

Remaining Research Agendas in the Post-2020 Period under the Paris Agreement

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Abstract

This paper aims at examining key issues that should be prioritized and dealt with by academic experts in the next three to five years, particularly for the purpose of supporting effective implementation of the Paris Agreement in the post-2020 period. The paper starts off with a section briefly illustrating the overall architecture and provisions of the Paris Agreement, followed by a section mapping out major themes under which remaining issues exist that should be overcome before countries start taking actions under Paris Agreement rules after 2020, and how researchers could contribute to resolving these remaining issues. Among the remaining issues, this article takes up the dimension related to governance of the Paris Agreement, covering agendas related to equity and transparency. Other major elements should be further elaborated by other articles in this special issue. The paper concludes by presenting recommendations to a Japanese audience as to how Japan should proceed in the post-2020 period under the Paris Agreement. There are two ways of looking at the world. The first is the traditional image of the 20th century, where the economy is grounded in a stable fossil fuel supply, and emission reduction seems costly. The second is a new image of the 21st century, where emission reduction is considered an opportunity for change. The paper argues that Japanese stakeholders and researchers are affected by the former image of the world, but they need to be aware of the transition, and start taking action today.

Key words: climate change, governance, Japan, nationally-determined contribution (NDC), Paris Agreement

1. Background

The Paris Agreement has opened a new door for the world to respond to climate change. Adopted on the final day of the Twenty-first Conference of the Parties (COP21) to the United Nations Framework Convention on Climate Change (UNFCCC) in December 2015, the agreement took less than a year to enter into force in November 2016. While the Paris Agreement has been hailed as a historic diplomatic success (Kinley, 2016), there are loads of remaining issues that need to be tackled for the agreement to be most effectively workable. Many of the remaining agendas require expert knowledge and inputs from the scientific community.

This paper aims at examining key issues that should be prioritized and dealt with by academic experts in the next three to five years, particularly for the purpose of supporting effective implementation of the Paris Agreement. The first section briefly illustrates the overall architecture and provisions of the Paris Agreement. The second section maps out major themes under which remaining issues exist, that should be overcome before countries start taking action under Paris Agreement rules in the post-2020 period, and how

researchers might contribute to resolving these remaining issues. Among these remaining issues, this article takes up the dimension related to governance of the Paris Agreement, covering agendas related to equity and transparency. It discusses how Japanese stakeholders are engaging in this aspect. Other major elements of the Paris Agreement are further elaborated by other articles in this special issue. This article concludes with recommendations to a Japanese audience as to how Japan should proceed in the post-2020 period under the Paris Agreement.

2. Architecture and Provisions of the Paris Agreement

The Paris Agreement is the outcome of a four-year negotiation process that was initiated by a decision called “Durban Platform,” that had been agreed to in 2011 at COP17 (Bodansky, 2016). The countries involved under the Durban Platform decided “to launch a process to develop a protocol, another legal instrument or an agreed outcome with legal force under the UNFCCC applicable to all Parties” (UNFCCC, 2011). The process was to include in its work elements related to “mitigation, adaptation,

finance, technology development and transfer, transparency of action, and support and capacity-building.” Thus, the structure and provisions of the Paris Agreement fully reflect the scope set by the Durban Platform.

2.1 Long-term Goals

Unlike the Kyoto Protocol, which set legal obligations on countries to limit or reduce their greenhouse gas (GHG) emissions to targets clearly indicated in the Kyoto Protocol, the Paris Agreement merely obligates each country to periodically prepare nationally determined contributions (NDCs) that it intends to achieve. The agreement does not ensure that the aggregated amount of all countries’ NDCs is sufficient to avoid dangerous consequences of climate change to human beings as well as ecosystems as described in Article 2 of the UNFCCC. The Paris Agreement sets a long-term goal of partially overcoming this deficit. Its Article 2 states, “Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5° C above pre-industrial levels” would significantly reduce the risks and impacts of climate change. Article 4 follows by further stating, “Achieving a balance between anthropogenic emissions by sources and removals by sinks of GHGs in the second half of this century” should be aimed for to achieve the long-term target set out in Article 2. The COP decision invites the Intergovernmental Panel on Climate Change (IPCC) to provide a special report in 2018 on the impacts of global warming of 1.5°C and related global GHG pathways.

2.2 Mitigation

Article 4 of the Paris Agreement obligates each country to “prepare, communicate and maintain successive NDCs that it intends to achieve.” The successive NDCs are to represent progression beyond the country’s then current NDC and reflect its highest possible ambition. Developing countries are urged to continue taking the lead by undertaking economy-wide absolute emission reduction targets, while developing countries are encouraged to continue enhancement of mitigation efforts. Many of the first NDCs had already been submitted before COP21, setting targets for years up to around 2025 or 2030. All Parties must also strive to formulate long-term low GHG emission development strategies and communicate them by 2020. Countries may voluntarily use market mechanisms such as emissions trading schemes to achieve their NDCs (Article 6).

2.3 Adaptation, Loss and Damage

Both the UNFCCC and Kyoto Protocol put more weight on mitigation than adaptation, but it has become clear that adverse impacts of climate change are already occurring. Thus, the Paris Agreement aims at striking a balance between mitigation and adaptation. Its Article 7 establishes a global goal also for adaptation to enhance adaptive capacity, strengthen resilience and

reduce vulnerability to climate change. Countries are to engage in adaptation planning processes and implement actions, including the development or enhancement of relevant plans, policies and/or contributions. Countries should submit and periodically update adaptation communications in ways that mitigation actions should be communicated.

The concepts of loss and damage already existed from the time of the UNFCCC, but were enshrined as an independent article in the Paris Agreement (Article 8). The Warsaw International Mechanism for Loss and Damage associated with Climate Change Impact shall be subject to the authority and guidance of the meeting of the Parties of the Paris Agreement (CMA).

2.4 Finance

Finance has always been one of central issues of contention in the climate regime. Several financial mechanisms have been established, but financial flows have been insufficient for responding to all the financial needs in developing countries. The Paris Agreement requests not only developed countries but also other countries to voluntarily provide financial resources to help developing countries take actions under the Paris Agreement (Article 9). One COP decision that was adopted with the Paris Agreement states, “Developed countries intend to continue their existing collective mobilization goal through 2025,” and “Prior to 2025 the CMA shall set a new collective quantified goal from a floor of US\$100 billion per year.”

2.5 Transparency

Now that countries’ central obligation for the post-2020 period is to set NDCs and update them periodically, it has become more important to verify whether countries are making enough progress to achieve their NDCs. A transparency framework for action has thus become a necessary component of the Paris Agreement in order to build mutual trust and confidence. On the other hand, a series of processes have already been established under the UNFCCC that are related to monitoring, reporting and verification (MRV). Article 13 of the Paris Agreement therefore aims at making the best use of these existing processes in the most efficient manner. Existing reporting requirements are focused mainly on mitigation actions, but with new commitments of the Paris Agreements, actions related to other elements, notably adaptation and finance, should also be subject to the MRV process.

2.6 Global Stocktaking

Global stocktaking is a process inserted into the Paris Agreement to assess the collective progress towards achieving the long-term goals. Countries’ NDCs are nationally determined, which does not ensure reaching the ultimate long-term goal. The first global stocktaking is to be held in 2023, but the procedures’ details have yet to be determined. Somewhat related to the stocktaking process is a facilitative dialogue among countries to be

held in 2018 to take stock of the collective actions, as described in the COP decision. This is an important process because this is just about the only avenue for countries to assess sufficiency of their own and other countries' efforts to curb global GHG emissions towards reaching the long-term goals.

2.7 Differentiation

Both the UNFCCC and Kyoto Protocol categorized countries into two distinctive groups called Annex I and non-Annex I. The Annex I group consisted of developed countries and countries in transition into a market economy, such as former Soviet Union countries. Countries that achieved economic development were expected to shift from non-Annex I to Annex I. This categorization became outdated as the distinction between the two groups became vague. The Paris Agreement precluded categorization of countries and set common commitments for all countries. This does not necessarily mean all countries face same level of stringency. Within each element of commitment such as mitigation, adaptation and finance, all countries are expected to take the same actions, but at differentiated levels. The level of actions is to be determined nationally and voluntarily.

2.8 Legal Nature of the Agreement

The Paris Agreement takes the form of a treaty. During the negotiation process, there was a disagreement over the name of the agreement. Some countries wanted it to be called a "protocol," while others preferred "agreement" or "implementing agreement." The legal nature of the agreement is determined not by how it is named, but by the clauses that form parts of the agreement. Articles on signing (Article 20), ratification (Article 20), entry into force (Article 21), and depositaries (Article 26) fulfill necessary conditions for the agreement to be an international treaty with official legal status.

2.9 Non-state Actors

The roles of non-state actors are not explicitly stated in the Paris Agreement itself, but are securely embedded in the founding basis of the agreement. The Paris Agreement does not have any teeth in the sense that it does not determine countries' GHG emission targets in a top-down manner. This means that any additional emission reductions need to occur voluntarily, independent of national governments' initiatives. The COP decision "welcomes the efforts of all non-Party stakeholders to address and respond to climate change, including those of civil society, the private sector, financial institutions, cities and other subnational authorities." The Non-State Actor Zone for Climate Action platform (NAZCA) was established at COP20 to support various actions taken by the non-state actors.

3. Remaining Issues to be Solved with Support from Academia

Multilateral agreements usually take at least several years from adoption to entry into force. The Kyoto Protocol took eight years for enforcement. The Paris Agreement was an extraordinary case that entered into force within eleven months after its adoption. This is a good sign that the world is supporting the transition into de-carbonization, but countries had been expecting several years at least to negotiate detailed rules to confidently proceed in the post-2020 period. Among those are elements that require input from scientific experts.

3.1 Long-term Goals and Emission Budgets

The first set of research questions is related to long-term emission trajectories and levels of near-term emission reduction targets. The IPCC has already started preparing the 1.5°C special report. On the other hand, monitoring data by NOAA (National Oceanic and Atmospheric Administration) and NASA (National Aeronautics and Space Administration) have indicated that the year 2016 was the warmest year on record (NASA, 2017). The mean global surface temperature has already risen more than 1.0°C from the pre-industrial period, leaving very little room for the world to stay within the 1.5°C warming path.

"Carbon budget," or "emission budget," is a notion that expresses the amount of carbon, or GHGs, that could be emitted while aiming to achieve a long-term temperature goal. If we were to achieve the long-term goal of 2°C, the total carbon budget since pre-industrialization would be about 840 GtC of CO₂. We have already emitted about 530 GtC in the past up to 2011 (IPCC, 2014), so there is only about 310 GtC that could be emitted by future generations in order to keep the temperature under 2°C. The future budget will be even smaller if we are to achieve the 1.5°C goal. Calculating a carbon budget is not an easy task. The amount will depend on how much CO₂ can be sequestered by various sinks and reservoirs. Emissions of non-CO₂ gases also affect the budget. How much of the carbon budget would be left for the future world at the global level if we were to reach the 2.0 or 1.5°C goal? How will it change according to changes in assumptions regarding levels of deforestation and CCS (carbon capture and storage) technologies? These are remaining questions that need to be answered by researchers.

While global emission pathways are discussed, others need to focus more on national emission pathways. Many developed countries have already set long-term emission goals for the year 2050 at the national level. This is in line with declarations in 2008 and 2009 among the Group of 8 (G8) member countries that have called for halving global GHG emission by 2050. In order for these countries to reach deep cuts in emissions such as 80% reduction by 2050, they would have to make good progress at reducing emissions in the

years 2030 and 2040 as well. Questions such as “which is the most economically efficient emission pathway for reaching the long-term goal” need to be answered to enable the world to conduct an effective facilitative dialogue in 2018 and global stocktaking process in 2023.

3.2 Mitigation: Hard and Soft, Involvement of Non-state Actors

The second set of research questions is on mitigation over the short to medium term. It is clear that total amount of countries’ NDCs for the years between 2025 and 2030 is insufficient to reach the long-term goal (UNFCCC, 2016). More needs to be done in the area of mitigation to further deepen the targets, and actually reach the targets. But how? There is some opposition to the long-term temperature goals as too idealistic or unrealistic (Pielke, 2009). These opposing views stem from pessimism regarding plausibility of GHG emission reductions. It is true to say no one can live without energy. Energy must continue to be supplied even under the trajectory towards the long-term goals (Rogeli *et al.*, 2015). Carbon dioxide from fossil fuels should be completely phased out by mid-century either by shifting energy sources to renewable energy or nuclear energy, or by using CCS technology alongside fossil fuel power plants. In addition, non-CO₂ GHGs such as methane and fluorocarbons needs to be reduced as much as possible. Remaining emissions should be counterbalanced by sequestration of CO₂ in forests.

While making an energy shift towards de-carbonized sources, the energy demand side also needs to make a huge transition into a less energy-intensive society. Urban planning and infrastructure require more than three decades to make a transition. We need to start making changes from today if we are to complete the restructuring of our cities by mid-century. Buildings and people’s dwellings are also a sector that needs a long-term view to reduce their GHG emissions. Thinking in the long term, we need to take into account various technologies and means that could totally change our way of living. As for transportation, for instance, current automobiles with engines might become a thing of the past. People could continue enjoying mobilization using smarter and lighter vehicles with electric motors. It is thus insufficient to argue against stringent emission targets using only the technologies we have today.

Issues related to mitigation include not only engineering, or the “hard” aspect, but also policy, or the “soft” aspect. Infrastructure and technologies would not exist without relevant policy implementation. All countries have already implemented a wide variety of climate mitigation policies, including regulations, market-oriented mechanisms, and information-oriented tools such as labeling. These policies should be further strengthened and implemented in a speedy manner. Although many policy analyses have already been conducted (Höhne *et al.*, 2017), it is still at too early a stage to conclude which policy instruments are more effective than others. The effectiveness of policies will

greatly depend upon each country’s national circumstances, other relevant non-climate policies, and its share of sectors in terms of emission sources.

Engagement of non-state actors in climate change mitigation activities is a prerequisite for achieving deep emission cuts. Technological breakthroughs are achieved by private companies’ R&D. Urban city development is determined by local governments and citizens. The role of policies and measures is to develop enough incentives for these various actors to voluntarily shift to less carbonized behavior. Fossil fuel divestment is a movement that started from NGOs and university students, to divest their holdings of fossil fuel stocks in favor of other climate-friendly alternatives (Ayling & Gunningham, 2016). More research is needed to investigate ways to involve investments by the private sector, as well as actions by local governments.

3.3 Adaptation and “Loss and Damage”

Adaptation and “loss and damage” is the third pillar of work remaining to be tackled under the Paris Agreement. Adaptation actions are mainly rooted in each country or even further at each local level. As adverse impacts of climate change become more evident, however, the need for more precise estimations of future plausible damage becomes stronger.

As the COP decision accompanying the Paris Agreement requested the IPCC to publish a special report on 1.5°C, climate researchers have already started to elaborate on plausible climate impacts that are expected to occur under the 2°C and 1.5°C scenarios, and how much damage the world could avoid by seeking the higher ambitious temperature goal (Hulme, 2016). This exercise is necessary for comparing the costs required to reduce GHG emissions to reach the 1.5°C goal and the cost required to adapt to a warmer world by 2°C or more and damage associated with higher temperatures. Currently, researchers are making a great effort to estimate the future impact of climate change. Mean precipitation and temperature are the most commonly acknowledged parameters affected by climate change, but it is also important for local people to understand extreme precipitation or temperature events locally in a shorter timeframe.

As for loss-and-damage-related debates, the key will be finding ways to prove direct damage-and-loss consequences from climate change and those considered to be associated with climate change. Attribution of extreme weather patterns and the damage they cause to climate change is a new frontier in climate science. Climate security is a notion that aims at finding potential links between climate change and armed conflict, but few studies have resulted in robust results so far (Ide, 2017). From the legal aspect, responsibility and liability for loss and damage are still under debate (Lees, 2017).

3.4 Finance, and Involvement of Non-state Actors

Finance has always been an issue at stake in climate change negotiation. Three types of financial mechanisms

were established in 2001 at COP7: the Special Climate Change Fund and Least Developing Countries Fund, both under the UNFCCC, and the Adaptation Fund under the Kyoto Protocol. Establishment of these mechanisms was supported by developing countries, but dissatisfaction was soon raised by the same countries, because the amount of financial flow was too meager to fulfill all their needs. To respond to these serious financial demands, the Copenhagen Accord, adopted in 2009 at COP15 included a quantitative target of “US\$30 billion for the period 2010-2012 with balanced allocation between adaptation and mitigation” as short-term finance, and “US\$100 billion a year by 2020” in the long term (UNFCCC, 2009). The funding sources were not limited to official assistance, but included both public and private, and bilateral and multilateral types of finance. A significant portion of such funding was to flow through a newly established financial mechanism called the Green Climate Fund. The short-term financial goal was reached through huge financial contributions from developed countries. The long-term financial goal is yet to be achieved but the amount of financial flow is certainly on the rise. Much of the growth owes to investment by private companies (CPI, 2015). The Copenhagen Accord only set financial goals up to 2020, and the COP decision in 2015 supplemented the Paris Agreement by stating that developed countries intended to continue their existing collective mobilization goal through 2025, and that a new collective goal from a floor of US\$100 billion per year would be agreed upon prior to 2025.

It goes without saying that the amount of financial flow makes a crucial difference in making effective changes towards de-carbonization in both developed and developing countries, but merely talking about quantity is not enough. Financing should be directed towards the most effective technologies and investments. In reality, however, it is difficult to track all financial flows, and there is no assurance that all the financial resources are being used either to mitigate climate change or to adapt to the changing climate (Clapp *et al.*, 2012). Studies are needed to monitor how financial resources have contributed to actual emission reductions or adaptation.

There have been a number of studies that elucidated the financial amounts needed for developing countries to take action against climate change (Kameyama *et al.*, 2016; Bowen *et al.*, 2017). In many cases, most of the financial burden required to make substantial emission reductions occurred at the time of initial investment. Once the facilities were entirely installed, the investors could profit from energy saving for the next two to four decades. Loans and mortgages that leveraged the initial investment cost and avoided costs later on could motivate citizens to invest in less energy-intensive infrastructure and renewable energy.

4. Governance

4.1 Equity: Two Contrasting Images of the World

The Paris Agreement was absolutely successful in attracting most countries to be Parties to the agreement. Nevertheless, the real engagement of countries and other sub-national stakeholders starts today. The agreement does not force countries to reduce GHG emissions to a level indicated by any third-party institutions that take equity into consideration. This means the equity dimension of the climate change problem is not institutionally embedded in the agreement. It is up to each country how much it will consider its own responsibility to respond to the climate change problem and take action voluntarily. This system is completely different from how many researchers used to consider equity—or burden-sharing rules—to determine emission reduction targets for countries (Höhne *et al.*, 2014).

There are two distinctive ways to look at the game of climate change politics. Traditional debates related to equity in the realm of climate change politics are based on the idea that reducing emissions is costly (Barrett, 2006). On one hand, countries agree to reduce GHG emissions globally because they understand climate change is likely to harm all. On the other hand, however, they oppose setting stringent emission reduction targets at the national level, insisting that deep emission cuts would negatively affect their economy. A country that does not participate in the emission reduction regime, often called a “free-rider,” will still be able to enjoy alleviation of adverse impacts of climate change, thanks to other countries’ efforts to reduce GHG emissions. Equity considerations are particularly important under such conditions to avoid allowing countries to become free riders. Burden-sharing rules are investigated to see if any rule could be agreeable to all nations. Emissions per capita and emissions per GDP are major equity rules that have been proposed by countries and researchers (Kameyama, 2004). The Kyoto Protocol’s emission reduction targets were set after long debates on equity. This image is, so to say, the “20th century image” of the world—a fossil-fuel-based economy.

The second way of looking at the game of politics is to see climate-related investment as an opportunity rather than a cost. Fossil fuel is a non-renewable natural resource that will eventually deplete. Coal reserves are relatively large, but oil production could peak out sometime within the next few decades. It is therefore necessary for all countries to start investing in new sources of energy in one way or another for the purpose of energy security. Climate change mitigation has worked as motivation for the private sector to invest in renewable energy and other technologies that would contribute toward moving away from fossil fuel use. The faster companies develop new technologies, the more competitive they become and able to profit by dominating markets. Under the free market of climate investment, countries will not need to compare NDCs across countries or make persistent efforts in the equity

dimension of the agreement. Rather, countries would voluntarily implement policies to lead companies to invest in R&D in the area of energy and efficiency, and set ambitious goals, giving incentives. This image is, so to say, the “21st century image” of the world, making huge investments in renewable energy.

Assessments of the effectiveness of the Paris Agreement largely depend on how individuals see today’s status quo, whether it is closer to the former or the latter.

The agreement will have negligible effectiveness in mitigating climate change if the world continues to have the former image of the world. Many developing countries were unhappy about abolishment of the Annex I – non-Annex I division in the Paris Agreement. During the negotiations at COP21, developing countries continuously underscored the importance of the historical responsibility of developed countries for causing climate change and called for the agreement to be based on equity and common but differentiated responsibilities (CBDR) (Ajit, 2015). Developed countries also accepted differentiation, except that they insisted that it be reflected in a dynamic manner, since the world has changed since the time the UNFCCC was adopted. The agreement was still considered fair by most countries, because it was agreed upon by the developed countries that a further financial commitment would be made by the developed countries in the post-2020 period. Efforts to reduce GHG emissions by developing countries are dependent on the amount of financial resources transferred to the developing countries, as well as efforts by developed countries to reduce their own emissions. Now that the current U.S. Trump administration is against the Paris Agreement and overall emission reduction policies at the federal level, it is not likely that developing countries will receive a positive message from the richest and second largest GHG-emitting country in the world.

On the other hand, the Paris Agreement could be considered a level playing field for all stakeholders to shift towards a de-carbonized world, if we could see the world as the latter image. There have already been a lot of signs of the world being steered in this direction. For example, Chinese President Xi Jinping is said to be strongly committed to the Paris Agreement and other climate change mitigation efforts, even if the United States pulls out of the agreement (Phillips, 2017). Saudi Arabia, the largest oil producer, has been making huge investments in solar and wind power plants, with further plans to develop almost 10 gigawatts of renewable energy by 2023 in its vast northwestern desert. It is expected that new development of renewable energy could replace the equivalent of 80,000 barrels of oil a day now burned for power (Dipaola, 2017). In the United States, many judge that coal production will not regain profitability even with full support from President Trump in eliminating all of the regulations set by the former Obama administration, because the falling price of natural gas is the primary reason for the plunge in use

of coal by utility companies. Renewable energy sources, such as wind and solar, are also becoming more competitive (Isadore, 2017).

The two images of the world co-exist today and will stay that way in the next decade. It is likely, however, that the first image will slowly fade away. Not only because of climate change, but also because fossil fuel is a depleting resource and from a sustainable development point of view, we should not depend on non-renewable sources.

4.2 Transparency: Tracking Efforts

Countries’ actions will be assessed by the transparency mechanism set up under the Paris Agreement, but the process is yet to be discussed. Reliable information on mitigation, adaptation and financing is the key to ensuring the agreement’s effectiveness. Many developing countries lack basic data, including GHG emissions and energy consumption. One of the remaining tasks for researchers is to introduce simple ways to collect these data periodically with the simplest methodology.

The transparency system is important for different reasons, depending on the image of the world, each requiring different types of information. In the case of the traditional image of the world, transparency is important because all countries need to be watched to make sure they are really doing what they promised to do. The transparency system should put much effort into tracking actual emission trajectories, and agree on rules in case of noncompliance. In addition, countries need to start discussing possibilities to increase the level of ambition of their future NDCs. This will be a laborious process because no country wants to set stringent emission reduction targets. Developing countries will look at developed countries with an eye on how much the rich countries have adopted “common but differentiated responsibility.”

Meanwhile, in the latter case, transparency is important for sharing information on best practices and performances. Information to be submitted under the transparency mechanism, the verification processes and compliance procedure as a consequence would differ according to which world we assume we are living in. The transparency system could collect various information, such as GDP growth data and policies implemented, to find high-performance policies. Success stories could be duplicated in other countries to enhance best practices.

A number of reporting and verification processes have already been established under the UNFCCC regime, and it has been widely acknowledged that the process should be as simple as possible for all countries to comply with. Some studies have proposed new methodologies to assess countries’ efforts for mitigation by grasping the policies implemented in those countries (Kameyama & Kawamoto, 2016; New Climate Institute *et al.*, 2016). More studies are needed to assess policy packages that result in maximal emission reductions while also striking a balance with healthy economic

growth.

4.3 Japan's Case

In Japan, many government officials and industries welcome the universal coverage of the Paris Agreement, officially stating that the agreement is “fair” just because it achieved more or less universal participation (MOFA, 2015). Meanwhile, the same individuals also stress that Japan does not necessarily have to endeavor seriously to achieve its NDC, as the commitments elaborated in the Agreement are voluntary and there will be no penalty even if Japan does not achieve its target. Although this interpretation is correct in legal terms, it should be noted that it is based on the traditional image of the world.

One of the events that have been attracting much attention worldwide is the inauguration of President Trump of the United States. He himself has been unwilling to take action against climate change, and intends to pull out of the Paris Agreement (Worland, 2017). Japanese stakeholders also pay much attention to changes in the United States. People who are unwilling to take action to reduce GHG emissions in Japan will welcome President Trump's actions—or inaction—that almost cancel out what his predecessor, former President Obama, introduced both inside and outside the United States to tackle climate change.

Nevertheless, there are others that see signs of the newer, more proactive image of the world (Kiko Network, 2017). They feel that Japan should be the front runner in a race towards decarbonization for many reasons other than climate change. Foremost, Japan does not own any extraction or production industries within its territory related to fossil fuels and is currently almost totally dependent on energy sources imported from overseas. Nevertheless, the share of fossil fuel within the total primary energy supply was almost 94.6% in 2013, higher than that of most countries around the world (United States: 83.3%, China 88.1%) (Agency for Natural Resources and Energy, 2016). Replacement of fossil fuel by renewable energy would contribute to reduced payments to overseas countries for fossil fuel imports.

Actions to reduce energy consumption are likely to contribute also toward adaptation to a rapidly aging society. The elderly share of society (ages above 65) is likely to reach almost 40% by 2050 (IPSS, 2012). The size of the Japanese population, currently around 120 million, is expected to decrease to less than 100 million by 2050. As the number of elderly lacking support of family or relatives is likely to expand, more people will be willing to dwell close to each other, with shops and community buildings within walking distance. Less driving of automobiles and more use of public transportation will be welcomed by these people. Energy consumption per person is expected to be much smaller when people live in housing complexes than individual houses (NIES, 2016).

Japan's NDC for the year 2030 is a “26 percent reduction from 2013.” Although there are controversies

over the degree of ambition of the target, it should be achievable if Japan were to aim at an 80% reduction by 2050, as has been indicated by the Global Warming Mitigation Plan adopted as a Cabinet Decision in 2016. Japan needs to start moving in the direction of a decarbonized community by investing in infrastructure and buildings that can last for more than three decades (Central Environmental Council, 2017).

In the international arena at meetings under the UNFCCC, countries are discussing ways for countries to deepen their emission targets. Japan should undertake additional cooperation with other countries, specifically in Asia, and develop effective projects for reducing emissions jointly. One such Japanese initiative is a mechanism called the Joint Crediting Mechanism (JCM). The JCM develops GHG emission reduction projects in developing countries and uses Japanese financial assistance to install facilities to reduce emissions and at the same time enhance sustainable development (JCM, 2017). Seventeen developing countries have signed onto partnership agreements with Japan on JCM projects. The effectiveness of the mechanism is yet to be seen, but some projects initiated by the JCM could flourish to become bigger and more effective projects in the future.

5. Conclusion

We see today evidence of increasing temperatures and more frequent extreme weather patterns. Even if any scientific uncertainty still remains, there is nearly a consensus that climate change and its impacts are human induced at a level serious enough for all countries to start taking action. The Paris Agreement should not be another excuse for delaying actions just because the achievement of emission reduction targets is not legally binding, or because the level of the targets could be set according to each country's preference. Rather, the Paris Agreement should be the founding basis for wider cooperation among countries, local governments, the business community, and citizens. That said, researchers are expected to supply the various stakeholders with data sets and information to enable them to find the best, most effective and least costly solutions obtainable, that also invite other co-benefits related to sustainability.

Japanese stakeholders should not confine themselves to the traditional way of looking at the world, assuming stable prices, with the prices of fossil fuels continuing at their current level into the future, thinking emission reduction to be costly. People should be aware that GHG emission reduction actions bring about opportunities to invest in reconstructing new ways of living in the 21st century.

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