
Mizuho Economic Outlook & Analysis

June 5, 2019

Building momentum for measures against climate change

*Risks and investment opportunities cited by central banks
and regulatory authorities*

< Summary >

- ◆ Amid the significantly changing global perceptions of climate change, companies are being called upon to make rules-based responses under a new framework targeting on the goals of the Paris Agreement.
- ◆ A virtuous cycle of the environment and growth is the key to the paradigm shift toward a low-carbon society that creates investment opportunities and significantly changes money flows while entailing some risks.
- ◆ Japan with its excellent green technologies is expected to send out a powerful message and contribute to the entire world by regarding the realization of a decarbonizing society, a truly global issue, as a long-term growth strategy.

Mizuho Research Institute Ltd.
Naoyuki Yoshikawa, Senior Economist
Research Department -Financial Market
Mizuho Research Institute Ltd.
naoyuki.yoshikawa@mizuho-ri.co.jp

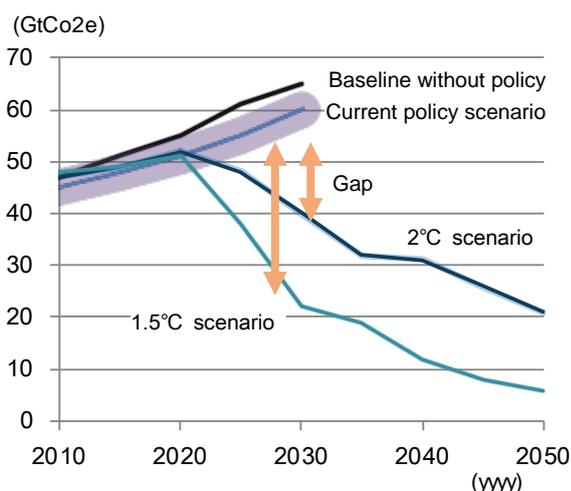
This publication is compiled solely for the purpose of providing readers with information on a free-of-charge basis and is in no way meant to solicit transactions. Although this publication is compiled on the basis of sources which we believe to be reliable and correct, Mizuho Research Institute does not warrant its accuracy and certainty. Readers are requested to exercise their own judgment in the use of this publication. Please also note that the contents of this publication may be subject to change without prior notice. In the event readers do not wish to receive information free of charge from Mizuho Research Institute, readers are requested to notify their wish to suspend subscription.

1. Recent developments related to climate change

The broad-based movement calling for measures to address global warming, called “Extinction Rebellion (XR),” is spreading in the United Kingdom. The movement is nonviolent protest activities to hold climate change in check, characterizing it as a crisis for life on earth. Over 1,000 activists were arrested after they occupied central London, and in May 2019, the House of Commons adopted a motion for “an environment and climate emergency,” declaring a state of emergency.¹ The declaration of a climate emergency began in Australia in 2016, and a lot of local governments in the United Kingdom, the United States, Canada and other countries adopted similar declarations, reflecting spreading concerns over climate change in many parts of the world and giving rise to expectations about quick actions to address climate change.

Among scientists, emissions of greenhouse gas (GHG) by combustion of fossil fuels are generally considered to be the primary cause of global warming, but there remains a considerable gap to attain the targets under the Paris Agreement² (**Chart 1**).

Chart 1: Annual GHG emissions



Note: Image chart.
Source: Made by MHRI based on UN Environment Programme (UNEP).

Chart 2: Global risks

	2019	2018
Risks in terms of Likelihood	1. Extreme weather events	1. Extreme weather events
	2. Failure of climate-change mitigation and adaptation	2. Natural disasters
	3. Natural disasters	3. Cyber-attacks
	4. Data fraud or theft	4. Data fraud or theft
	5. Cyber-attacks	5. Failure of climate-change mitigation and adaptation
Risks in terms of Impact	1. Weapons of mass destruction	1. Weapons of mass destruction
	2. Failure of climate-change mitigation and adaptation	2. Extreme weather events
	3. Extreme weather events	3. Natural disasters
	4. Water crises	4. Failure of climate-change mitigation and adaptation
	5. Natural disasters	5. Water crises

Source: Made by MHRI based on WEF The Global Risks Report 2019

In the 2019 version of The Global Risks Report, which the World Economic Forum (WEF) releases every year to coincide with the Davos Forum, weather-related risks account for many of the Top 10 risks in terms of Likelihood and Impact (**Chart 2**).

¹ Based on the website of the Parliament of the United Kingdom.
<https://www.parliament.uk/business/news/2019/may/mps-debate-the-environment-and-climate-change/>

² The Paris Agreement central aim is to strengthen the global response to the threat of climate change by keeping a global temperature rise this century well below 2 degrees Celsius above pre-industrial levels and to pursue efforts to limit the temperature increase even further to 1.5 degrees Celsius.

Almost simultaneously with the building-up of XR in the United Kingdom, a meeting of the Network for Greening the Financial System (NGFS) was held in Paris in April. Following the progress report published in October 2018, the NGFS recently released its first comprehensive report that summed up the results of the considerations so far. Below, we introduce the contents of the report and at the same time take an overview of the initiatives taken by the Bank of England that led responses to climate change risks in Europe and an impact of climate change on the financial markets in a bid to understand the trends mainly from Europe.

2. Recommendations by NGFS

(1) NGFS

The NGFS is the network established by the willing from central banks and financial supervisors during the “One Planet Summit” held in Paris in December 2017. It aims to improve environment and climate risk management in the financial sector and financially support the transition to the sustainable economy. With Frank Elderson, an executive director of De Nederlandsche Bank (DNB) serving as chair, the Banque de France acts as the secretariat. The network was initially launched by eight central banks and financial supervisors.³ Subsequently, the number of participants in the network increased, and as of April 2019, it comprises a total of 36 members and six observers, with their jurisdictions covering half of the world’s GHG emissions and two-thirds of global systemically important banks (G-SIBs) and global systemically important insurers (G-SIIs). From Japan, the Financial Services Agency (FSA) joined the network in June 2018.

(2) Characteristics of Climate Change Risks

The progress report released in October 2018 concluded that climate change may result in physical and transition risks that can have system-wide impacts on financial stability and might adversely affect macroeconomic conditions. More specifically, climate change is recognized as a source of financial risk to be overseen by central banks and financial supervisory institutions.

Physical risks mean risks that arise from natural disasters stemming from extreme climate change-related weather events (such as heat waves, landslides, floods, wildfires and storms) as well as longer term progressive shifts of the climate (such as changes in precipitation, extreme weather variability, ocean acidification, and rising sea levels and average temperatures). Transition risks are risks that arise from various economic and social adjustments stemming from the process of transition towards a low-carbon society. In the process of reducing GHG emissions, these risks will spread to all sectors of the economy through the transformation of the ecosystem.

³ Eight institutions are the Bank of England, Deutsche Bundesbank, Banque de France, De Nederlandsche Bank, the Swedish Financial Supervisory Authority, the People’s Bank of China, the Monetary Authority of Singapore, and Banco de Mexico.

And their adjustments might have persistent impacts on macroeconomic and financial variables (for instance, growth, productivity, food and energy prices, inflation expectations and insurance costs) that are fundamental to achieving central banks' monetary policy mandates.

Characteristics of climate change risks are their far-reaching impact in breadth and magnitude. Climate change will affect all agents in the economy, across all sectors and geographies, and the risks will likely be correlated with and potentially aggravated by tipping points, in a non-linear fashion. The impact of climate change is determined by the concentration of GHG emissions in the atmosphere and there is currently no mature technology to reverse the process. Climate change will have irreversible consequences on our planet. The magnitude and nature of the future impacts will be determined by actions taken today, which thus need to follow a credible and forward-looking policy path.

(3) Risks to and opportunities for the financial system

Extreme weather events impact health and damage infrastructure and private property, reducing wealth and decreasing productivity. These events can disrupt economic activity and trade, creating resource shortages and diverting capital from more productive uses. Uncertainty about future losses could also lead to lower investment. Physical impacts of climate change risks are not just risks for the future; they are already impacting the economy and financial system today. Estimates suggest that absent action to reduce emissions, the physical impact of climate change on the global economy in the second half of the century will be substantial. In addition, feedback loops between the financial system and the macroeconomy could further exacerbate these impacts and risks (**Chart 3**).

The transition to a low-carbon society called for under the Paris Agreement requires a rapid transformation of the existing social and industrial systems, that is to say, the paradigm shift. While there are the above-described risks in the economic and financial systems, there also are huge opportunities for investment. The recommendations by the Task Force on Climate-related Financial Disclosures (TCFD)⁵ specified as fields having opportunities technological innovation related to improved efficiency of the use of energy, transition to low-emission energy (clean energy) sources, low-emission products/services, investment in green bonds and infrastructure in association with the transition to a low-carbon society, and resilience through the development of capabilities to address climate change.

The International Energy Agency (IEA) estimates that the transition to the low-carbon society would require \$3.5 trillion in energy-sector investments on average until 2050.⁶ Under this

⁵ A subsidiary organization of the Financial Stability Board (FSB) established with the purpose of encouraging companies to disclose climate-related financial information to help investors make appropriate investment decisions. As of February 2019, a total of 580 organizations support the TCFD.

⁶ The amount of investment required to achieve the scenario of achieving "66% probability of staying below 2°C" in the rise in

scenario, nearly 95% of electricity would need to be low-carbon by then, compared with about a third today, seven out of every 10 new cars would need to be electric, compared with one in 100 today, the entire existing building stock would need to be retrofitted, and the CO2 intensity of the industrial sector would need to drop by 80% below today's levels. In order to cover all these investment needs, it would require a large-scale change of course in capital for "green financing."

(4) NGFS' Six Recommendations to central banks, financial supervisors and policymakers

The NGFS issued six recommendations on the roles of the financial sector in achieving the goals of the Paris Agreement, albeit on a non-binding basis. The NGFS advised central banks and supervisors to (1) integrate climate-related risks into financial stability monitoring and micro supervision; (2) integrate sustainability factors into own-portfolio management; (3) bridge the data gaps; and (4) build awareness and intellectual capacity and encourage technical assistance and knowledge sharing. The NGFS called upon policymakers to (5) achieve robust and internationally consistent climate and environment-related disclosure, and (6) support the development of a taxonomy of economic activities concerning climate change risks and a low-carbon society. As for (3), many companies are under pressure to disclose information on climate change risks in accordance with the recommendations of the TCFD.⁷

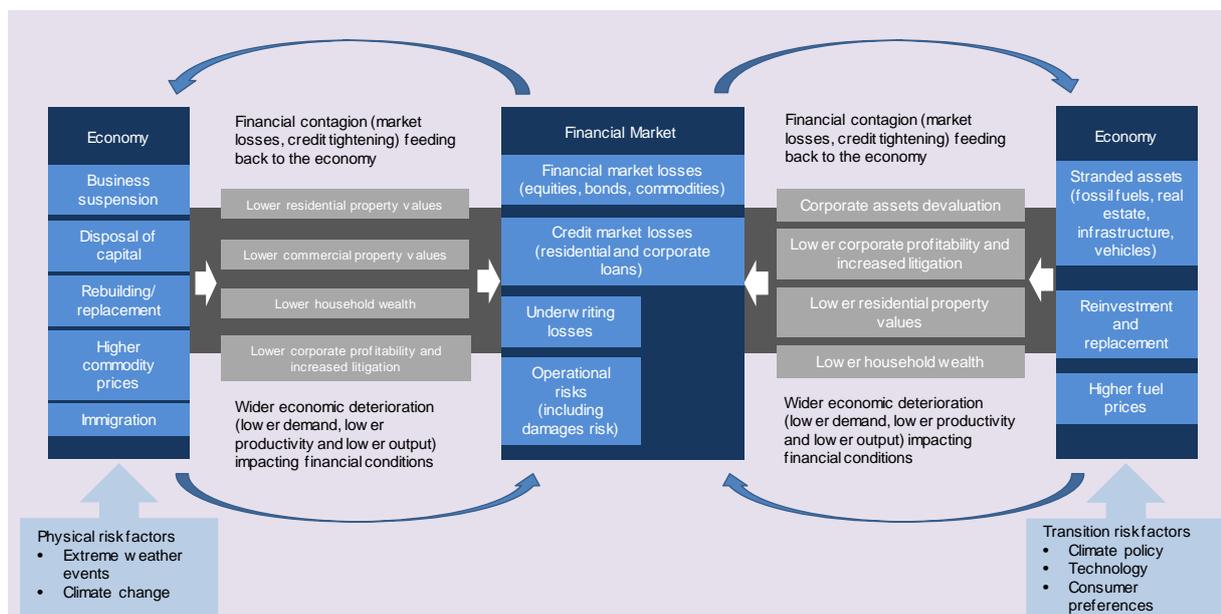
Over the coming year, the NGFS is planning to develop (i) a handbook on climate and environment-related risk management for supervisory authorities and financial institutions; (ii) voluntary guidelines on scenario-based risk analysis; and (iii) best practices for incorporating sustainability criteria into central banks' portfolio management.

temperature.

<https://www.iea.org/newsroom/news/2017/march/deep-energy-transformation-needed-by-2050-to-limit-rise-in-global-temperature.html>

⁷ The final report released in June 2017 proposed the four basic items for disclosure of governance, strategy, risk management, and metrics and targets, for capturing the financial impact of climate change, and recommended the scenario analysis as a strategic item.

Chart 3: The vicious cycle of the economy and the financial markets



Source: Made by MHRI based on NGFS

3. Bank of England Governor Carney took the initiative

Since the speech given at the Lloyd’s of London by Bank of England Governor Mark Carney in September 2015, when he was also serving as chairman of the Financial Stability Board (FSB), the Bank of England has set alarm bells ringing about financial risks by climate change and deepened its efforts toward financial stability. At the U.K. central bank, the insurance sector in particular is exposed to physical risks due to extreme weather events resulting from climate change.⁸ In recent years, losses have been rising in tandem with an increase in the number of natural disasters⁹ traced to climate change (**Chart 4**). In early 2015, the insurance sector was supervised for risk, but the Bank of England subsequently broadened the scope of its supervision to the banking sector, and in the Quarterly Bulletin 2017 Q2, it announced “The Bank’s response to climate change,” offering the directions of the micro-prudence policy by supervising individual financial institutions and the macro-prudence policy for enhancing the resilience of the U.K. financial system as a whole.¹⁰ Then in April 2019, the Bank of England announced the Supervisory Statement, “Enhancing banks’ and insurers’ approaches to managing the financial risks from climate change.”¹¹ Furthermore, the Prudential Regulation Authority (PRA) showed

⁸ The Bank of England cites “liability” risks for insurance companies along with “physical” risks and “transition” risks as climate change risks.

⁹ Natural disasters are classified as geophysical, meteorological, hydrological and climatological disasters.

¹⁰ Bank of England website.

<https://www.bankofengland.co.uk/quarterly-bulletin/2017/q2/the-banks-response-to-climate-change>

¹¹ Bank of England website.

<https://www.bankofengland.co.uk/prudential-regulation/publication/2019/enhancing-banks-and-insurers-approaches-to-managing-the-financial-risks-from-climate-change-ss>

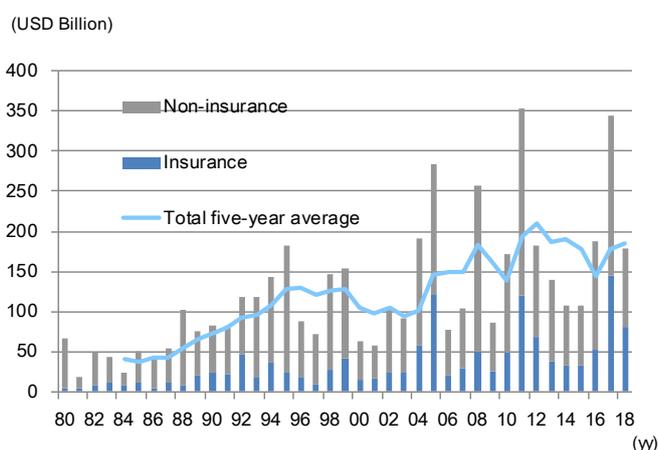
supervisory expectations by following in the steps of the TCFD recommendations.

In March 2019, the PRA and the Financial Conduct Authority (FCA) jointly held the Climate Financial Risk Forum (CFRF) for the first time, inviting representatives of major financial institutions to help enhance knowledge about climate change and share best practices in responding to climate change risks. At the same time, the CFRF set up four working groups to focus on risk management, scenario analysis, information disclosure and innovation. Going forward, the CFRF is to be held at the frequency of three times a year.

The U.K. government regards the transition to low-carbon technologies, systems and services as a tremendous opportunity for U.K. industry, and the Department for Business, Energy & Industrial Strategy (BEIS) set up the Green Finance Task Force in September 2017 in order to activate green financing. The task force prepared its recommendations in March 2018, which were taken up by the House of Commons Environmental Audit Committee.

At the European Central Bank (ECB), Executive Board member Benoît Cœuré has made a lecture on climate change and monetary policy, including the perspective of green financing. Several other ECB Executive Board members, including Yves Mersch, delivered speeches on similar topics. In May 2019, the Financial Stability Review carried special features entitled “Climate change and financial stability.”

Chart 4: Losses from natural disasters in the world



Source: Made by MHRI based on Munich Re NatCatSERVICE

4. Impacts of climate change on the financial market

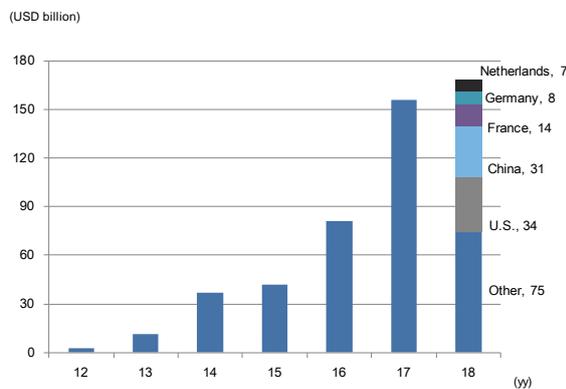
(1) Issuance of green bonds and expansion of the market size

Issuance of green bonds has been increasing in recent years. A green bond is defined as a bond whose proceeds an issuer spends environment improvement projects. According to the Climate Bonds Initiative (CBI)¹², a non-profit group in the United Kingdom, new issuance in 2018 came to \$168.5 billion, about four times as large as the issuance in 2015 (**Chart 5**). In 2019, issuance of green bonds is expected to further expand to \$250.0 billion. While still minor as the ratio to the total bond issuance on the global market, green bonds are expected to grow into a promising asset

¹² A non-profit organization in the United Kingdom established to promote investment in transition to the lower carbon economy resilient to climate change. It provides information on green bond market strategies, evaluates and certifies climate bonds and makes policy proposals.

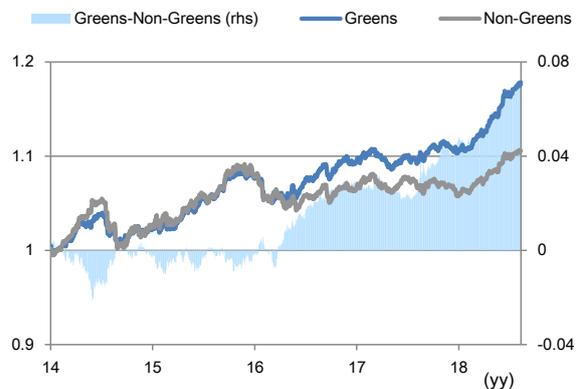
class in the future. Of green bonds issued in 2018, the top three issuing countries of the United States, China and France accounted for a little less than half of the total. The Federal National Mortgage Association (FNMA, Fannie Mae) was the largest issuer, bringing some \$20.0 billion of bonds to the market. The Chinese government is pushing green financing as an important policy measure, with issuance by China starting to grow since 2016. The French government placed \$6.0 billion of government bonds in 2018. With the balance of \$16.7 billion outstanding, France is the largest issuer of green government bonds and has been increasingly raising its presence with the Paris Agreement providing momentum. As seen above, the market size is expanding, but there remain issues to be worked out, such as international certification standards and external systems to evaluate compliance with requirements.

Chart 5: Issuance of green bonds



Note: Based on CBI certification. The graph for 2018 shows the five largest issuing countries.
Source: Made by MHRI based on Climate Bonds Initiative (CBI)

Chart 6: Performances of green bonds



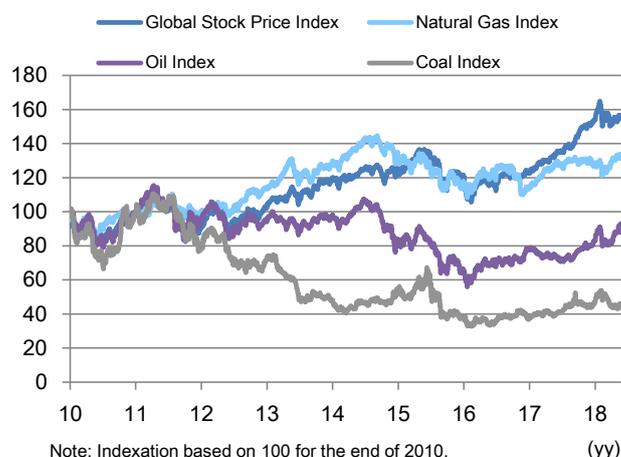
Note: Indexation with 1 for the end of October 2014.
Source: Made by MHRI based on Bloomberg

Green bonds provide investors with the mandate for sustainable investment with effective solutions. But the performance of such bonds is an important requirement in making investment decisions. Here, we compare the total return of the global green bond index¹³ and the global non-green bond index.¹⁴ Though it is difficult to compare green premiums alone because of differences in issuers and duration, the green bond index performed well from mid-2016 to the end of the observation period (**Chart 6**), with no signs of the performance of green bonds falling behind of that of non-green bonds as some market participants had feared.

¹³ Based on the Bloomberg Barclays MSCI Global Green Bond Total Return Index.

¹⁴ Based on the Bloomberg Barclays Global Aggregate Bond Total Return Index.

Chart 7: Global stock price indexes by industry



Note: Indexation based on 100 for the end of 2010.

Source: Made by MHRI based on Bloomberg stock indexes

Note: Indexation based on 100 for the end of 2010.

Source: Made by MHRI based on Bloomberg stock indexes

(2) Movements of indices by sector

Comparison of fossil fuel-related indexes on the stock market shows the underperformance of the coal index, a sign that the stock market has already been discounting the transformation to a low-carbon society. While the market capitalization of the coal index shrank about 60% from the 2010 level, the natural gas index, with less amounts of GHG emissions among fossil fuels, is significantly outperforming the oil index and the coal index (**Chart 7**). According to data for 2016, about 80% of the global supply of primary energy relies on fossil fuels, used as energy for power generation and energy for conversion. If the paradigm shift in energy policy accelerates, it could bring a huge impact on the value chains of companies, with greater attention being paid to investment risks by sector.

5. High expectations toward Japan's leadership

The international tides around climate change have been moving acceleratingly in recent years. In November 2018, the European Commission (EC) announced a long-term strategy to reduce GHG emissions by 80% from the 1990 level by 2050 and consider the realization of climate-neutral policy, or virtually no GHG emissions. Some news reports also say that concerning spending on measures to combat climate change under the 2021-2027 medium-term budget of the European Union (EU), eight EU member states (Belgium, Denmark, France, Luxembourg, the Netherlands, Portugal, Spain and Sweden) are seeking to set aside 25% of the budget for climate change countermeasures. Discussions are under way to set aggressive and ambitious goals toward the U.N. Climate Action Summit to be held in New York in September 2019 and the 25th session of the Conference of the Parties (COP 25) to the U.N. Framework

Convention on Climate Change (UNFCCC) to be held in Santiago, Chile, in December 2019. In the elections of the European Parliament in May 2019, forces skeptical about the EU increased their presence, but the environmentalist Greens/EFA also made great advances, evidence of the rising awareness of environmental issues in Europe.

In the United States, in countering the federal government that announced its decision to withdraw from the Paris Agreement, the governors of the states of Washington, New York and California formed the United States Climate Alliance committed to reducing GHG emissions consistent with the goals of the Paris Agreement in June 2017. By April 2019, the governors of 24 states consented to the cause of the U.S. Climate Alliance, with participation increasing further. In March 2019, the Federal Reserve Bank of San Francisco issued an economic letter that discussed the climate change and the Federal Reserve. It is still fresh in our memory that Pacific Gas & Electric (PG&E) filed for Chapter 11 bankruptcy in 2019 under the heavy burdens of liabilities traced to wildfire that raged in the state of California in 2019.

In Japan, the 49th Session of the Intergovernmental Panel on Climate Change (IPCC) was held in Kyoto in early May 2019 and refined the Guidelines on National Greenhouse Gas Inventories. On May 27, over 160 companies and financial institutions that agree with the TCFD recommendations established the TCFD Consortium to push forward their efforts together, with the Ministry of Economy, Trade and Industry, the Financial Services Agency and the Ministry of the Environment also joining as observers. Moreover, the number companies expressing their willingness to participate in “Renewable Energy 100% (RE100)” to switch all of electricity they use to renewable energy is also increasing. While the leaders’ declaration from the Group of 20 (G20) Osaka Summit did not contain any significant progress in measures to combat climate change, Japan will surely have an opportunity to exercise its international leadership in climate change issues with its excellent environmental technologies and products on the back of the recently rising awareness of climate change issues and international trends. What is expected of Japan is to regard the realization of a decarbonizing society, a truly global issue, as the long-term growth strategy, lead the innovation toward an early achievement of the long-term goals of the Paris Agreement together with the financial and industrial communities, and send out a powerful message to the entire world to further accelerate the international tides toward a low-carbon society.

Reference

Speech by Mark Carney, September 2015, “Breaking the tragedy of the horizon - climate change and financial stability”

Speech by Mark Carney, March 2019, “A new horizon”

NGFS, October 2018, “First Progress Report”

NGFS, April 2019, “First comprehensive report”

IEA, “CO2 emissions from fuel combustion 2018”

UNEP “Emissions Gap Report 2018”

TCFD, “Final Report: Recommendations of the Task Force on Climate-related Financial Disclosures (June 2017)”

OECD/IEA and IRENA, 2017, “Perspectives for the energy transition”