing while also achieving a more balanced risk allocation. Significant standardisation efforts have already been made. They include, at the regional level, standardised solar documentation available under IFC's Scaling Solar programme in Africa, for example (World Bank, 2018b, 2019; IFC, 2019b). Country-level initiatives include Argentina's RenovAr programme, South Africa's Renewable Energy Independent Power Producer Procurement Programme (REIPPPP) for solar tenders, and model contracts developed by Tanzania as well as Uganda's PPA templates found in the country's comprehensive investors' guide (McDaid and SAFCEI, 2016).

At the global level, IRENA and the Terrawatt Initiative (TWI) have brought together top-tier international law firms to develop simplified, standardised and publicly available contractual templates for solar PV projects, through **Open Solar Contracts**. This initiative provides a simplified and standardised contractual solution for solar power that lowers transaction times and costs, and also provides a template for a well-balanced risk allocation among transaction counter-parties. The documentation package was released in the first quarter of 2020 (see Box 3.3).

In addition to streamlining and simplifying processes, standardisation also provides the basis for the **aggregation of projects** to achieve greater scale. Large projects are more likely to attract institutional investors since their overall transaction costs (per capital invested) tend to be smaller than those of smaller-scale projects. By aggregating multiple smaller projects, institutional investors are able to "write big tickets" and reduce transaction costs, while at the same time diversifying risks among multiple projects. The El Naranjal and Del Litoral solar PV projects in Uruguay, described in the final section, illustrate the benefits of aggregation in attracting institutional capital.

Box 3.3 Open Solar Contracts

OPEN SOLAR CONTRACTS

Borne out of the need for a simplified and streamlined contractual framework to unlock greater investments in renewable energy, IRENA and the Terrawatt Initiative (TWI) jointly launched Open Solar Contracts, in collaboration with a dozen leading global law firms. The initiative serves to:

- Reduce legal transaction costs and expedite project development and finance timelines;
- Establish a well-balanced risk allocation between public and private parties, and reduce the cost of capital;
- Enable governments to attract capital by using a market-tested contractual structure; and
- Set the groundwork for project aggregation and securitisation.

The initiative has also strived to include expertise and experience from many different jurisdictions to ensure that the resulting documentation and risk allocation is universally applicable. The final package contains templates of:

- Power purchase agreement (PPA),
- Implementation agreement,
- Operations and maintenance agreement,
- Supply agreement,
- Installation agreement, and
- Finance term sheet.

For more information on this initiative and to access template documents, visit: https://opensolarcontracts.org.

Blended finance mechanisms

Even when renewable projects are sufficiently de-risked and standardised, investors rarely finance entire projects by themselves. **Blended finance transactions among providers of capital, such as institutional investors, developers, commercial banks, as well as multilateral, regional and national development banks, provide an effective sharing of risks and returns among the parties (Figure 3.6).** Institutional investors who are relative newcomers to renewables can also benefit from a more experienced party's financial and legal structuring know-how, and its access to low-cost capital in case such a partner is a multilateral bank or a development institution. For public providers of capital, blended financing structures are an effective way to crowd-in private sources of capital and help kick-start the local commercial market. Such structures can and often are coupled with risk mitigation solutions to further improve a transaction's overall risk-adjusted return.

Co-financing structures (such as loan syndications, for example) whereby several funding institutions extend financing are common in large infrastructure projects, including those involving renewable energy. Through the IRENA/Abu Dhabi Fund for Development (ADFD) Project Facility, a co-financing structure set up in 2014, ADFD has co-funded 24 renewable energy projects in 23 countries, allocating USD 245 million and attracting another USD 450 million from other funding sources as of the end of 2019 (IRENA and ADFD, 2019). The Asian Development Bank and KfW also launched a co-financing partnership in 2014 to finance projects in the Asia and Pacific region including in clean energy. This partnership was renewed in November 2019 with an additional USD 2 billion pledge from KfW (ADB, 2019).

Co-financing can take the form of A-loan and B-loan structures. For example, a DFI may keep a portion of the loan for its own account (A-loan), while selling the remaining portion (B-loan) to

other participants like institutional investors. These investors thus transact with the DFI as opposed to the underlying projects and therefore benefit from the DFI's credit rating, financial structuring capabilities as well as its relationship with the governments of countries where such projects are located (IRENA, 2016). Solar PV projects in Uruguay (described in Section 3.5) provide an example of a successful A-loan/B-loan structure executed by IDB Invest, the private sector arm of the Inter-American Development Bank Group, that helped attract capital from several institutional investors.

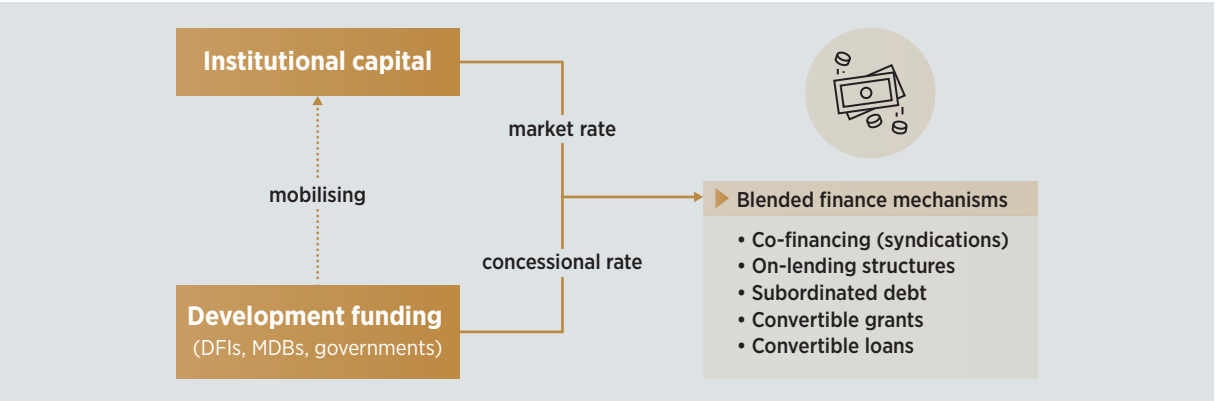
In **on-lending structures**, public financiers like DFIs use their high credit rating to access funding at low rates. They then "on-lend" such funds, usually via credit lines, to local financial institutions or public entities, which then disburse the funds or co-finance with local project developers and other financiers on terms that are typically more attractive than such parties would be able to access otherwise. For example, in July 2019 the Asian Infrastructure Investment Bank launched a USD 100 million on-lending programme with L&T Infrastructure Finance Company Limited, a financier of renewable energy, to support solar and wind projects in India (AIIB, 2019).

Blended finance can include the deployment of other financing mechanisms such as **subordinated debt** issued by multilateral development banks or DFIs which helps attract and insulate senior debt investors, such as institutional investors, from certain risks inherent in renewable projects. **Convertible grants and convertible loans** that convert to debt or equity (a higher-risk instrument) once certain project milestones are reached can protect investors from early-stage risks. Such mechanisms can enable public finance institutions to mobilise other sources of capital including from institutional investors.

In addition to blended finance, other project facilitation initiatives that can significantly reduce transaction time and costs, and therefore lay the groundwork for greater institutional investments in renewables, include **technical assistance** and **capacity building for project development**, as well as platforms and initiatives that **connect project developers with providers of capital**. Public providers of capital (multilateral development banks, DFIs) and organisations like IRENA play an important role in the provision of such initiatives.

Policy makers and providers of public capital can help create a pipeline of investable assets by utilising instruments to mitigate the risk of renewable projects. It is also helpful to standardise processes and documentation, and aggregate projects to achieve economies of scale. Co-financing initiatives facilitate the sharing of know-how, risks and returns with institutional investors.

Figure 3.6 Blended finance approaches



Source: Adapted from Convergence (2019) and IRENA (2016).
Note: DFIs = development finance institutions; MDBs = multilateral development banks.

3.4 Enhancing internal capacities

Provided that the appropriate policy, regulatory and capital market conditions are present, as well as a sufficient supply of investable projects and desirable investment instruments, renewables can provide the type of returns that fit institutional investors' needs. To seize such benefits, however, institutional investors may need to put additional efforts to foster the right internal conditions and skills base. By building internal capacity, institutional investors can increase both indirect and direct modes of investment in renewables, across different stages of the project life cycle (Figure 3.7).

- **Efforts to raise awareness may be needed to combat the sometimes unduly pessimistic view held by institutional investors that the renewable sector is too new or too risky**. This can result in a reluctance to invest in the sector or to avoid direct or early-stage investments. Renewables have made great strides over the past decade in terms of their technological, policy-related and cost elements, as well as in the financing mechanisms and instruments available. In addition, training may be needed on the topic of climate-related risks, their impacts on asset values and the latest disclosure standards, social and regulatory trends bolstering ESG-related investments and institutional investors' fiduciary duty and role in directing societal capital toward sustainable solutions.
- **Stronger internal capacity in financial, legal and technical structuring provides an important base for investment in renewable energy assets.** Learning from other institutional investors who have the relevant experience can be an effective way to acquire the needed skills. In an example of such a potentially powerful collaboration, in September 2019, the Asia Investor Group on Climate Change, a network of Asian asset owners and asset managers, and Caisse de dépôt et placement du Québec (CDPQ), a Canadian pension fund with assets of about Canadian dollar (CAD) 326.7 billion as of June 2019 and one of the world's largest investors in renewable energy, announced a partnership to develop training in low-carbon investments for Asian investors (CDPQ 2019a, 2019b).
- **It is important to review portfolio investment goals, and incorporate long-term sustainability mandates and targets for green investments.** Institutional investors should align their daily and long-term investment management, risk management and internal training and incentive structure with a long-term sustainability strategy. The stage can be set for long-term success by adopting best management practices, such as the Santiago Principles for the management of sovereign wealth fund assets. These are 24 generally accepted principles for good governance, accountability and transparency in investments (IFSWF, 2019). TCFD guidelines, in

Figure 3.7 Internal actions to be taken by institutional investors

Source: IRENA, analysis.
Note: AIGCC = Asia Investor Group on Climate Change; IIGCC = Institutional Investors Group on Climate Change.

Institutional investors are responsible for creating internal conditions that foster increased investment in sustainable assets like renewables. Raising awareness of the renewable sector's progress can be helpful. So can building internal capacity for the financial and legal structuring of renewable transactions, co-financing transactions and co-operation with other institutional investors.

turn, provide leading standards for climate-related risk analysis and disclosure (TCFD, 2017). In terms of targets for green investments, some institutional investors are ahead of the curve. Danish pension plans have, for example, committed to invest 350 billion Danish krone (equivalent of about USD 52 billion) in green transition assets such as renewables and energy-efficient construction by 2030. This amount represents more than a tenth of the Danish pension industry's assets (Ministry of the State of Denmark, 2019; Schwartzkopff, 2019).

- **Start by co-financing and/or making indirect investments in renewable energy assets via funds or bonds while building internal capacity for direct investment.** Participation in co-investment platforms and joint investments in renewables provide a way to share the risks and returns. The Africa50 fund – established by the African Development Bank to mobilise African sovereign wealth funds, central banks and other providers of capital to spur growth in infrastructure spending in Africa – is one example of a potentially powerful co-investment initiative (Chen, 2019).
- **Institutional investor groups concerned with sustainability and climate risk management facilitate the sharing of best practices and know-how** for investments in renewables and other low-carbon assets. The number of such groups has expanded significantly, as the concern about stranded assets and the need to shift capital towards sustainable solutions have intensified. Such groups operate on the global, regional and national levels. For a list of select institutional investor groups, see Box 3.4.

Box 3.4 Institutional investor groups

In the last decade or so, numerous associations have been formed to help coordinate efforts in the transition to a low-carbon future. These bring institutional investors and policy makers together to exchange know-how and information. Examples include the following:

- **Asian Investor Group on Climate Change (AIGCC)** was launched in 2016 to foster awareness and co-operation among Asia's asset owners and financial institutions regarding climate change and low-carbon investments.
- **Ceres Investors Network on Climate Risk and Sustainability (Ceres)** is a US-based network comprised of more than 140 institutional investors managing over USD 15 trillion in assets to advance sustainable investment practices.
- **Institutional Investors Group on Climate Change (IIGCC)** is a European-based trade body with over 180 members across the world, representing about EUR 23 trillion in assets, focusing on climate change. Members include institutions such as Allianz, Amundi, CalPERS (California pension plan), Australian Super (a pension fund) and many others.
- **Investor Group on Climate Change (IGCC)** is based in Australia and New Zealand and includes institutional investors with assets over USD 2 trillion, with the aim of catalysing investor action on climate change.
- **Global Investor Coalition in Climate Change (GIC)** was created in 2012 by joining four regional climate change investor groups – IIGCC, Ceres, IGCC and AIGCC – to form a global platform for dialogue between investors and governments on climate and low-carbon investments.
- **One Planet Sovereign Wealth Fund Working Group**, established at the One Planet Summit held on 12 December 2017, brings together sovereign wealth funds across the world to integrate climate change risks into investment decisions.
- **Global Investors for Sustainable Development Alliance (GISD)**, launched in October 2019, brings together 30 business leaders to scale up private sector investment to reach the United Nations' Sustainable Development Goals.

Sources: AIGCC, 2019; Ceres, 2019; IGCC, 2019; IIGCC, 2019; One Planet, 2019; UN, 2019.

3.5 Reaping the benefits: Selected renewable investments by institutional investors

Three examples of projects that benefited from the participation of institutional investors are described below. They illustrate the positive results that can spring forth from the right enabling environment that includes supportive policies, innovative capital market solutions, effective de-risking strategies, efficient support from public capital providers and the existence of strong internal capacities.

1. The El Naranjal and Del Litoral solar PV projects in Latin America[8]

The El Naranjal and Del Litoral solar photovoltaic (PV) projects are located across a total of 190 hectares of land in the Department of Salto in the northwest of Uruguay. The two projects were acquired by the project sponsor, Atlas Renewable Energy, an independent power generation company with renewable energy projects across Latin America, from SunEdison in 2017 while they were still under construction (Allianz GI, 2018b). The projects have been operating at full capacity since September (El Naranjal) and June (Del Litoral) 2017.

In 2018, the two solar PV projects were bundled into one deal (with about USD 114.4 million in long-term financing) to re-finance the existing construction debt of the project sponsor, Atlas Renewable Energy. IDB Invest, the private sector arm of the Inter-American Development Bank (IDB) Group, acted as the lender of record, providing a financing package consisting of both senior and subordinated facilities structured as B-bonds (Figure 3.8). This facilitated the mobilisation of capital from institutional investors, including Allianz Global Investors, John Hancock, Industrial Alliance and BlackRock. The subordinated tranche was the first instrument wherein institutional investors took subordinated risks in the renewable sector in Uruguay.

Multiple factors made this transaction appealing to institutional investors. These include:

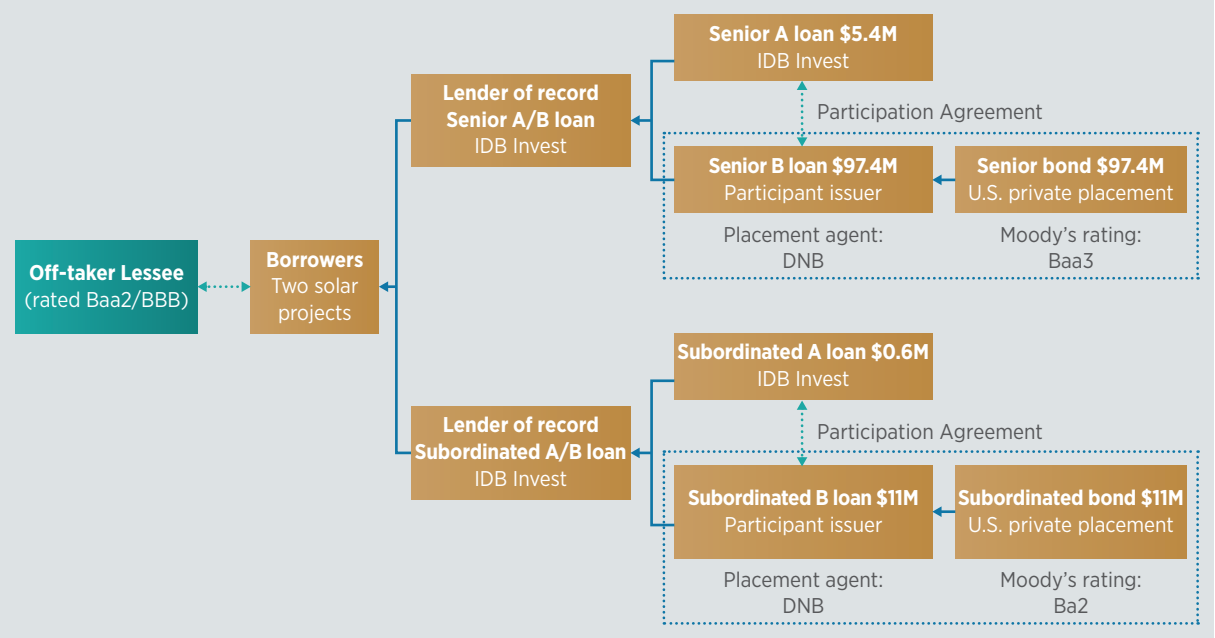
- Perception of Uruguay as a stable country that is highly supportive of renewable energy. The overall political risk is seen as low, with strong institutions and a low risk of expropriation and adverse government actions. At the same time the power sector structure is seen as effective, without state interference in the transmission system and distorting energy subsidies. Uruguay's support for renewables includes long-term clean energy targets, emission reduction targets, various tax incentives (value-added tax exemptions, income tax reductions, import duty reductions), well-developed auctions and a tender system and priority dispatch right for renewable power.

Table 3.4 Project snapshot, El Naranjal and Del Litoral solar PV projects

Technology	Solar PV
Capacity	El Naranjal 58.8 MW, Del Litoral 17 MW
Location	Department of Salto, Uruguay
Financial close	June 2018
Total investment	USD 114.4 million
Sponsor	Atlas Renewable Energy ("Atlas")
Lender of record	IDB Invest
Other/final lenders	Institutional investors (via U.S. private placement)
Placement agent	DNB Markets, Inc.

8 Sources: Allianz GI, 2018a, 2018b; Atlas, 2018; IDB, 2018a, 2018b; Moody's, 2018a, 2018b.

Figure 3.8 Project structure, El Naranjal and Del Litoral solar PV projects



- Participation by a multilateral agency (IDB's private sector arm) and several risk mitigation approaches, including:
  - Bankable 30-year term power purchase agreements (PPAs) with a stable state-owned electric utility and beneficial terms including fixed price, inflation-adjusted payments over the PPA life, no requirement for minimum power generation and curtailment provisions to compensate renewable producers.
  - Aggregation of two projects into one transaction, benefiting from common documentation, due diligence process and a single set of financial, technical and legal advisors.
  - Ratings of the B-bonds issued to institutional investors: a senior B-bond (rated Baa3) and a subordinated B-bond (rated Ba2). In addition, both bonds received a GB1 (Excellent) Green Bond Assessment by Moody's.

2. Sindicatum green bonds financing for renewable energy in Southeast Asia[9]

On 27 November 2018, Assad Razzouk, CEO of Sindicatum, and colleagues opened the markets at the London Stock Exchange with the listing of USD 60 million (equivalent of Indian rupee [INR] and Philippine Peso [PHP]) bonds in three tranches. This marked several firsts. It was the first-ever PHP bond to be listed on the London Stock Exchange, the first Singapore-based bond issuance to conform to both the International Capital Market Association's Green Bond Principles and the Association of Southeast Asian Nations' Green Bond Standards, the first 10-year offshore PHP bond and the first offshore INR corporate bond with a tenor of seven years.

The bonds have been issued to a consortium of ten institutional investors by the Singapore-based Sindicatum parent company, which in turn owns equity interests in renewable energy projects in India and the Philippines, as shown in Figure 3.9. Payments to the parent company are dependent on local-currency-denominated receipts from domestic power purchase agreements and are junior to payments to project level lenders. Bonds are settled in US dollars at the applicable INR/USD and PHP/USD exchange rate. Crucially, the bonds carry a 100% unconditional guarantee from GuarantCo Ltd which is wholly owned by the Private Infrastructure Development Group, a development finance institution backed by the governments of Australia, Germany, the Netherlands, Sweden, Switzerland and the United Kingdom, and the International Finance Corporation. GuarantCo carries a rating of AA- (Fitch) and A1 (Moody's). The INR bonds were rated AA- and A1 by Fitch and Moody's, respectively, and the PHP bonds were rated A1 by Moody's, making them very attractive to institutional investors wishing to gain exposure to Indian- and Philippine-based investment grade renewable energy assets.

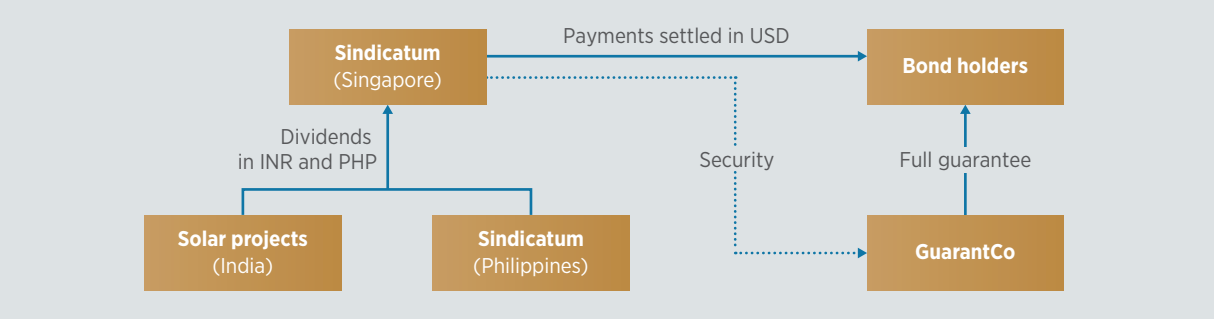
The bonds were attractive to institutional investors due to several factors, including the guarantee provided to the bond holders by GuarantCo, which was 100% unconditional, irrevocable and on-demand. Bond holders therefore received the benefit from GuarantCo's high investment rating and a relatively high yield in currencies in which it is difficult to gain renewable energy exposure. In addition, Sindicatum Renewable Energy is a Singapore-based developer with well over a decade worth of experience developing, owning and operating renewable energy projects in South and Southeast Asia. Also, the bonds were attractive due to the Sustainalytics Green Bond certification and issuance in accordance with the Green Bond Principles, while the London Stock Exchange listing ensured that the bonds were subject to high standards of governance and disclosure.

Table 3.5 Project snapshot, Sindicatum green bond

Technology	Solar PV, wind, bagasse and waste-to-energy projects
Capacity	Gross 400 MW across 12 projects
Location	India and the Philippines
Financial close	January (INR) and August (PHP) 2018
Total investment	USD 60 million equivalent (USD 40 million in INR and USD 20 million in PHP)
Sponsor	Sindicatum Renewable Energy Pte. Ltd. ("Sindicatum")
Equity	Sindicatum
Debt	A consortium of ten institutional investors
Guarantor(s)	GuarantCo Ltd
Adviser(s)	ING Bank

9 Sources: Moody's, 2018c; PIDG, 2018; Reuters, 2017; Sindicatum 2019; Sustainalytics, 2017.

Figure 3.9 Project structure, Sindicatum green bond



3. The Kahone and Kaél solar projects in Senegal, Africa[10]

In July 2019, financial close was announced for two solar photovoltaic (PV) plants in Senegal, with a total installed capacity of 60 megawatts (MW), to be constructed in the rural regions of Kahone and Kaél in central Senegal. The plants were developed by a Senegalese SWF, Fonds Souverain d'Investissements Stratégiques S.A. (FONSIS), and sponsored by Engie (the French power company), Meridiam (a Paris-based asset manager) and FONSIS. The plants are the first projects in Senegal under the World Bank's Scaling Solar programme. The two plants are expected to provide nearly 600 000 people with better access to clean electricity, create or support more than 2 300 local jobs, and produce affordable power (the tenders resulted in some of the lowest electricity prices in West Africa).

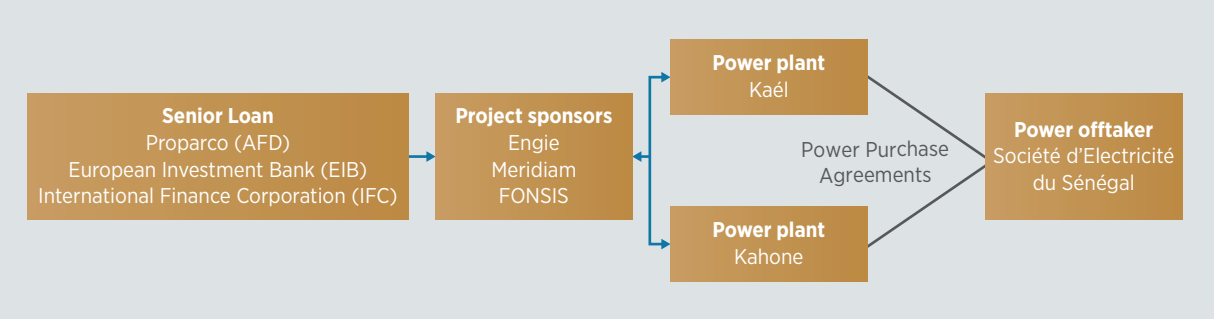
The financing package for the construction and operation of the two plants consisted of a EUR 38 million senior loan provided by the Proparco unit of the French Development Agency (Agence Française de Développement), the European Investment Bank and the International Finance Corporation (IFC). Part of IFC's contribution was financed by the Finland-IFC Blended Finance for Climate Program set up in 2017 to fund climate projects in developing countries. Funds were made available to project sponsors – Engie, Meridiam and FONSIS – who would each hold a 40%, 40% and 20% stake, respectively. Engie has already constructed two large-scale solar plants in Senegal – Senergy and Ten Merina plants – in Santhiou Mékhé and Merina Dakhar regions northeast of the capital Dakar, with 30 MW capacity each. Through a tender for both plants finalised by Senegal's Electricity Sector Regulatory Commission (CRSE) in April 2018, long-term power purchase agreements with the national power utility Société d'Electricité

Table 3.6 Project snapshot, Kahone and Kaél solar plants

Technology	Solar PV plants
Capacity	60 MW for two plants
Location	Senegal, Kahone and Kaél regions
Financial close	July 2019
Total investment	EUR 38 million
Sponsors	Engie (40%), Meridiam (40%) and FONSIS (20%)
Debt	Proparco (Agence Francaise de Développement), the European Investment Bank and International Finance Corporation

10 Sources: African Business Magazine, 2018b, 2019; Bellini, 2019; IFC, 2019b; MFA Finland, 2019; Proparco, 2019; World Bank, 2019.

Figure 3.10 Project structure, Kahone and Kaél solar plants



du Sénégal were secured. The Kahone plant in western Senegal will sell power for EUR 0.03801/kilowatt-hour (kWh), while the Kaél plant in central Senegal has secured a tariff of EUR 0.03983/kWh – among the lowest power prices so far recorded in Western Africa.

The projects were successful due to multiple enabling factors. The two projects are the first achievements in Senegal under the World Bank's Scaling Solar programme whose objective is to promote investments in renewable energy in emerging markets, particularly in Africa, by offering a "one-stop shop" that includes project preparation assistance, tender bid preparation and award assistance, standardised contractual templates, preapproved financing and risk mitigation solutions such as insurance and guarantees. In addition to this programme and the co-financing provided by multilateral development banks and development finance agencies, the two projects successfully reached financial close due to the know-how of the French renewable energy company Engie in Senegal, as well as the long-term commitment of the Senegalese government to improve energy access and increase the contribution of renewable energy to the energy generation mix. An initial targeted share of 15% is likely to be reached well ahead of the 2025 goal and be replaced by a more ambitious objective of 30% by 2030. Finally, the Senegalese SWF, FONSIS, has significant experience in developing and co-investing renewable energy projects. FONSIS was a co-investor in West Africa's largest (30 MW) solar power plant in Santhiou Mékhé in 2017, alongside Proparco, a subsidiary of the French development finance institution Agence Française de Développement (AFD) and several other investors (Proparco, 2017). FONSIS has also helped attract other financiers to Senegal's green sectors and has partnered with the Scaling Solar project to organise the tender process for solar projects in Senegal.

CONCLUSIONS

The global energy transformation hinges on a massive reallocation of capital into investments in renewable energy and other sustainable, low-carbon activities. The need for action is urgent. This report shows that institutional investors have the potential to play a far more active role in making the necessary investments, but the shift demands combined efforts on multiple fronts, with the active engagement of all stakeholders.

Policy makers can develop enabling frameworks for increased renewable investments by:

- Creating supply-side conditions for green infrastructure investments by supporting the growth and integration of renewables through direct, integrating and enabling policies
- Reviewing and revising the regulation of institutional investors to ease restrictions on green investments and to incorporate clear and long-term sustainability mandates
- Adopting principles of sustainable finance that require sustainability to be integrated into all investment decisions, promote greater co-operation among stakeholders, and encourage new practices by the investment community, including assessment and disclosure of climate risks
- Supporting the creation of market instruments to channel institutional capital into renewable assets (such as project bonds, project funds, green bonds and green funds) by adopting green frameworks aligned with leading standards, designing economic incentives to offset the cost of the issuance and certification processes, providing co-financing, and sponsoring demonstration issuances
- Helping to create a pipeline of investable projects through greater provision of risk-mitigation instruments tailored to renewable assets, the adoption of standardisation and aggregation initiatives to create desirable scale, and the co-financing of transactions that facilitate the sharing of know-how as well as returns.

Institutional investors can seize opportunities offered by renewables and lay needed internal groundwork by:

- Raising awareness and implementing training across the institution to familiarise staff with the renewable energy sector, climate-related risks, disclosure standards, and institutional investors' own fiduciary and social obligation to promote sustainable action
- Reviewing internal decision processes to ensure that they incorporate clear, long-term sustainability targets and embody healthy, transparent governance and risk-management practices
- Building internal capacity in financial, legal and technical structuring of renewable trades
- Investing indirectly in renewable energy assets to build internal skills and comfort, if renewables are new to the institution, and participating in co-investment platforms and initiatives
- Joining groups of institutional investors to share best practices.

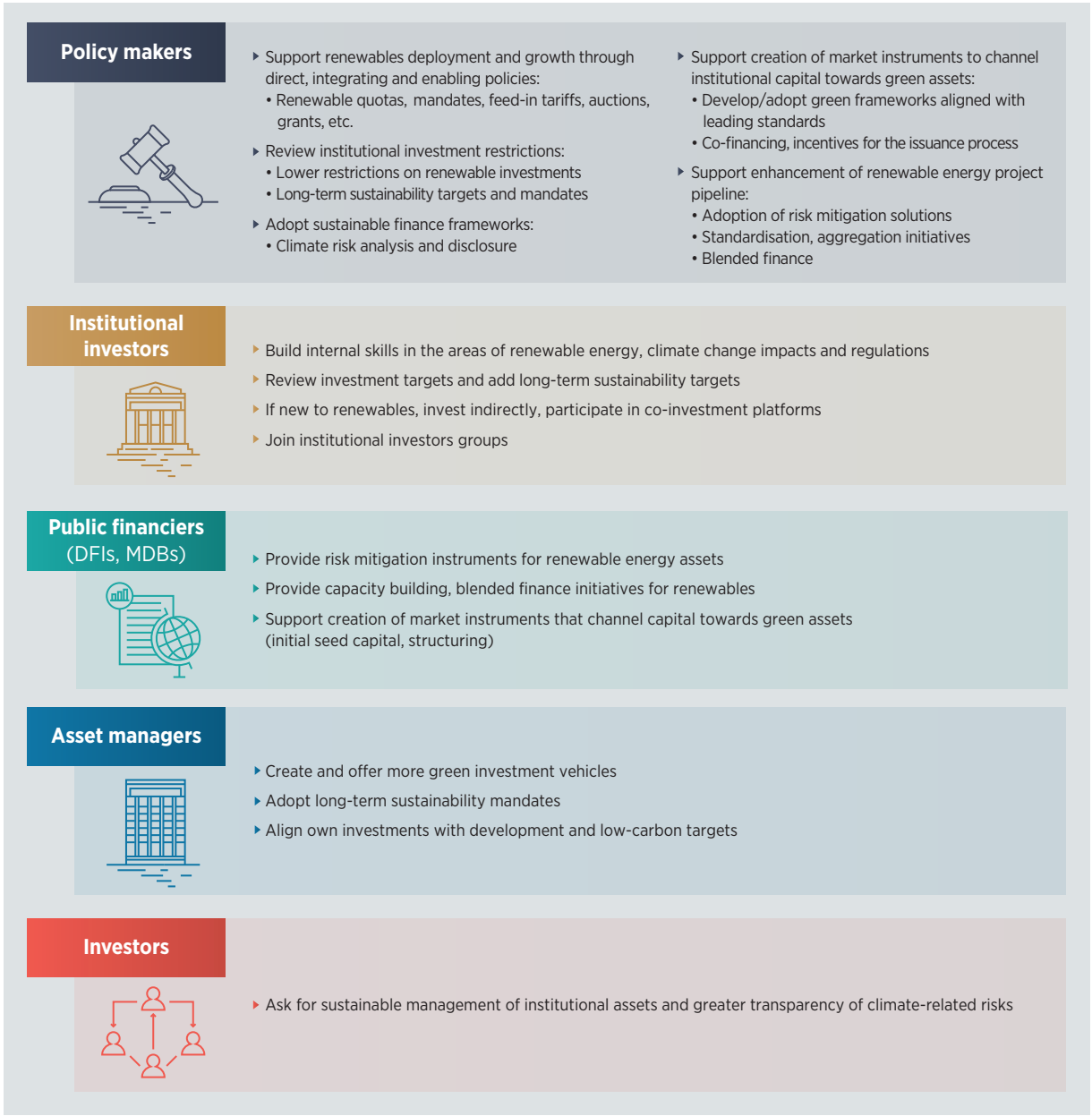
Public providers of capital, such as multilateral development banks and development finance institutions, can fulfil their development mandate and crowd in institutional capital through:

- Greater provision of easily accessible and affordable risk-mitigation instruments that lower the risks associated with renewable projects
- Capacity building and blended finance initiatives in which they partner with institutional investors to prepare and execute renewable energy trades

- The provision of seed capital for investment vehicles such as green bonds that attract institutional capital to green assets.

Other stakeholders that have not been analysed in this report but who are important in this discussion are asset managers, project developers and investors. **Asset managers** often manage assets of institutional investors and therefore act as advisers and gatekeepers of institutional capital. Their actions, capacities and opinions on sustainability matter. To spur greater institutional investments in renewables, asset managers should develop their internal capacities, and adopt sustainability targets that require them to create and offer green investment options to their institutional clients. **Project developers** can attract a greater share of institutional capital by ensuring that good project management standards are deployed. Last but not least, **investors and beneficiaries** whose assets are managed by institutional investors can be powerful stakeholders by urging the institutions that manage their investments to do so in a way that fosters environmentally and economically sustainable solutions for generations to come.

Figure C.1 Recommended actions to mobilise institutional capital in renewable energy, by stakeholder



Source: IRENA, analysis.

REFERENCES

Abnett, K. and M. Green (2020), "EU makes world's biggest 'green recovery' pledge - but will it hit the mark?", www.reuters.com/article/us-eu-summit-climate-change-idUSKCN24N231.

Access Bank (2019a), *PwC Green Bond Verification Report*, www.accessbankplc.com/AccessBankGroup/media/Investors/PwC-Green-Bond-Verification-Report.pdf.

Access Bank (2019b), "Announcement – Proposed issuance of green bond", www.accessbankplc.com/AccessBankGroup/media/Documents/Proposed-Issuance-Of-Green-Bond.pdf.

Acuris (2018), "APAC: Equis Energy sale ignites Asian renewable prospects", www.inframationgroup.com/apac-equis-energy-sale-ignites-asian-renewable-prospects.

ADB (Asian Development Bank) (2019), "ADB, KfW expand cofinancing partnership with additional $2 billion", www.adb.org/news/adb-kfw-expand-cofinancing-partnership-additional-2-billion.

AfDB (African Development Bank) (2018), "Africa's infrastructure: Great potential but little impact on inclusive growth", In *African Economic Outlook 2018*, Chapter 3, www.afdb.org/fileadmin/uploads/afdb/Documents/Publications/2018AEO/African_Economic_Outlook_2018_-_EN_Chapter3.pdf.

African Business Magazine (2019), "Renewable energy powers growth in Senegal", https://africanbusinessmagazine.com/region/west-africa/renewable-energy-powers-growth-in-senegal/.

African Business Magazine (2018a), "What African SWFs can learn from Asian counterparts", https://africanbusinessmagazine.com/sectors/finance/what-african-swfs-can-learn-from-asian-counterparts/.

African Business Magazine (2018b), "Senegal becomes West Africa's renewable energy leader", https://africanbusinessmagazine.com/company-profile/solutions-co/senegal-becomes-west-africas-renewable-energy-leader/.

AIIB (Asian Infrastructure Investment Bank) (2019), "AIIB approves on-lending facility to support renewable energy in India", www.aiib.org/en/news-events/news/2019/20190712_003.html.

AIGCC (Asian Investor Group on Climate Change) (2019), "Who are we?", www.aigcc.net/who-are-we/.

Ainger, L. and L. Pronina (2020), "EU to Sell 225 Billion Euros of Green Bonds to Fund Recovery", www.bloomberg.com/news/articles/2020-09-16/eu-plans-to-sell-225-billion-euros-of-green-bonds-for-stimulus?sref=6K2T7rH3.

Allianz GI (Allianz Global Investors) (2018a), "Allianz Global Investors infrastructure debt team closes its first A/B Bond with IDB Invest and also first deal in Uruguay", https://irei.com/news/allianz-global-investors-infrastructure-debt-team-closes-first-b-bond-idb-invest-also-first-deal-uruguay/.

Allianz GI (2018b), "Press release: Allianz Global Investors Infrastructure debt team cl oses its first A/B Bond with IDB Invest and also first deal in Uruguay", https://irei.com/news/allianz-global-investors-infrastructure-debt-team-closes-first-b-bond-idb-invest-also-first-deal-uruguay/.

Allianz and Euler Hermes (2019), "The view: Global insurance market at a crossroads", www.allianz.com/content/dam/onemarketing/azcom/Allianz_com/economic-research/publications/specials/en/2019/20190522-TheView-GlobalInsurance.pdf.

Amundi Asset Management (2019), *Amundi Planet Emerging Green One: Annual Impact Report 2018*, www.amundi.lu/professional/product/view/LU1688574620 (accessed August 2019).

Amundi Asset Management (2018), "IFC and Amundi successfully close the world's largest green bond fund", www.amundi.lu/professional/Local-Content/News/IFC-and-Amundi-successfully-close-world-s-largest-green-bond-fund.

Aquila Capital (2019), "Institutional investors nearly double exposure to renewable infrastructure from 2% to 3.6% in two years, new research shows", https://www.aquila-capital.de/en/deals/details/institutional-investors-nearly-double-exposure-to-renewable-infrastructure-from-2-to-36-in-two-years-new-research-shows-1.

ASFI (Australian Sustainable Finance Initiative) (2019), "What is ASFI?", www.sustainablefinance.org.au/.

ATI (African Trade Insurance Agency) (2019), "RLSF - Regional Liquidity Support Facility - African Trade Insurance Agency", www.ati-aca.org/energy-solutions/facilities/regional-liquidity-support-facility/.

Atlas (2018), "Atlas Renewable Energy announces USD $114.4 million financing of Uruguayan solar energy plants", www.atlasrenewableenergy.com/en/atlas-renewable-energy-announces-usd-114-4-million-financing-of-uruguayan-solar-energy-plants/.

Azim Premji Foundation (2017), "Who we are", https://azimpremjifoundation.org/about/who-we-are.

Banque de France (2019), "Network for Greening the Financial System: About us", www.banque-france.fr/en/financial-stability/international-role/network-greening-financial-system/about-us.

Bellini, E. (2019), "Engie secures financing for 60 MW of solar in Senegal", www.pv-magazine.com/2019/07/22/engie-secures-financing-for-60-mw-of-solar-in-senegal/.

BIS (Bank for International Settlements) (2019), "Basel III: International regulatory framework for banks", www.bis.org/bcbs/basel3.htm.

BNEF (Bloomberg New Energy Finance) (2020), "China's Long Road to Carbon Neutrality Will Reshape World Economy", https://about.bnef.com/blog/chinas-long-road-to-carbon-neutrality-will-reshape-world-economy/#:~:text=China's%20Long%20Road%20to%20Carbon%20Neutrality%20Will%20Reshape%20World%20Economy,-September%2029%2C%202020&text=As%20the%20world's%20largest%20carbon,Road%20and%20everywhere%20in%20between.

BNEF (2019), *Clean energy investment trends report,* https://about.bnef.com/clean-energy-investment/

Cambridge Dictionary (2019), ESG | meaning in the Cambridge English Dictionary, https://dictionary.cambridge.org/dictionary/english/esg.

Carrington, D. (2019), **"**Historic breakthrough: Norway's giant oil fund dives into renewables", www.theguardian.com/environment/2019/apr/05/historic-breakthrough-norways-giant-oil-fund-dives-into-renewables

CBI (Climate Bonds Initiative) (2019a), *Green Bonds: The State of the Market 2018*, *www.climatebonds.net/files/reports/cbi_gbm_final_032019_web.pdf*.

CBI (2019b), *2018 Green Bond Market Highlights*, *www.climatebonds.net/files/reports/2018_green_bond_market_highlights.pdf*.

CBI (2019c), "Nigeria: Access Bank 1st certified corporate green bond in Africa: Leadership in green finance", www.climatebonds.net/2019/04/nigeria-access-bank-1st-certified-corporate-green-bond-africa-leadership-green-finance.

CBI (2018), "Green bond highlights 2017", www.climatebonds.net/files/reports/cbi-green-bonds-highlights-2017.pdf.

CBI (2017), "Climate bonds standard", www.climatebonds.net/files/files/Climate%20Bonds%20Standard%20v2_1%20-%20January_2017.pdf.

CBI (2015), "Final 2014 green bond total is $36.6bn", www.climatebonds.net/2015/01/final-2014-green-bond-total-366bn-%E2%80%93-that%E2%80%99s-more-x3-last-year%E2%80%99s-total-biggest-year-ever-green.

CDPQ (Caisse de dépôt et placement du Québec) (2019a), "AIGCC and CDPQ announce partnership to develop capacity-building training for investors in Asian markets", www.cdpq.com/en/news/pressreleases/aigcc-and-cdpq-announce-partnership-to-develop-capacity-building-training-for.

CDPQ (2019b), "Climate change", www.cdpq.com/en/investments/stewardship-investing/climate-change.

CDSB (Climate Disclosure Standards Board) (2019), "UK expects all listed companies and large asset owners to disclose in line with TCFD by 2022, commits to work with international partners to catalyse market-led action on nature-related financial disclosures", www.cdsb.net/mandatory-reporting/937/uk-expects-all-listed-companies-and-large-asset-owners-disclose-line-tcfd.

CDSB and SASB (Sustainability Accounting Standards Board) (2019), *TCFD Good Practice Handbook*, www.cdsb.net/sites/default/files/tcfd_good_practice_handbook_web_a4.pdf.

Ceres (Ceres Investors Network on Climate Risk and Sustainability) (2019), "About us", www.ceres.org/index.php/about-us.

Ceres (2018), "In sight of the clean trillion: Update on an expanding landscape of investor opportunities", www.ceres.org/CleanTrillionInSight.

Chasan, E. (2019), "Bonds to save the planet", www.bloomberg.com/news/articles/2019-04-23/bonds-to-save-the-planet.

Chen, J. (2019), "Financing the sustainable development goals: The role of African sovereign wealth funds", *Journal of International Law and Politics*, Vol. 51, pp. 1259, http://nyujilp.org/wp-content/uploads/2019/09/NYI405.pdf.

Chestney, N. (2018), "Ireland commits to divesting public funds from fossil fuel companies", www.reuters.com/article/us-ireland-fossilfuels-divestment/ireland-commits-to-divesting-public-funds-from-fossil-fuel-companies-idUSKBN1K22AA.

Convergence (2019), "Blended finance", www.convergence.finance/blended-finance.

CPI (Climate Policy Initiative) (2019), *Global Landscape of Climate Finance 2019*, http://climatepolicyinitiative.org/wp-content/uploads/2013/03/The-Challenge-of-Institutional-Investment-in-Renewable-Energy.pdf.

CPI (2013), *The Challenge of Institutional Investment in Renewable Energy*, https://climatepolicyinitiative.org/publication/the-challenge-of-institutional-investment-in-renewable-energy/.

CTI (Carbon Tracker Initiative) (2018), *2020 Vision: Why You Should See the Fossil Fuel Peak Coming*, www.carbontracker.org/reports/2020-vision-why-you-should-see-the-fossil-fuel-peak-coming/.

Dalberg (Dalberg Advisers) (2018), "Local currency-denominated tariffs for Kenyan power purchase agreements", Feasibility study, June 2018, https://guarantco.com/gco/wp-content/uploads/2019/Documents/news/Feasibility-Study-Local-Currency-Denominated-PPAs-for-Kenya_vF.pdf.

De Wit, E., A. Quinton and F. Meehan (2019), *Climate Change Litigation Update*, www.nortonrosefulbright.com/en/knowledge/publications/848dafd1/climate-change-litigation-update.

Edwardson, N. (2019), "Renewable energy – powering your returns", http://sustainability-soapbox.com/soapbox/renewable-energy-powering-your-returns/.

EIB (European Investment Bank) (2017), "CAB Newsletter 10th anniversary", www.eib.org/attachments/fi/2017-cab-newsletter-10years.pdf.

EIU (The Economist Intelligence Unit) (2015), *The Cost of Inaction: Recognising the Value at Risk from Climate Change*, www.eiuperspectives.economist.com/sites/default/files/The%20cost%20of%20inaction_0.pdf.

Enochs, L. (2018), "SASB and GRI step up project to align reporting standards", www.greenbiz.com/article/sasb-and-gri-step-project-align-reporting-standards.

Environmental Finance Bond Database (2020), www.bonddata.org/ (subscription required, accessed 15 January 2020).

European Commission (2020), "2030 climate & energy framework", https://ec.europa.eu/clima/policies/strategies/2030_en#:~:text=As%20part%20of%20the%20European,least%2055%25%20compared%20to%201990.

European Commission (2019), "Sustainable finance", https://ec.europa.eu/info/business-economy-euro/banking-and-finance/green-finance_en.

Evans, S. (2020), "Analysis: World has already passed 'peak oil', BP figures reveal", www.carbonbrief.org/analysis-world-has-already-passed-peak-oil-bp-figures-reveal.

Fabrikant, G. (2018), "Harvard's endowment grew 10% last year, but some rivals did better", www.nytimes.com/2018/09/28/business/harvard-endowment-gains.html.

FC4S (Financial Centres for Sustainability Network) (2019), "About us", www.fc4s.org/about/.

FMDQ (FMDQ OTC Securities Exchange) (2018), "FMDQ, CBI, FSD Africa launch Nigerian Green Bond Market Development Programme", www.fmdqgroup.com/fmdq-cbi-fsd-africa-launch-nigerian-green-bond-market-development-programme/.

FONSIS (Fonds Souverain d'Investissements Strategiques S.A.) (2019), "FONSIS mobilise 31 milliards pour les centrales solaires de Kaél et Kahone (fr)", http://www.fonsis.org/en/articles/23-08-2019/fonsis-mobilise-31-milliards-pour-les-centrales-solaires-de-kael-et-kahone-fr.

Frankfurt School-UNEP (United Nations Environment Programme) Centre/BNEF (Bloomberg New Energy Finance) (2020), *Global Trends in Renewable Energy Investment 2020*, Frankfurt School of Finance and Management, Frankfurt am Main, Germany, www.fs-unep-centre.org/wp-content/uploads/2020/06/GTR_2020.pdf.

FSB (Financial Stability Board) (2019), "History of the FSB", www.fsb.org/history-of-the-fsb/.

Gandel, S. (2020), "Exxon Mobil dropped from the Dow after nearly a century", www.cbsnews.com/news/dow-jones-exxon-mobil-pfizer-raytheon-replaced-salesforce-amgen-honeywell/#:~:text=Exxon%20Mobil%2C%20which%20joined%20the,enterprise%20software%20company%20Salesforce.com.

GEPF (Government Employees Pension Fund) (2019), **"**Investment policy statement", www.gepf.gov.za/wp-content/uploads/2019/08/GEPF_Investment_Policy_Statement.pdf.

GF (Bill & Melinda Gates Foundation) (2018), "Who we are: Financials", www.gatesfoundation.org/Who-We-Are/General-Information/Financials.

Globe Newswire (2018), "Equis and Global Infrastructure Partners announce closing of US$5.0 billion renewable energy acquisition of Equis Energy", www.globenewswire.com/news-release/2018/01/19/1297888/0/en/Equis-and-Global-Infrastructure-Partners-Announce-Closing-of-US-5-0-Billion-Renewable-Energy-Generation-Acquisition-of-Equis-Energy.html.

GovHK (The Government of the Hong Kong Special Administrative Region) (2018), "Government launches green bond grant scheme", www.info.gov.hk/gia/general/201806/15/P2018061500373.htm.

Government of Norway (2019), **"**Allowing for unlisted renewable energy infrastructure", www.regjeringen.no/en/aktuelt/allowing-for-unlisted-renewable-energy-infrastructure/id2640386/

Government of UK (2020), "New plans to make UK world leader in green energy", www.gov.uk/government/news/new-plans-to-make-uk-world-leader-in-green-energy.

Government of UK (2019), "Green finance strategy", www.gov.uk/government/publications/green-finance-strategy.

GSIA (Global Sustainable Investment Alliance) (2018), *The Global Sustainable Investment Review 2018*, http://www.gsi-alliance.org/trends-report-2018/.

Hirtenstein, A. (2018), "Strategy that killed SunEdison is now beating UK stocks", www.bloomberg.com/news/articles/2018-05-11/strategy-that-killed-sunedison-is-now-beating-u-k-stocks.

Holter, M. (2019), "Here's the (secret) list of Norway's oil stock divestments", www.bloomberg.com/news/articles/2019-10-04/here-s-the-secret-list-of-norway-s-oil-stock-divestments?srnd=premium-europe.

Hui, C. (2017), "MAS to offset cost of issuing green bonds with new grant scheme", https://wildsingaporenews.blogspot.com/2017/03/mas-to-offset-cost-of-issuing-green.html.

ICMA (International Capital Market Association) (2018), "Green Bond Principles: Voluntary process guidelines for issuing green bonds", ICMA, www.icmagroup.org/green-social-and-sustainability-bonds/green-bond-principles-gbp/.

IDB (Inter-American Development Bank) (2018a), "What is a B-bond", www.idbinvest.org/en/articles/what-b-bond.

IDB (2018b), "IDB Invest structured its third bond for the financing of renewable energy in Uruguay", https://idbinvest.org/en/news-media/idb-invest-structured-its-third-bond-financing-renewable-energy-uruguay.

IEA (International Energy Agency) (2020a), *Global Energy Review 2020*, International Energy Agency, Paris, www.iea.org/reports/global-energy-review-2020.

IEA (2020b), *World Energy Outlook 2020*, International Energy Agency, www.iea.org/reports/world-energy-outlook-2020.

IEA (2018), *Key World Energy Statistics 2018*, IEA, Paris, France.

IEEFA (Institute for Energy Economics and Financial Analysis) (2020a), "Dutch asset manager Robeco to divest thermal coal, oil sands holdings by year's end", https://ieefa.org/dutch-asset-manager-robeco-to-divest-thermal-coal-oil-sands-holdings-by-years-end/.

IEEFA (2020b), "U.K.'s biggest pension fund to divest from fossil fuels", https://ieefa.org/u-k-s-biggest-pension-fund-to-divest-from-fossil-fuels/.

IEEFA (2019), "New York pension fund plan stops short of divestment", http://ieefa.org/new-york-pension-fund-plan-stops-short-of-divestment/.

IEEFA (2017), *Making the Case for Norwegian Sovereign Wealth Fund Investment in Renewable Energy Infrastructure*, http://ieefa.org/wp-content/uploads/2017/02/Making-the-Case-for-Investment-in-Renewable-Energy-Infrastructure_February-2017.pdf.

IFC (International Finance Corporation) (2019a), *Emerging Market Green Bonds Report 2018*, www.ifc.org/wps/wcm/connect/9e8a7c68-5bec-40d1-8bb4-a0212fa4bfab/Amundi-IFC-Research-Paper-2018.pdf?MOD=AJPERES.

IFC (2019b), "Two scaling solar projects in Senegal advance to construction with IFC financing package", https://ifcextapps.ifc.org/IFCExt/Pressroom/IFCPressRoom.nsf/0/F132145C7A245A8B8525843B005B5225.

IFC and UNEP (United Nations Environment Programme Inquiry) (2015), *Aligning Kenya's Financial System with Inclusive Green Investment*, www.ifc.org/wps/wcm/connect/fc8b6cc6-036f-44f2-b767-08893e7bdcc6/IFC+-+Aligning+Kenya%27s+Financial+System+with+Inclusive+Green+Investment+-web.pdf?MOD=AJPERES&CVID=l4hM4eq.

IFSWF (International Forum of Sovereign Wealth Funds) (2019), "Santiago principles", www.ifswf.org/santiago-principles-landing/santiago-principles.

IGCC (Investor Group on Climate Change) (2018), "Who are we?", https://igcc.org.au/who-are-we/.

IIGCC (Institutional Investor Group on Climate Change) (2018), "About us?", www.iigcc.org/about-us/.

IISD (International Institute for Sustainable Development) (2014), "Introduction to institutional investor fiduciary duties", www.iisd.org/library/introduction-institutional-investor-fiduciary-duties.

Imperial College Business School (2016), "Is clean energy a safe bet for individual investors?", www.imperial.ac.uk/business-school/blogs/ib-knowledge/clean-energy-safe-bet-individual-investors/.

Insurance Europe (2017), "Solvency II one year on: successfully implemented, but excessive conservativeness risks harming consumers, long-term investment and economy", www.insuranceeurope.eu/solvency-ii-one-year-successfully-implemented-excessive-conservativeness-risks-harming-consumers.

IPCC (Intergovernmental Panel on Climate Change) (2018), *Global Warming of 1.5 ºC: An IPCC Special Report on the Impacts of Global Warming of 1.5 °C above Pre-Industrial Levels and Related Global Greenhouse Gas Emission Pathways, in the Context of Strengthening the Global Response to the Threat of Climate Change, Sustainable Development, and Efforts to Eradicate Poverty*, www.ipcc.ch/sr15/.

IPE (Investments and Pension Europe) (2018), "Aviva Investors invests £400m in Hornsea 1 offshore wind farm project", https://realassets.ipe.com/news/aviva-investors-invests-400m-in-hornsea-1-offshore-wind-farm-project/realassets.ipe.com/news/aviva-investors-invests-400m-in-hornsea-1-offshore-wind-farm-project/10028215.fullarticle.

IRENA (International Renewable Energy Agency) (forthcoming), *Financing Renewables with Green Bonds,* International Renewable Energy Agency, Abu Dhabi.

IRENA (2020a), *Renewable Power Generation Costs in 2019*, International Renewable Energy Agency, Abu Dhabi.

IRENA (2020b), Renewable Energy Statistics 2020 The International Renewable Energy Agency, Abu Dhabi

IRENA (2020c), *Global Renewables Outlook: Energy transformation 2050 (Edition: 2020)*, International Renewable Energy Agency, Abu Dhabi.

IRENA (2020d), *The Post-COVID Recovery: An Agenda for Resilience, Development and Equality,* International Renewable Energy Agency, Abu Dhabi.

IRENA (2020e), *Renewable Energy Finance: Sovereign Guarantees*, International Renewable Energy Agency, Abu Dhabi.

IRENA (2018a), *Renewable Power Generation Costs in 2017*, International Renewable Energy Agency, Abu Dhabi.

IRENA (2018b), *Corporate Sourcing of Renewables: Market and Industry Trends*, International Renewable Energy Agency, Abu Dhabi.

IRENA (2016), *Unlocking Renewable Energy Investment: The Role of Risk Mitigation and Structured Finance*, International Renewable Energy Agency, Abu Dhabi.

IRENA and ADFD (Abu Dhabi Fund for Development) (2019), *Advancing Renewables in Developing Countries: Progress of Projects Supported through the IRENA/ADFD Project Facility,* January 2019, International Renewable Energy Agency, Abu Dhabi.

IRENA and CPI (2020), *Global Landscape of Renewable Energy Finance 2020*, International Renewable Energy Agency, Abu Dhabi

IRENA and CPI (2018), *Global Landscape of Renewable Energy Finance 2018*, International Renewable Energy Agency, Abu Dhabi.

IRENA, IEA and REN21 (Renewable Energy Policy Network for the 21st Century) (2018), *Renewable Energy Policies in a Time of Transition*, www.irena.org/-/media/Files/IRENA/Agency/Publication/2018/Apr/IRENA_IEA_REN21_Policies_2018.pdf.

KBA (Kenya Bankers Association) (2015), "Banking industry adopts sustainable finance guiding principles and industrywide standards to promote inclusive growth agenda" www.kba.co.ke/news32.php.

Keating, C. (2020), "BlackRock pledges to divest from coal, take active role in energy transition", www.pv-tech.org/news/blackrock-pledges-to-divest-from-coal-take-active-role-in-energy-transition#:~:text=The%20world's%20largest%20asset%20manager,integral%E2%80%9D%20to%20its%20investment%20portfolios.

Kim, S. *et al.* (2020), "South Korea's Green New Deal shows the world what a smart economic recovery looks like", https://theconversation.com/south-koreas-green-new-deal-shows-the-world-what-a-smart-economic-recovery-looks-like-145032.

Lies, E. (2020), "Japan's plan to become carbon neutral by 2050", www.weforum.org/agenda/2020/10/japan-zero-emissions-carbon-neutral-society-2050/.

LSEG (London Stock Exchange Group) (2019), "Renewable funds", www.lseg.com/markets-products-and-services/our-markets/london-stock-exchange/investment-funds/renewable-funds.

Mainstreaming Climate (2019), "Central Banks and Supervisors Network for Greening the Financial System (NGFS)", www.mainstreamingclimate.org/ngfs/.

Mazzacurati, E. (2017a), "Art. 173: France's groundbreaking climate risk reporting law", http://427mt.com/2017/01/16/impact-french-law-article-173/.

Mazzacurati, E. (2017b), "New EU directive requires pension funds to assess climate-related risks", http://427mt.com/2017/02/15/iorp-ii-directive-pensions-assess-climate-risks/.

McCrone, A. (2019), "Marry institutional cash to developing world green power", https://about.bnef.com/blog/mccrone-marry-institutional-cash-developing-world-green-power/.

McDaid, L. and SAFCEI (Southern African Faith Communities Environment Institute) (2016), "Opportunities for investing in renewable energy sector in Africa", www.kirkensnodhjelp.no/contentassets/c1403acd5da84d39a120090004899173/briefing-paper-2016-opportunities-for-investing-in-renwable-energy-sector-in-africa.pdf.

McKinsey (2019), "2019 global insurance trends and forecasts", www.mckinsey.com/industries/financial-services/our-insights/2019-global-insurance-trends-and-forecasts.

McKinsey (2018), *Global Insurance Industry Insights: An In-Depth Perspective: McKinsey Global Insurance Pools – Seventh Edition, 2017*, www.mckinsey.com/~/media/McKinsey/Industries/Financial%20Services/Our%20Insights/Global%20insurance%20insights%20An%20overview%20of%20recent%20trends%20in%20life%20P%20and%20C%20and%20health/Global-Insurance-Industry-Insights-An-in-depth-perspective-May-2018.ashx.

Mercer (2019), *Investing in a Time of Climate Change: The Sequel 2019*, www.mercer.com/content/dam/mercer/attachments/private/nurture-cycle/gl-2019-wealth-climate-change-the-sequel-full-report.pdf.

MFA (Ministry of Foreign Affairs), Finland (2019), "Finland-IFC blended finance for climate program", https://um.fi/finland-ifc-blended-finance-for-climate-program.

Mills, R. (2020), "What BP's Claim of an End to Peak Oil Demand Means for Gulf Producers", https://agsiw.org/what-bps-claim-of-an-end-to-peak-oil-demand-means-for-gulf-producers/.

Ministry of the State of Denmark (2019), "The prime minister and the Danish pension industry announce billion investments in green change", https://stateofgreen.com/en/partners/state-of-green/news/the-danish-government-and-the-danish-pension-industry-announce-investments-worth-billions-in-the-green-transition/.

Moody's (2018a), "Announcement: Moody's assigns Green Bond Assessment (GBA) of GB1 to Naranjal/Litoral Uruguay Issuer 1 and 2's senior secured and subordinated notes", www.moodys.com/research/Moodys-assigns-Green-Bond-Assessment-GBA-of-GB1-to-NaranjalLitoral--PR_384525.

Moody's (2018b), "Rating action: Moody's assigns a Baa3 and Ba2 ratings to Naranjal/Litoral Issuer 1 and 2 notes offering; stable outlook", www.moodys.com/research/Moodys-assigns-a-Baa3-and-Ba2-ratings-to-NaranjalLitoral-Issuer--PR_385127.

Moody's (2018c), "Rating Action: Moody's assigns A1 to Sindicatum's PHP green bonds guaranteed by GuarantCo", www.moodys.com/research/Moodys-assigns-A1-to-Sindicatums-PHP-green-bonds-guaranteed-by--PR_385085.

Murray, S. (2016), *Foundations Tap into Endowments to Make "Mission Investments"*, www.ft.com/content/51a2e3de-0232-11e6-99cb-83242733f755.

NGFS (Network for Greening the Financial System) (2019). *A Call for Action: Climate Change as a Source of Financial Risk*, www.banque-france.fr/sites/default/files/media/2019/04/17/ngfs_first_comprehensive_report_-_17042019_0.pdf.

NRF (Norton Rose Fulbright) (2015), "Ten things you need to know about Solvency II", www.nortonrosefulbright.com/en/knowledge/publications/f12a4a4a/ten-things-you-need-to-know-about-solvency-ii.

OECD (Organisation for Economic Co-operation and Development) (2019a), *Global Insurance Market Trends 2018*, www.oecd.org/finance/globalinsurancemarkettrends.htm.

OECD (2019b), "Annual survey of investment regulation of pension funds 2019", www.oecd.org/daf/fin/private-pensions/2019-Survey-Investment-Regulation-Pension-Funds.pdf.

OECD (2018), *Pension Markets in Focus: 2018*, http://www.oecd.org/daf/fin/private-pensions/Pension-Markets-in-Focus-2018.pdf.

OECD (2017), *Investment governance and the integration of environmental, social and governance factors*, www.oecd.org/finance/Investment-Governance-Integration-ESG-Factors.pdf.

OECD (2016), *Progress Report on Approaches to Mobilising Institutional Investment for Green Infrastructure*, www.oecd.org/cgfi/resources/Progress_Report_on_Approaches_to_Mobilising_Institutional_Investment_for_Green_Infrastructure.pdf.

OECD and Milken Institute (2018), *Guaranteeing the Goals: Adapting Public Sector Guarantees to Unlock Blended Financing for the U.N. Sustainable Development Goals*, www.milkeninstitute.org/reports/guaranteeing-goals-adapting-public-sector-guarantees-unlock-blended-financing-un.

One Planet Sovereign Wealth Fund Working Group (2019), "Who we are", https://oneplanetswfs.org/#who.

PIDG (Private Infrastructure Development Group) (2018), "Sindicatum Renewable Energy lists INR and PHP green bonds", www.pidg.org/2018/11/sindicatum-renewable-energy-lists-bonds/.

Plumer, B. (2019), "Companies see climate change hitting their bottom lines in the next 5 years", www.nytimes.com/2019/06/04/climate/companies-climate-change-financial-impact.html.

Preqin (2019), "Global infrastructure data" (subscription required, last accessed September 2019).

Preqin (2018), *2018 Preqin Sovereign Wealth Fund Review*, https://docs.preqin.com/reports/Preqin-Special-Report-Sovereign-Wealth-Funds-August-2018.pdf.

Proparco (2019), *Proparco,* "IFC and EIB finance the construction of the two new solar power plants in Senegal as part of the Scaling Solar program", www.proparco.fr/en/proparco-ifc-and-eib-finance-construction-two-new-solar-power-plants-senegal-part-scaling-solar.

Proparco (2017), "Senegal: Inauguration of West Africa's largest solar power plant", www.proparco.fr/en/actualites/senegal-inauguration-west-africas-largest-solar-power-plant

Quantum Global (2017), *Sovereign Wealth Funds as a Driver of African Development*, http://quantumglobalgroup.com/wp-content/uploads/2017/10/Sovereign-Wealth-Funds-as-a-driver-of-African-development.pdf.

REN21 (Renewable Energy Policy Network for the 21st Century) (2020), *Renewables 2020: Global Status Report,* REN21 Secretariat, Paris, www.ren21.net/wp-content/uploads/2019/05/gsr_2020_full_report_en.pdf.

Reuters (2017), "Fitch rates Sindicatum's guaranteed bonds 'AA-(EXP)'", https://af.reuters.com/article/africaTech/idAFFit2IyjV7.

SASB (Sustainability Accounting Standards Board) and CDSB (2017), "Converging on climate risk: CDSB, the SASB, and the TCFD. The emerging alignment of market-based approaches to climate-related financial disclosure", www.cdsb.net/sites/default/files/sasb_cdsb-tcfd-convergingonclimaterisk-091317-web.pdf.

Schroders (2019), *Schroders Institutional Investor Study 2018: Institutional Perspectives on Sustainable Investing*, www.schroders.com/en/sysglobalassets/schroders_institutional_investor_study_sustainability_report_2018.pdf.

Schwartzkopff, F. (2019), "Pension funds in Denmark pledge $52 billion in green investments", www.bloomberg.com/news/articles/2019-09-23/pension-funds-in-denmark-target-52-billion-in-green-investments?sref=SG2VOMNd

Seekings, C. (2019), "Solvency II rules hindering sustainable investments, ABI warns", www.theactuary.com/news/2019/03/solvency-ii-rules-hindering-sustainable-investments-abi-warns/.

Sindicatum Renewable Energy (2019), "About us", www.sindicatum.com/about-us/at-a-glance/.

Singleton, L. (2018), "UK green companies generate greater returns for clean energy investing", www.imperial.ac.uk/news/186375/uk-green-companies-generate-greater-returns/.

Slezak, M. (2018), "Super fund REST being sued for not having a plan for climate change", www.abc.net.au/news/2018-07-25/super-fund-rest-sued-for-not-doing-enough-on-climate-change/10029744.

Sustainalytics (2017), *Sindicatum Renewable Energy Company Green Bond. Second Opinion by Sustainalytics*, www.sustainalytics.com/wp-content/uploads/2018/01/Sindicatum-Green-Bond-Opinion_FINAL-13112017.pdf.

SWFI (Sovereign Wealth Funds Institute) (2019), "Top 89 largest sovereign wealth fund rankings by total assets (as of November 2019)", www.swfinstitute.org/fund-rankings/sovereign-wealth-fund.

SWFI (2018), "Sovereign wealth funds rankings by total assets (as of August 2018)", www.swfinstitute.org/sovereign-wealth-fund-rankings/.

TCFD (Task Force on Climate-Related Financial Disclosures) (2019a), "About | Task Force on Climate-Related Financial Disclosures", www.fsb-tcfd.org/about/#.

TCFD (2019b), *2019 Status Report*, www.fsb-tcfd.org/wp-content/uploads/2019/06/2019-TCFD-Status-Report-FINAL-053119.pdf.

TCFD (2017), *Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures*, www.fsb-tcfd.org/wp-content/uploads/2017/06/FINAL-TCFD-Report-062817.pdf.

The Economist (2020), "Is it the end of the oil age?", www.economist.com/leaders/2020/09/17/is-it-the-end-of-the-oil-age.

Tuck, N. (2020), *Sweden's AP1 to divest fully from fossil fuels*, www.europeanpensions.net/ep/Sweden-AP1-to-divest-fully-from-fossil-fuel.php#:~:text=Sweden%E2%80%99s%20AP1%20fund%20has%20announced,carbon%20neutral%20portfolio%20by%202050.

Tweed, A. (2016), "Bigger risk, bigger returns in renewable energy's emerging markets", www.greentechmedia.com/articles/read/bigger-risk-bigger-returns-in-renewable-energys-emerging-markets#gs.g4pfsj.

UN (United Nations) (2019), "Press release: 30 business titans join UN push to scale up private sector investment for sustainable development", www.un.org/sustainabledevelopment/blog/2019/10/gisd-alliance/.

UNDP (United Nations Development Programme), 2017. *Lebanon: Derisking Renewable Energy Investment*, www.uncclearn.org/sites/default/files/inventory/undp-lecb-lebanon-drei-full-report-2017.pdf.

UNPRI (United Nations Principles for Responsible Investment) (2019), "About the PRI", www.unpri.org/pri/about-the-pri.

UNPRI (2017), *PRI Reporting Framework 2017. Snapshot Report*, https://app.powerbi.com/view?r=eyJrIjoiZjA2OTA5MWUtMzc4OC00MTZhLWIyZDYtYTc3NDMzOGE1OGFjIiwidCI6ImZiYzI1NzBkLWE5OGYtNDFmMS1hOGFkLTEyYjEzMWJkOTNlOCIsImMiOjh9.

UNPRI (2015), "What is fiduciary duty and why is it important?", www.unpri.org/fiduciary-duty/what-is-fiduciary-duty-and-why-is-it-important/247.article.

WEF (World Economic Forum) (2016), *Renewable Infrastructure Investment Handbook: A Guide for Institutional Investors*, http://www3.weforum.org/docs/WEF_Renewable_Infrastructure_Investment_Handbook.pdf.

WindEurope (2018), *Financing and Investment Trends. The European Wind Industry in 2018*, https://windeurope.org/wp-content/uploads/files/about-wind/reports/Financing-and-Investment-Trends-2018.pdf.

Winkler, M. (2020), "Socially Conscious Investing Thrives Amid Pandemic", www.bloomberg.com/opinion/articles/2020-07-28/esg-investing-thrives-amid-coronavirus-pandemic?sref=6K2T7rH3.

World Atlas (2017), "The wealthiest charitable foundations in the world", www.worldatlas.com/articles/which-are-the-wealthiest-charitable-foundations-worldwide.html.

World Bank (2019), "Scaling Solar", www.scalingsolar.org/.

World Bank (2018a), *Global Investment Competitiveness Report 2017-2018: Foreign Investor Perspectives and Policy Implications (English)*, http://documents.worldbank.org/curated/en/169531510741671962/Global-investment-competitiveness-report-2017-2018-foreign-investor-perspectives-and-policy-implications.

World Bank (2018b), "The power of sunlight: Incentivizing private investment in solar PV", http://blogs.worldbank.org/ppps/power-sunlight-incentivizing-private-investment-solar-pv.

WRI (World Resource Institute) (2016), *Navigating the Sustainable Finance Landscape*, www.wri.org/publication/sustainable-investment-landscape.

WTW (Willis Tower Watson) (2019), *Global Pension Assets Study 2019*, www.thinkingaheadinstitute.org/-/media/TAI/Pdf/Research-Ideas/GPAS_2019_final.pdf.

WTW (2018), *Global Pension Assets Study 2018*, www.willistowerswatson.com/en-CA/Insights/2019/02/global-pension-assets-study-2019.

WTW (2017), *The World's 300 Largest Pension Funds – Year Ended 2017*, www.willistowerswatson.com/en-AE/insights/2018/09/the-worlds-300-largest-pension-funds-year-ended-2017.

WWF (World Wildlife Fund) (2018), "Eight national banks and WWF-Indonesia launch the 'Indonesia Sustainable Finance Initiative' ISFI", www.wwf.or.id/?66702/Eight-National-Banks-and-WWF-Indonesia-Launch-the-Indonesia-Sustainable-Finance--Initiative-ISFI.

IRENA
International Renewable Energy Agency

MOBILISING INSTITUTIONAL CAPITAL FOR RENEWABLE ENERGY

IRENA HEADQUARTERS
P.O. Box 236, Abu Dhabi
United Arab Emirates

www.irena.org