



# Steering global investment to be consistent with the vision of the Paris Agreement

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## Main messages

- The role of private investment becomes more and more important and it is crucial for achieving the vision of the Paris Agreement to make an investment portfolio that is not only robust against climate risks but also beneficial for developing countries such that their development aspiration can be fulfilled.
- There are increasing number of investment initiatives for such purposes by various stakeholders including international institutions, national and local governments, central banks, private investors, CSOs and researchers.
- This paper presents some of major investment initiatives, discusses the remaining gaps and makes recommendations for steering investment portfolio in consistence with the vision of the Paris Agreement.
- It is observed that the most advanced actions are taken to reflect financial risks of carbon intensive assets, supported by research communities that provide useful information such as carbon footprint, potential impacts of climate change, and risk premium associated with climate change.
- Investment flows are gradually shifting to low-carbon, but there is little investment to promote resilient society. Similarly, investment in low-carbon has been discussed and initiated mainly in the context of developed countries, and not much in developing countries.
- It is natural for business and investors to concentrate their efforts in areas with higher expected returns. Some rules or frameworks to increase expected returns of investments in adaptation area or in developing countries must be developed to fill the gaps, and governments and international organisations are expected to take proactive actions to do so. In this context, policy alignment across different policy objectives is an important issue.
- For the government and international institutions to take such proactive actions, wider recognition is needed of risks/costs of inactions in adaptation and in low-carbon investment in developing countries by various stakeholders. Further research to demonstrate such risks/costs and communication of such knowledge to various stakeholders in particular policymakers, business and investors is crucially important.

# 1. Introduction

## 1.1 Implications of the Paris Agreement to investment decisions

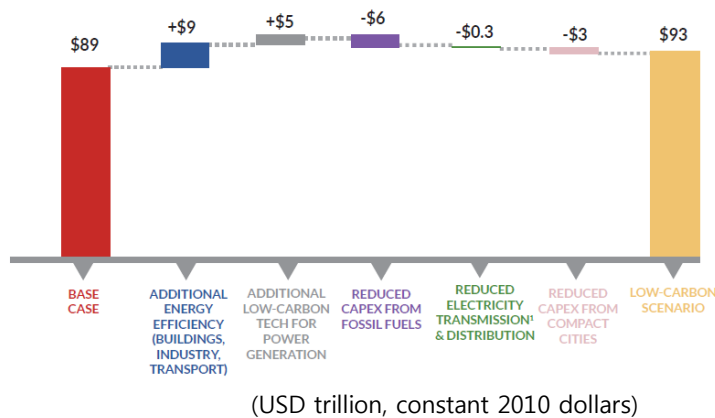
The Paris Agreement sent out a clear signal to investors, both public and private investors alike, that the world must endeavour to achieve net zero greenhouse gas (GHG) emissions in the second half of this century. The success of the COP21 in delivering this most ambitious outcome in the history of climate negotiation reflects now globally prevailing recognition that risks associated with climate change are becoming more and more real and have already been realised to a certain extent, and this fact has the following two key implications for investment decisions:

- Investment is expected to contribute to the realisation of net zero GHG emissions worldwide as well as to making the world robust and resilient against physical climate risks.
- Investment itself must be robust and resilient against physical climate risks as well as financial risks associated with tighter climate policies.


## 1.2 Global investment requirements to achieve climate goals

According to the New Climate Economy report (New Climate Economy, 2014), the global infrastructure investment requirement for 2015 - 2030 is estimated at USD 89 trillion without taking into account necessary actions to combat climate change, and a significant investment shift will be necessary to make infrastructure consistent with the 2°C target (see Figure 1: Low-Carbon Scenario corresponds to the investment consistent with the 2°C target).

Figure 1: Indicative estimate of global investment requirements for 2015-2030



Source: New Climate Economy (2014)



In addition, adaptation requires large-scale investment. There are many estimates of adaptation cost and the estimation varies dependent on its assumption, but for instance, World Bank (2010) estimated that USD 71-81 billion would be required annually until 2030 (it means in total USD 1.4 - 1.6 trillion) to implement adaptation in developing countries.

### 1.3 Recent efforts to meet investment requirements for attaining climate goals

The primary challenge to meet these investment requirements is not a shortage of capital but a lack of short-term profitability of mitigation and adaptation investment. Climate change is characterised as a long term event with high uncertainty. Conventional cost benefit analysis often fails to reflect real cost of such event, and real benefits of mitigation and adaptation have not been well captured by investors.

However, cumulative scientific knowledge as well as frequent extreme weather events worldwide make people more aware of climate risks than before. In addition, the issue of stranded assets associated with unburnable fossil fuels highlighted another type of climate risk, that is, a large part of currently confirmed fossil fuel reserve will not be used under stricter climate policies consistent with the 2°C goal and there is a significant risk that fossil fuel related assets such as reserves and fossil fuel based power plants will be stranded. An increasing number of investors is recognising these risks, and there is plenty of opportunities to utilise their investment to promote mitigation and adaptation worldwide through some mechanisms to reflect long-term benefits of addressing these risks into rate of return to the investment.

In this context, the above-mentioned two key implications are closely interlinked. Efforts to make investment robust against various climate risks will increase short-term profitability of mitigation/adaptation investments. The Paris Agreement gives incentive for investors to address inconsistency between current investment portfolio and climate goals, and business decisions that properly reflect the importance of both managing climate risks and meeting investment demand of developing countries for taking climate actions will be essential to effectively implement the Paris Agreement.

In 2015, global climate finance rose up to USD 391 billion, which include mitigation and adaptation: USD 141 billion from governments and intermediaries and USD 243 billion from private sector (CPI, 2015). Hence, the amount of current climate finance is by far less than climate finance needed for what the Paris Agreement asks for. Public finance is expected to increase in the UNFCCC negotiation by developing countries, but this will not definitely fill this financial gap completely, given the volume of public money and fiscal situation of the Annex II countries. Hence, how to redirect or mobilise private sector to climate change mitigation/adaptation should be examined.

In this context, under the UNFCCC, larger role of private finance mobilisation has been long discussed. Among the three windows of Green Climate Fund (GCF), one is specifically for the private sector and this will be expected to mobilise private sector for climate change. Also, if not the amount is not as large as GCF, Global Environmental Facilities (GEF) has been contribute to supporting private sector involvement in mitigation.

Outside of the UNFCCC, there are many bilateral/multilateral development financial institutions such as World Bank Group have been supporting mobilisation of climate finance for climate change. These financial institutions have been making efforts for mobilisation of private finance through not only providing loans to private companies, but also issuing climate-related bonds such as World Bank Green Bonds.


## 1.4 Major means to move forward a low-emission society

There may be four categories of means shifting high-emission to low-emission society:

(1) Regulation: Regulation on high-emission sector is a direct and one of the most-strong instrument in achieving Paris Agreement. Types of such regulation includes limiting/abolishing emission of coal-fired power plant, employing low-carbon technologies, requiring a certain amount of renewable energy in the production of gasoline, establishing an criteria of energy efficiency to products that have impacts on energy consumption such as window. One example is that direct emission regulation on high-emission sector such as Zero Emission Vehicles (ZEVs) (first adopted in 1990) in California, whose goals is to have zero emission technologies as quickly as possible. This regulation (amended in 2012) required over 15% of new vehicle sales to be ZEVs and hydro-electric vehicles (PHEV) by 2025 (California Air Resources Board, 2012), which would give direct and strong incentives to companies to invest in these area.

Mobilisation or re-direction of climate finance can be also realised through government or international regulation e.g. regulation on high-emission sector. One example is that in January, 2016, California's Insurance Commissioner, Dave Jones, who leads the California Department of Insurance and regulates the California insurance market, called for insurance industry divestment from coal (The California Department of Insurance, 2016). Or, if not regulating the high-emission sector directly, regulating more information disclosure on their emission etc will give private sector incentives to redirect their investment.

(2) Economic instruments: Various economic instruments such as emission trading scheme, carbon tax, and feed-in-tariff for renewable energy have played important roles to shift from carbon intensive technologies/sectors to low-carbon/carbon-free alternatives. In addition to regulatory actions, increasing number of companies voluntarily implement internal carbon prices as a planning tool for their business operations to identify opportunities and risks of mitigation actions (CDP North America, 2013).



(3) Subsidy: This includes financial support by multilateral development banks (MDBs) and GCF. It is also implemented at the government level. An example is the Green Investment Bank in UK whose business model is to mobilise other private sector capital, crowding in additional finance (Green Investment Bank, 2016).

(4) Voluntary initiatives by private sector: In contrast with the above three categories whose actions are mainly by government or international institutions, there are initiatives by private sector themselves. These initiatives varies from reallocation to information disclosure at the different levels.

Among them this paper focuses on investors, and it presents some major initiatives by institutional investors who are making efforts to contribute to climate change (Category 4: Voluntary Initiatives). In addition, activities of other stakeholders who are contributing to such efforts of institutional investors are also introduced, i.e. international institutions, subnational/national/central banks, and research communities.<sup>1</sup> It then discusses how to further advance these efforts and fill the remaining gaps in steering investment portfolio consistent with the vision of the Paris Agreement.

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<sup>1</sup> Please note that the scope of our survey is not comprehensive and only some major initiatives are presented.

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## 2. Ongoing related initiatives

### 2.1 Investors

There are already many initiatives by investors themselves for addressing inconsistency. On the website of the Investor Platform for Climate Action, 19 initiatives are listed as shown in Table 1, where in total, more than 400 investors from 40 countries participate, amounting to USD 25 trillion. Initiatives can be classified into four types: one for measurement of the carbon footprint of investment portfolios; nine for engagement; two for reallocation of investment to low emission; and seven for reinforcement (Investor Platform for Climate Action, 2016).

Table 1: Indicative estimate of global investment requirements for 2015-2030

Type of Initiative	Names of Initiatives
Measurement (1)	<ul style="list-style-type: none"> <li>• Montréal Carbon Pledge</li> </ul>
Engagement (9)	<ul style="list-style-type: none"> <li>• Aiming for A</li> <li>• Carbon Asset Risk</li> <li>• CDP Carbon Action</li> <li>• Ceres Shareholder Initiative on Climate Sustainability</li> <li>• GES Carbon Risk Engagement</li> <li>• IIGCC Initiative on EU Company Climate Lobbying</li> <li>• Investor Expectations on Corporate Climate Risk Management</li> <li>• PRI Investor Working Group on Corporate Climate Lobbying</li> <li>• Regnan Climate Change Resilience Engagement</li> </ul>
Reallocate (2)	<ul style="list-style-type: none"> <li>• Portfolio Decarbonization Coalition</li> <li>• Low Carbon Registry</li> </ul>
Reinforce (7)	<ul style="list-style-type: none"> <li>• Global Investor Statement on Climate Change</li> <li>• CDSB Fiduciary Duty &amp; Climate Change Disclosure</li> <li>• Climate Bonds Initiative</li> <li>• EU and G20 Governments to enable more investment in energy efficiency</li> <li>• Investor Expectations for Oil &amp; Gas Companies</li> <li>• Investor Expectations on Corporate Climate Lobbying</li> <li>• Statement of Investor Expectations for the Green Bond Market</li> </ul>

Source: Authors based on Investor Platform for Climate Action (2016)

In the context of investment, "Measurement" refers to measuring the carbon footprint of the investment portfolio. Also, "Engagement", in the context of investment, is any communication between a company and its investors such as broad and indirect engagement e.g. websites, press releases, written communication (The Conference Board

Governance Center Advisory Board on & Engagement, 2014). "Reallocate" refers to reallocating investors' portfolio from high-emission to low-emission. Finally, "Reinforce" in this context means other initiatives that reinforce the above efforts to address the risks and opportunities of climate change (Investor Platform for Climate Action, 2016).

It is the Global Investor Coalition on Climate Change (the Coalition) that established the Investor Platform for Climate Action. The Coalition is composed of four regional climate change investor groups: the Investor Network on Climate Risk (INCR) (North America), Institutional Investors Group on Climate Change (IIGCC) (Europe), Investor Group on Climate Change (IGCC) (Australia & New Zealand) and Asia Investor Group on Climate Change (AIGCC) (Asia). Table 2 describes each groups and their activities/achievements.

Table 2: Regional investor groups of the Global Investor Coalition on Climate Change

Network	Members, Activities and Achievement
The Investor Network on Climate Risk (INCR) (North America)	<ul style="list-style-type: none"> <li>● Composed of more than 120 institutional investors representing more than \$14 trillion in assets.</li> <li>● Recent activities and achievements are:-               <ul style="list-style-type: none"> <li>➢ In 2013, announced a proposal to require corporate listings across global stock exchanges to disclose ESG information</li> <li>➢ In 2010, a petition by INCR members made the Securities &amp; Exchange Commission issue guidance on climate-related material risks that publicly held companies must disclose in their financial filings</li> </ul> </li> </ul>
The Institutional Investors Group on Climate Change (IIGCC) (Europe)	<ul style="list-style-type: none"> <li>● Composed by over 120 members, representing over €13 trillion in assets</li> <li>● Recent activities are:-               <ul style="list-style-type: none"> <li>➢ In 2016, called for the need for action to ensure capital allocation decisions to achieve less than 2 degrees at the AGM of oil and gas companies.</li> <li>➢ In 2015, 120 investor CEOs representing more than \$12 trillion wrote an open letter to G7 finance ministers urging them to support the inclusion of a long-term emissions reduction goal in the Paris Agreement</li> </ul> </li> </ul>
Investor Group on Climate Change (IGCC) (Australia and New Zealand)	<ul style="list-style-type: none"> <li>● Composed of investors representing over \$1 trillion, and others in the investment community interested in the impact of climate change on investments</li> <li>● Various activities were conducted including making a policy submission, advocacy works, research and engagement, including policy advocacy works focusing on Australia's post 2020 national emissions reduction target</li> </ul>
Asia Investor Group on Climate Change (AIGCC) (Asia)	<ul style="list-style-type: none"> <li>● Now calling for participation.</li> </ul>

Sources: Made by authors based on the webpage of Ceres, the Institutional Investors Group on Climate Change (IIGCC) and the Investor Group on Climate Change (IGCC) and Investor Group on Climate Change (2015) The Conference Board Governance Center Advisory Board on & Engagement (2014)

As shown above, there are many investor-networks that collectively work in line with the context of the Paris Agreement. It is found that many of them are to contribute to GHG



emission reduction and preparedness for financial risks. Initiatives for engagement or reallocation are directly or indirectly contribute to GHG emission reduction and resilience of financial sectors. Initiatives for measurement are contributing not only to quantification of financial risks or exposure to climate change but to avoidance of litigation risks of investors, by disclosing information as to how much they are exposed to climate change and how much they are contributing to GHG emission reduction.

Recently, there has been a steady growth in climate litigation across multiple jurisdictions and investors are not exempt from these trends (Keely, Julie-Anne, & Stephen, 2016). For instance, in 2015 in the Philippines, investor-owned Carbon Majors, including Chevron, ExxonMobil, Rio Tinto, Lukoil and Massey Coal were sued by the Philippine Reconstruction Movement and Greenpeace Southeast Asia for causing climate change and the violation of human rights (Keely et al., 2016). Another example is in 2002, Friends of the Earth, Greenpeace and the city of Boulder, Colorado filed the Export-Import Bank and the Overseas Private Investment Corporation filed a case in District Court for the Northern District of California, alleging that these two US government agencies had supported oil fields, pipelines and coal-fired plants in developing countries over the previous 10 years without assessing the impacts on the environment including global warming (IPCC, 2007). A Federal Judge in California has ruled in favour of the plaintiffs (IPCC, 2007).

On the other hand, there are hardly any initiatives for adaptation or initiatives for contribution to climate finance '100 million pledge annually by 2020' from developed countries to developing countries. It is not surprising, though, because according to the World Bank, only 4 percent of the 500 largest cities in developing countries are deemed creditworthy (World Bank, 2013), investors are difficult to be involved in. Also, these initiatives have been led by Europe and the US investors, whereas investors in other areas are not active. It is expected that the new-born Asia Investor Group on Climate Change (AIGCC) will catalyse investment in Asia and beyond.

## 2.2 International Institutions

There are many initiatives by international institutions, which are addressing inconsistency between the current investment portfolio and climate goals. These initiatives are contributing to initiatives by private investors to redirect their investment to low-emission sector. This paper introduces some of the major initiatives.

Financial Stability Board (FSB)'s Task Force on Climate-related Financial Disclosures (FSBTF): In the G20 Communiqué, the FSB was asked to convene public and private sector participants to review how the financial sector can take account of climate-related issues. The FSB then proposed it would set up of an industry-led disclosure task force to develop voluntary, consistent climate-related disclosures of the sort that would be useful to lenders, insurers, investors and other stakeholders in understanding material risks (Financial Stability Board, 2015). The background of this proposal is that despite the fact that there are already

almost 400 information disclosure/reporting schemes relating to climate or sustainability, it is argued by Mark J. Carney, the Governor of Bank of England that there was an information gap to understanding climate change risk adequately (Japan Research Institute, 2016). Against this background, FSB's Task Force on Climate-related Financial Disclosures (FSBTf) was established during COP21 in 2015. This is an industry-led initiative where the chair of the TSBTF is Michael Bloomberg, the founder of Bloomberg LP and 30 members are all from business. Its mission is to develop voluntary, consistent climate-related financial risk disclosures for use by companies in providing information to investors, lenders, insurers, and other stakeholders (Task Force on Climate-related Financial Disclosures, 2016). It will seek to develop a set of recommendations and guidelines for voluntary disclosure by identifying leading practices to improve consistency, accessibility, clarity, and usefulness of climate-related financial reporting at the end of 2016 (Task Force on Climate Related financial disclosures, 2016). The new framework is intended to cover a broader scope than the existing initiatives, focusing more on climate change and assuring disclosure of necessary information.

United Nations Environment Programme (UNEP): UNEP has also played a major role in investment in climate change. Together with the Cambridge Institute for Sustainability Leadership (CISL) of University of Cambridge, it published a report 'Stability and Sustainability in Banking Reform: Are Environmental Risks Missing in Basel III?' (Institute for Sustainability Leadership University of Cambridge and UNEP FI, 2014). It made some recommendations that: the Basel Committee encourage and support bank regulators to collect the data and analyse environmental risks of banking sector; bank supervisors examine incorporating scenarios that estimate the potential financial stability impacts and examine banks' information-disclosure on their exposure to environmental risks in a globally common manner; national financial institutions consider their positive role in climate change; and financial regulators are encouraged to invest more in green assets.(Institute for Sustainability Leadership University of Cambridge and UNEP FI, 2014)

In addition, UNEP established an 'Inquiry: Design of a Sustainable Financial System', intending to support actions of financial system for sustainable and low-carbon economy by identifying best practice, and exploring financial market policy and regulatory innovations that would support the development of a green financial system (UNEP, n.d.).

United Nations Development Programme (UNDP): The above are the initiatives at the global level, but international institutions are also active at the local level. For instance, in Viet Nam, UNDP has been advocating the fossil fuel fiscal reform by the Vietnamese Government. In its report 'Fossil Fuel Fiscal Policies and Greenhouse Gas Emissions in Viet Nam,' it recommends that it remove indirect subsidies and selectively introduce differentiated fossil fuel taxes (UNDP, 2012), in the face of government subsidy to fossil-fuel energy in Viet Nam, where resulting in low-competitiveness of renewables.

As showed above, international institutions have been already working on encouraging investors' contribution to climate change mitigation both in terms of GHG emission reduction and reallocation of investment to 'green,' Whereas, these efforts by international

institutions on investors more or less seemed to be separated from or do not include the issues of supporting 'developing countries' financially. Their efforts are more focused on information disclosure and reallocation to 'somewhere', not developing countries, though mobilising private finance is very hot-topic under the United Nations Framework Convention on Climate Change (UNFCCC) and even some developing countries argue that they need private investment for their climate finance mobilisation in their Intended Nationally Determined Commitments (INDCs).

## 2.3 National/Sub-national Governments and Central Banks

There are a number of actions that were already taken by central banks, to address inconsistency between the current investment portfolio and climate goals in the context of investors. The actions are taken not only by developed countries, but by developing countries such as China, Brazil, Nigeria, Indonesia, Mongol, Kenya, Peru and Viet Nam, but the following actions are some major events recently. The following initiatives are some major actions by governments and central banks.

- European Systemic Risk Board (ESRB): European Systemic Risk Board (ESRB), in its report 'Too late, too sudden: Transition to a low-carbon economy and systemic risk', established two scenarios: a benign case where there is systemic risk via three main channels: (i) the macroeconomic impact of sudden changes in energy use; (ii) the revaluation of carbon-intensive assets; and (iii) a rise in the incidence of natural catastrophes, and an adverse case where the transition to a low-carbon economy occurs late and abruptly (a group of the ESRB Advisory Scientific Committee, 2016). In conclusion, it suggests that to quantify the importance of these channels, policymakers could aim for enhanced disclosure of the carbon intensity of non-financial firms and the related exposures of financial firms could then be stress-tested under the adverse scenario of a late and sudden transition (a group of the ESRB Advisory Scientific Committee, 2016).
- France: Energy Transition for Green Growth Act was enacted in August 2015, before COP21. The Act contains a broad range of policies, but Article 173 is related to institutional investors. It requires institutional investors to include in their annual reports the social and environmental impacts of their investment policy, in particular how climate change related risks are taken into account and how GHG emissions are measured (Ministry of Ecology Sustainable Development and Energy, 2015) (Galhau, 2015).
- California, US: In January, 2016, California's Insurance Commissioner, Dave Jones, who leads the California Department of Insurance and regulates the California insurance market, called for insurance industry divestment from coal (The California Department of Insurance, 2016).
- Bank of England: In May 2016, the Bank of England published a working paper, 'Let's talk about the weather: the impact of climate change on central banks.' The paper examines the channels via which climate change and policies to mitigate it could affect a central

bank's ability to meet its monetary and financial stability objectives and argues that two types of risks are particularly relevant for central banks: physical risks and transition risks (Batten, Sowerbutts, & Tanaka, 2016). It then suggests climate-related disclosure could facilitate an orderly transition to a low-carbon economy if it helps a wide range of investors better assess their financial risk exposures (Batten et al., 2016).

## 2.4 Research institutions and university

There are many other research institutions and universities that are supporting investors' action on climate change. These researchers are quantifying the financial risks or demonstrating the gap between the current investment and the 2°C goal and providing information to investors. The paper introduces some of the major activities.

- University of Oxford: In 2012, Sustainable Finance Programme at the University of Oxford's Smith School of Enterprise and the Environment was established to understand how finance and investment intersects with the environment and sustainability. One of the major recent achievement of the Programme is the report funded by the Norges Bank Investment Management (NBIM), 'Stranded Assets and Thermal Coal: An analysis of environment-related risk exposure (Caldecott, Dericks, & Mitchell, 2016a)'. The report examined 100 coal-fired utilities, top 20 thermal coal miners, and top 30 coal-to-liquids, in terms of how they are exposed to environmental-related risks. The outcome is that in April 2016, Norges Bank Investment Management decided to divest from 52 coal-related companies (Norges Bank Investment Management, 2016)'. In May, 2016, it also published 'Stranded Assets and Thermal Coal in Japan: An analysis of environment-related risk exposure' which examined to what extent all of Japan's current and planned coal-fired power stations are exposed to environment-related risks. It found that stranded coal assets could be JPY 6,857 billion - JPY 8,924 billion (USD 61.6 billion - USD 80.2 billion), equivalent to 22.6% - 29.4% of the current market capitalization, and 4.5%-5.9% of total assets, of Japan's power utilities. (Caldecott, Dericks, & Mitchell, 2016b)
- The Cambridge Institute for Sustainability Leadership (CISL), University of Cambridge: The Cambridge Institute for Sustainability Leadership (CISL) initiated many research activities. Their recent publication includes a report 'Unhedgeable risk: How climate change sentiment impacts investment' which tried to modelled the economic impacts of a series of plausible climate scenarios to test the vulnerability of investment portfolios to short-term swings in sentiment (Cambridge Institute for Sustainability Leadership, 2015).
- Carbon Tracker: Carbon Tracker is a non-profit financial think-tank and aiming at providing the financial and regulatory analysis to ensure that the risk premium associated with fossil fuels is correctly priced (Carbon Tracker, 2015a). It also conducts several research on the stranded assets. For instance, in 2013, it published 'Unburnable carbon 2013: Wasted capital and stranded assets', which found that between 60-80% of coal, oil and gas reserves of publicly listed companies are 'unburnable' if the world is to stay below 2°C global warming (Carbon Tracker, 2015a).

- The 2° Investing Initiative (2°ii) : The 2° Investing Initiative (2°ii), a multi-stakeholder think tank working to align the financial sector with 2°C climate goals, was founded in 2012. It has conducted wide range of research, but it recently published 'Assessing the Alignment of Portfolios with Climate Goals: Climate Scenarios Translated into a 2°C Benchmark', which provides comparison between energy and technology exposure of a portfolio and the 2°C roadmap of the International Energy Agency (IEA) (2° Investing Initiative, 2015)
- Ceres: Ceres is a non-profit organisation advocating for sustainability leadership, established in 1989. It has been playing an important role in mainstreaming institutional investors into climate change issues. It established the Investor Network on Climate Risk (INCR), a network of more than 120 institutional investors representing more than USD 14 trillion in assets committed to addressing climate change and other key sustainability risks, while building low-carbon investment opportunities (Ceres, 2016c). Ceres also working on an issue of stranded asset, called 'the Carbon Asset Risk Initiative'. This initiative tries to prevent fossil fuel companies from wasting investor capital by demonstrating how carbon risk poses an existential threat to their business models and lead their capital loss at risk (Ceres, 2016b). A recent major event held by Ceres together with the United Nations Foundation and the United Nations Office for Partnerships is the '2016 Investors Summit on Climate Risk: An event 'Advancing the Clean Trillion,' At the event, investors discussed implications of the Paris Agreement to sustain the momentum from Paris and catalyse further actions that investors, businesses and governments can take to shift our economy to a low-carbon future (Ceres, 2016a). The title of the event 'Clean Trillion' came from the report produced by Ceres, recommending to investors, companies and policymakers to increase annual global investment in clean energy to at least USD 1 trillion by 2030 (Fulton & Capalino, 2014).


### 3. Discussion and recommendations

The Paris Agreement sets a clear collective goal of the all parties to the global community, that is, achieving net zero GHG emissions in the second half of this century. It requires transformation of various parts of the social and economic systems underpinned by properly targeted investment from both public and private investors. In particular, the role of private investment becomes more and more important, and it is crucial to achieve the vision of the Paris Agreement to make investment portfolio not only robust against climate risks but also beneficial for developing countries such that their development aspiration can be fulfilled. There are an increasing number of initiatives for such purpose by various stakeholders including international institutions, national and local governments, central banks, private investors, CSOs and researchers, and this paper presents some of major initiatives and discusses the remaining gaps and makes recommendations for steering investment portfolio in consistence with the vision of the Paris Agreement.

It is observed that the most advanced actions have gradually taken to reflect financial risks of carbon intensive assets, most notably represented by the issue of stranded assets. Some prominent investors including Norway's pension fund (the world's largest sovereign fund) and the Rockefeller Brothers Fund have already started divestment from fossil fuel assets, and it is estimated that more than 500 institutional investors have implemented or announced divestment from fossil fuel assets as of December 2015 (Carbon Tracker, 2015b). These investors' initiatives are facilitated by research communities that provide useful information such as quantitative estimates of life cycle carbon emissions, potential impacts of climate change, and risk premium associated with climate change.

As a consequence of climate risk reflection to investment decisions, investment flows are gradually shifting to low-carbon alternatives: in 2015, global investment in renewable energy produced a new record and the amount of money committed to renewables excluding large hydro-electric projects rose to USD 285.9 billion (UNEP and Bloomberg New Energy, 2016). On the other hand, investment to promote resilient society are not much. Although some good practices of business involvement in adaptation have been found gradually (UNFCCC, 2016), efforts should be more needed for this area. Similarly, reallocation of investment from high to low emissions has been discussed and initiated in the context of developed countries, but shifting investment to meet demands of developing countries has hardly been discussed so far. Providing USD 100 billion climate finance for developing countries annually is one of the key global goals until 2020, but how private investment can contribute to this goal is not much discussed or limited.

It is natural for business and investors to concentrate their efforts to the areas with higher expected returns. In other words, some rules or frameworks to increase expected returns of investments in adaptation area or in developing countries must be developed to fill the gaps. Governments and international organisations are expected to take proactive actions to do so. In addition, it must be pointed out the importance of policy alignment across



different policy objectives. For example, the World Bank has implemented USD 200 million renewable energy development project in Viet Nam since 2009, but lack of policy coordination in electricity price setting hindered planned development of renewable energy, that is, while setting higher electricity price was needed to make renewable energy competitive, the government kept low electricity price for fuelling economic growth as well as for poverty consideration (World Bank, 2011). Another example is a potential policy misalignment between financial stability rule and low-carbon investment (OECD/IEA/NEA/ITF, 2015). It is argued that Basel III may discourage private investors to invest in low-carbon, climate-resilient infrastructure because the capital and liquidity requirements of Basel III may reduce the amount of capital available for long-term investment (OECD/IEA/NEA/ITF, 2015).

For the government and international institutions to play these expected roles, wider recognition of risks/costs of inactions in adaptation and in low-carbon investment in developing countries by various stakeholders is needed. Further research to demonstrate such risks/costs and communication of such knowledge to various stakeholders in particular policymakers, business and investors is crucially important. Actually, investors would take proactive actions by themselves once they could recognise such risks/costs of inactions, and it would be much easier for policymakers to implement supportive measures for such actions than to introduce rules/policies to shift investment to adaptation or to low-carbon investment in developing countries.



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