TRIES

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Environment and Sustainability

東海大学環境サスティナビリティ研究所

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東海大学
環境サステイナビリティ研究所(TRIES)
森本 英香（研究所長）

ごあいさつ

東海大学「環境サステイナビリティ研究所(TRIES)」は、さまざまな分野の枠組みを超えた学際的な視点を持って、人と社会と自然が共存できる社会システムの構築、サステイナブルな社会の構築に寄与することを目的として、2022年4月1日に発足しました。

以来、「環境」と「サステナビリティ」の分野で、様々な活動を進めてきました。

本研究所は3つの柱で活動しています。「サステイナビリティ・環境研究と教育の結集と発信」「日本のこれまでの経験の対外的発信」「産学官の人材交流プラットフォームの構築」の3本です。

第1の柱については、「エネルギー・金融に関する研究」、「循環経済に関する研究」、「地域CN(カーボンニュートラル)と環境・経済・社会の統合的向上に関する研究」をテーマとして設定し、多くの論文の発表、セミナーの開催などを行い、研究を進展させました。

また、国際連携も進め、韓国ソウルの延世大学と覚書を締結しました。

第2の柱については、我が国の多くの社会課題、とりわけ、環境問題の解決に取り組んできた経験、技術、文化を発信することを狙いとして、ウェブサイトにより政策分析の情報発信を高頻度に行うとともに、「環境政策50年の軌跡」と題する環境行政のオーラルヒストリーを、環境省に協力して出版しました。

また、産官学連携の下、環境省、経済産業省における循環経済系の複数の審議会に委員として参画して、研究成果の社会還元を行いました。

第3の柱については、渋谷キャンパスを拠点とし、オンラインも活用して、主として循環経済をテーマとして、産官学の幅広い参加を得て多くのセミナー・招待講演会を開催しました。

今日は、VUCAの時代と言われています。本研究所発足以来、コロナの蔓延に加え、ウクライナへのロシアの侵攻、イスラエルとパレスチナの紛争をはじめ、予想外想定外の事態が次々と起きています。とりわけ、気候変動については「沸騰する地球」と表現されるなど、危機的状況がより高いレベルに達しています。

その一方で、パリ協定を踏まえ、希望を捨てず、2050年カーボンニュートラルにチャレンジする動きが世界中の国々、企業、研究者、そして市民に広がっています。

気候変動をはじめとしたグローバルなリスクを乗り越える、また、社会の持続性(サステイナビリティ)を確保することが大きなテーマになっている今日、この両者を不可分のテーマとして掲げる本研究所の役割はますます高まっており、より一層の活動が求められていると痛感しています。

東海大学建学の精神に基づき、「希望」を持ち、「サステイナビリティ」「環境」の分野における研究を結集し、相互に連携を深めていきます。個々の研究のさらなる発展と外部に積極的に発信することを通じて、「協働」による社会的課題の解決に向けて社会に貢献していくことを目指します。

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1. チャートで見る環境政策

Environmental Policy in Charts

TRIESでは、日本の特徴を表すチャートについて解説するレポートや、国際的な問題を日本の視点から解釈した論考を、概ね隔週で公表している。環境問題のみならず、所得格差、都市問題、ジェンダー格差など、SDGsの目標に含まれるトピックを取り上げている。

Once every two weeks, we will provide commentary on a single chart that represents a characteristic of Japan. Alternatively, a discussion that interprets an international issue from a Japanese perspective will be posted along with the chart. The chart will not be limited to the environment, but will cover topics included in the SDG goals, such as income inequality, urban issues, and gender inequality

Why geothermal energy is stagnating in Japan, despite the availability of resources and technologies?

2023/2/3 Farhad Taghizadeh-Hesary

This policy brief extracted from
Taghizadeh-Hesary F., Mortha A., Farabi-Asl H., Sarker T., Chapman A., Shigetomi Y. & Fraser T. (2020) Role of energy finance in geothermal power development in Japan, International Review of Economics & Finance, 70: 398-412 (https://doi.org/10.1016/j.iref.2020.06.011)

1. Introduction and Background

After the Fukushima-Daiichi nuclear power disaster in March 2011, Japan found itself facing an energy supply crisis. Despite strong government support for renewable energy (RE), it appears that geothermal deployment is lagging, although Japan has the world's third-largest reserves of geothermal resources. To reach the objectives set by the Ministry of Economy, Trade and Industry (METI) within 15 years, the currently installed capacity would need to be tripled, an ambitious plan. Given the low level of energy self-sufficiency in Japan and its dependence on imported fossil fuels, the development of geothermal-based generation could alleviate the energy dependency issue. In doing so, vulnerability to external energy price volatilities, disruptive to economic growth, can be avoided, and energy security improved (Taghizadeh-Hesary et al. 2016).

Fig. 1 shows the geothermal power generation in Japan from 1966 to 2017. Over the past 20 years, energy derived from geothermal resources has been reduced. Taghizadeh-Hesary et al. (2020) examined the reasons behind the lack of development and a recent decrease in geothermal power generation in Japan. They analyzed the various barriers hindering development and a summary of the government's strategy to promote geothermal energy in the future. The major contribution of this study is a quantitative analysis of underpinning factors, quantifying the impact of barriers and supportive policies to increase the share of geothermal energy within Japan's future electricity generation mix. This policy brief summarizes their findings.

2. Challenges and opportunities

2.1. Challenges and barriers

Taghizadeh-Hesary et al. (2020) recognized four main barriers to geothermal energy deployment in Japan: technical, legal, social, economic, and financial. These will be detailed individually in the following section.

2.1.1. Technical Barriers

Geothermal energy for power generation has a relatively low electrical efficiency of around 10% (ENERMED, 2018). This is because geothermal energy for electricity production requires high-temperature sources (usually between 100°C and 180°C for binary power plants and higher for flash and dry steam power plants), as lower temperature sources are not fit for electricity production. Further, geothermal energy requires a high degree of specialization for engineers responsible for the deployment, which has decreased following budget cuts for the New Energy and Industrial Technology Development Organization (NEDO), 2014. NEDO has been responsible for new energy development since 1980, concentrating on providing subsidies and funding for R&D. However, their budget was cut due to social backlashes due to perceived high costs (JOGMEC, 2019). As a result, Japan has a very low success rate for survey drilling, approximately 30%, which is thought to contribute to relatively high exploration costs (JOGMEC, 2018b). Besides, despite the well-spread belief that geothermal energy benefits from a high capacity factor, Kawakami (2015) concluded that maintaining an 80% capacity factor throughout the plant lifespan could lead to a rapid depletion of resources. For sustainable use of geothermal resources, the desired capacity factor should be approximately 60% rather than the maximum technically feasible rate. In Japan, the capacity factor of geothermal generation facilities was reduced voluntarily following concerns over the sustainability of sources in 1997 (Kawakami (2015)).

2.1.2. Legal Barriers

One of the most critical barriers to developing geothermal energy is that around 80% of geothermal sources are located in national park areas (JOGMEC, 2018a). In September 1974, the Environmental Agency limited geothermal development within national parks to only six sites (JOGMEC, 2018a). Another factor that reduced the pace of geothermal development in Japan was the Environmental Impact Assessment (EIA), which came into force in 1999 (JOGMEC, 2018c). The EIA law states

that an environmental impact assessment is mandatory for geothermal projects with installed capacity above 10,000 kW, including publishing and discussing the results of the EIA with local communities (JOGMEC, 2018c).

2.1.3. Social Barriers

One of the major barriers to geothermal development is social opposition.Kubota (2015) also led a similar survey among stakeholders and local governments. About 70% of local government respondents supported the development of small-scale geothermal power plants. However, support fell to 25% when it comes to medium to large-scale geothermal power plants located within national parks. Kubota et al. (2013) showed through interviews that the main concern of stakeholders, including hot spring operators, is the irreversibility of resource depletion, as well as the lack of level of preparedness of developers in the event of accidents occurring. There is, for example, no compensation insurance scheme established between geothermal developers and the government. As Kubota (2015) writes, "the key decision-makers for issuing drilling permits for geothermal wells in development areas are prefectural governors", their level of opposition is a very important barrier. This system extends the lead time and financial risks for developers if they fail to reach a consensus with stakeholders.

2.1.4. Economic and Financial Barriers

According to a study conducted by Deloitte (2014), total installation costs in Japan are more than double those in Iceland. Higher prices in Japan arise due to long lead times resulting from the consensus-seeking process. As the results of EIA are made public, geothermal developers usually undergo additional survey drillings. Unlike other RE projects, the need to monitor sources and potentially drill new wells after project completion also strongly impacts overall costs. Furthermore, geothermal developers in Japan must undergo additional procedures surrounding exploration and deployment, which are not always present in other nations (including an environmental impact assessment, surface survey, or fumarole examination) (Deloitte, 2014). Finally, an additional barrier unique to Japanese geothermal developers arises because most geothermal sources are located in regions with limited connectivity to the national power grid (Deloitte, 2014).

2.2. Opportunities and supportive policies

This section reviews the various measures put in place to promote geothermal energy in Japan. After the first oil shock of 1973, the government decided to promote long-term R&D programs to increase energy self-sufficiency. The "Sunshine Plan" promoted R&D to tackle energy generation issues and was in force from 1974 to 2000 (New Energy and Industrial Technology Development Organization (NEDO), 2014). Over the years, the government-supported 23 national research projects, with 220 billion allocated toward geothermal energy R&D (Kimura et al., 2007). In 1980, NEDO was created and responsible for administrating most governmental R&D subsidies.

The stabilization of oil prices, coupled with growing discontent due to the expensive nature of the Sunshine Plan stopped these R&D subsidies in 2002. In the case of geothermal energy, the late 1990s was also a period where stakeholders expressed concerns regarding environmental sustainability. During this period, the Renewable portfolio standards (RPS), a command-and-control type policy, forced electricity providers to have a certain percentage of their electricity produced from RE sources and was in force from April 2003 to June 2012. According to Chen et al. (2014), the RPS was ineffective, as the target was set relatively low.

In 2012, the Feed-In Tariff (FIT) scheme succeeded the RPS, and Japan started to implement several types of supportive policies based on energy finance. The FIT scheme incentivizes electricity providers to purchase RE at a set price over a given procurement period (JOGMEC, 2018a). Japan also attempted to tackle the issue of geothermal sources being located in national parks by relaxing the National Park Law in March 2012, allowing developers to access 59% of geothermal resources. The Japanese government also put the Japanese Oil and Gas and Metal National Corporation (JOGMEC) in charge of geothermal resource development in 2012. The agency provides financial and technological support (JOGMEC, 2018a). JOGMEC provides subsidies for geothermal developers by covering all costs for local developers for surface and well-drilling surveys (excluding steam discharging tests). The agency covers 75% of these costs for ordinary developers. JOGMEC also covers all costs for environmental pre-survey and monitoring surveys. The agency offers up to 50% of equity capital, provided that JOGMEC is not the largest shareholder (JOGMEC, 2018a). The agency provides liability guarantee before receiving loans from private financial institutions for up to 80% of total liability, at a base rate of 0.4% per year (JOGMEC, 2018a), as a form of credit guarantee scheme. As of 2017, more than 70 projects have been supported by JOGMEC, predominantly through subsidies. Finally, the agency creates educational events and pamphlets aiming at promoting the understanding of geothermal energy taking place in schools, private firms and local governments

and even on-site events for the general public, presenting the state of geothermal energy in Japan, as well as the support they provide for potential investors (JOGMEC, 2018d). These educational programs are a way to reduce social barriers, as they promote mutual understanding between investors and the general public, including hot spring owners.

The evolution of the budget for each policy instrument related to geothermal energy is summarized in Fig. 2. Overall, Japanese government expenditures increased markedly post 2011. This level of support is not expected to be maintained in the long term.

3. Conclusion and policy implications

In this policy brief, barriers hindering the development of geothermal energy in Japan and policies that the Japanese government has implemented since 1966 were analyzed.

Barriers hindering geothermal energy development can be divided into four types: technical, legal, social, and economic. The Japanese government introduced plans to support geothermal energy development twice following the energy crises. The Sunshine Plan introduced in 1974 supported RE through extensive R&D and subsidies. However, due to the Plan's expense, support decreased in 1997 and discontinued in 2002. The post-Fukushima energy crisis brought about another opportunity for RE, and government expenditures for the promotion of RE reached unprecedented levels. This level of support will likely be discontinued for the same reasons as the Sunshine Plan, and this study aimed to identify which policies have affected geothermal power generation. To identify influential green finance policies, Taghizadeh-Hesary et al. (2020) conducted an empirical study using policy instruments, macroeconomic indicators and other factors affecting geothermal energy. In the long run, this study identifies that while the FIT and R&D expenditures seem to increase geothermal power production, non-investment subsidies have the opposite effect due to poor sectorial targeting. This study confirms the positive impact of green finance instruments such as R&D and FIT, while the empirical results discourage the use of subsidies. The short-run results show a different outcome, whereby only the FIT, Subsidies, and R&D expenditures are deemed to have a significant impact on the dependent variable, conserving the same signs as found in the long-run analysis. However, the size and the impact of FIT are smaller in the short run. The empirical results, therefore, demonstrate that the most efficient policy instruments in promoting geothermal energy for power production are R&D expenditures and the FIT scheme, whose impact is shown to be greater than those of barriers combined in the long run. Furthermore, this research shows that subsidies are not an efficient policy for geothermal electricity generation, both in the long and short-run.

The results of this study implied that the Japanese government should strengthen R&D expenditures and continue the FIT scheme. At the same time, subsidies should be reduced or targeted towards investment as they have mixed effects in their current form. To increase the share of geothermal energy in Japan's energy basket, the issue of social opposition needs to be addressed through programs promoting understanding on both sides for sustainable development of geothermal energy that benefits all the parties concerned.

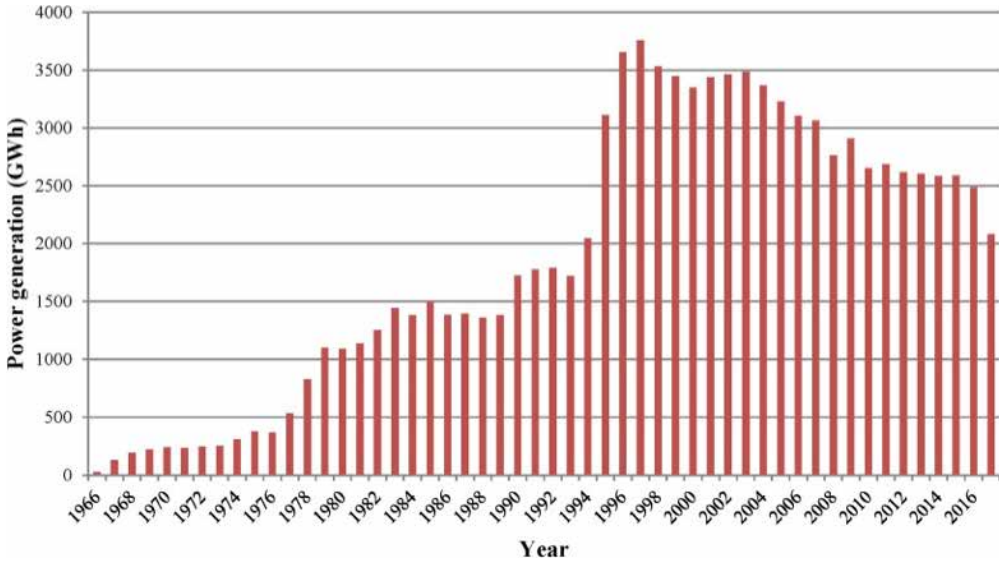

Fig. 1: Geothermal power generation in Japan (1966-2017)
Source: JOGMEC, 2018a

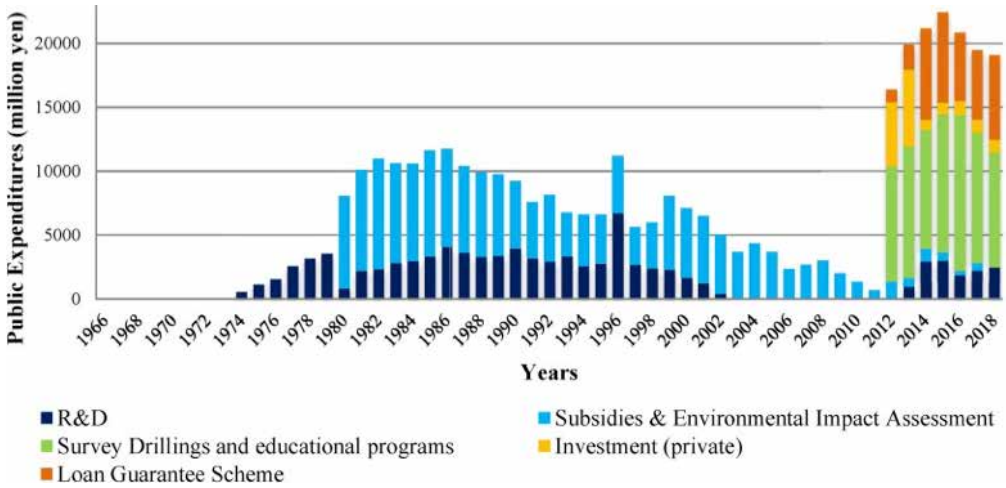

Fig. 2: Public expenditure for geothermal energy in Japan (1966–2018)
Source: Kimura et al., 2007; JOGMEC, 2018d.
Note:
Missing data for geothermal resource development survey and private investment from years 1974-2010

Japan's Approach to Achieving the SDGs

2023/1/20 Mari Kosaka

Since the adoption of the SDGs in 2015, the Japanese government has established various systems and issued policies to promote them in Japan. In this context, the government launched the "Japan SDGs Award" system in 2017, with the aim of recognizing organizations that can serve as models for SDG implementation and thereby encourage others to follow suit. A total of 64 organizations have received the award over the past 5 years, and a look at who they are and how they were selected by the government reveals the characteristics of Japan's approach to achieving them.

(1) Strengthening implementation of the SDGs by small and medium-sized enterprises (SMEs)

About 13 organizations are selected each year – one award is given by the Prime Minister, two each by the Chief Cabinet Secretary and the Minister of Foreign Affairs, in addition to eight special awards – and all types of actors have been selected, including companies, NGOs, municipalities, educational institutions, and the media, among others. Of the 64 selections made over the past 5 years, 27 were companies, and about 60% of these were SMEs. In general, it is difficult to say that SMEs in Japan are making progress in their efforts to implement the Goals. For instance, a survey of 2,000 selected SMEs in Japan showed that only 11% of them are currently implementing the SDGs (Organization for Small & Medium Enterprises and Regional Innovation JAPAN 2022) (see Fig. 1). With such limited efforts by these organizations, one of the government's intentions for the award system is to spotlight numerous SMEs and set them up as role models, so that other SMEs will recognize that they too are subject to SDG implementation and follow suit.

(2) From raising awareness to transformation

Based on advice from the SDGs Promotion Roundtable, there is a procedure by which the SDGs Promotion Headquarters, headed by the Prime Minister, selects the winning organization. What is most interesting is the evaluation criteria for the selection. From 2018 to 2021, the criteria were universality, inclusiveness, participation, transparency, and integration, which are concepts underlying the 2030 Agenda. From 2022, however, two additional criteria were added to these five: transformation and solidarity/behavior change. In the early stages when this award system was launched, there were some organizations selected that (only) contributed to raising awareness of the SDGs, but in the last few years awarded organizations focused on actually putting them into action and making the results public. The addition of these new criteria at this stage is a clear indication by the government that it is already not enough to simply implement actions consistent with the SDGs, but that organizations' activities should be creating transformative impact.

(3) Activities not necessarily triggered by the adoption of the Global Goals in 2015

Looking at the content of the activities among the selected organizations reveals that they were not necessarily started in response to the adoption of the SDGs; in some cases, overseas activities that have been conducted continuously since the 1980s were evaluated. In other words, the government is not emphasizing the promotion of the Global Goals themselves, which were adopted in 2015, but rather attempting to promote the areas set forth within them.

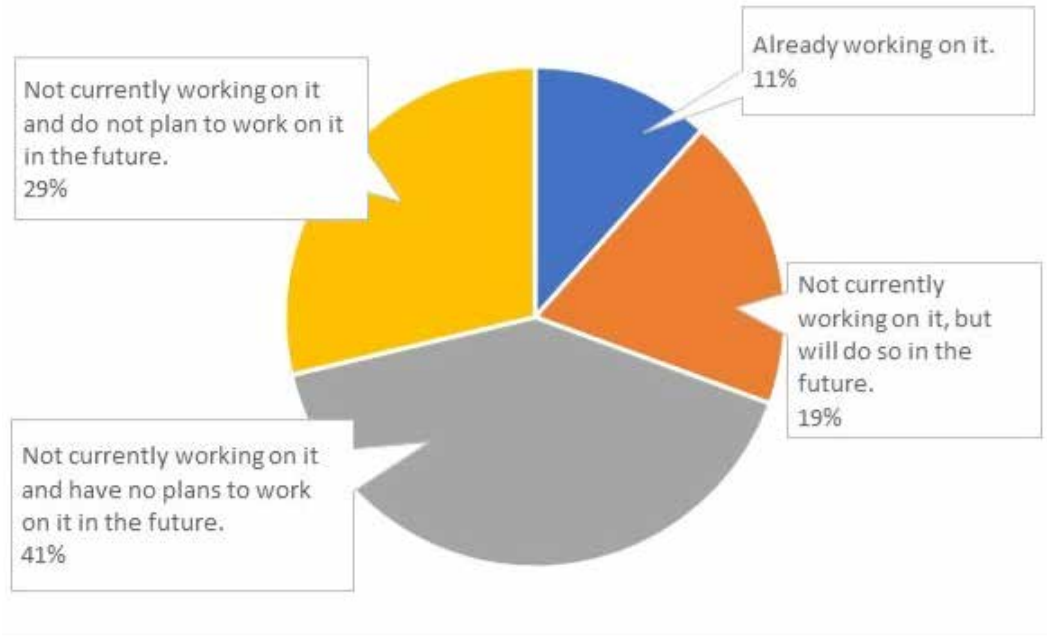

Fig. 1: SDGs Implementation Status of SMEs (n=2,000)
Source: Organization for Small & Medium Enterprises and Regional Innovation JAPAN (2022) Survey on SDGs Promotion by Small and Medium Enterprises: Questionnaire Survey Report.

Reference:

- Organization for Small & Medium Enterprises and Regional Innovation JAPAN (2022) Survey on SDGs Promotion by Small and Medium Enterprises: Questionnaire Survey Report. (in Japanese, Accessed: 11 January 2023).

Connecting Mineral and Metal Imports to Authoritarianism

2023/1/6 David D. Sussaman

The invasion of Ukraine by Russia, and the now 10-month long war, serves as a reminder of the importance of global supply chains. Socio-environmental impacts range from increased food insecurity due to disruptions in wheat supplies, to a shift towards greater efficiency and the search for alternative sources of energy due to sanctions of Russian oil and natural gas.

These examples, as well as those of other materials, show how trade in resources from one country to another can affect the environment, while also being tied to authoritarian regimes. This briefing utilizes the Observatory of Economic Complexity (OEC)[1] to suggest that Japan (as is the case with other industrialized countries) needs to remain vigilant in terms of its sourcing of energy and minerals. A New York Times report in October of this year noted that Japan's volume of trade with Russia actually increased 13% after the invasion of Ukraine, with exports down 42% but imports up 40% (Gamio and Swanson 2022). It may be easier to find alternative markets in which to sell products, though the raw materials that Russia exports are more challenging to replace.

Oil is often associated with less than democratic governments, and Japanese imports of petroleum are no exception. In 2020 crude petroleum represented 6.6% of the value of all imports into Japan, the largest single category among the World Customs Organization's 4-digit harmonized systems codes for products.

As Figure 1 shows, the petroleum sourced from Russia is not insignificant, making up more than 5% of Japan's imports of that energy source. By June of this year, S&P Global Commodity Insights reported that Japan stopped importing Russian crude altogether (Kumagai 2022). This is an important step in cutting off financial flows to the authoritarian regime in Moscow, but a further story here has to do with the origin of energy from other countries – what we see is a huge reliance on the Middle East and Asia, in countries which are not very democratic. Freedom House provides a global score to rank countries, in the year 2021, according to the political rights and civil liberties guaranteed to their citizens. Of 18 countries that export crude to Japan, the organization categorizes Saudi Arabia (39.3% of the petroleum), the United Arab Emirates (31.5%), Qatar (8.42%), Russia (5.37%), Kazakhstan (0.99%), Oman (0.75%), Bahrain (0.37%), Iraq (0.35%), Vietnam (0.33%), Algeria (0.3%), Brunei (0.1%), Azerbaijan (0.095%), and China (0.076%) as "not free", and Kuwait (8.89%) and Malaysia (1.26%) as "partly free". Only the United States (1.08%), Ecuador (0.4%), and Australia (0.18%) are classified as "free", accounting for merely 1.66% of Japan's crude petroleum imports.

Another essential material, aluminum, is not mined within Japan, and yet is key for green technologies. Among metals, Japan's largest import by value is raw aluminum, at 3.37 billion USD, or .58% of all its imports in 2020.

What additional observations can be drawn from Figure 2 above, showing the origins of raw aluminum imported into Japan? In 2020 there was a great reliance on Russia, as the largest exporter (16.8%) of the material. Even if this source is reduced, the remaining countries are, according to Freedom House, a mixture of "free", such as Australia (16.5%) and New Zealand (9.6%), and "not free", such as the United Arab Emirates (14.5%), China (7.24%) and Saudi Arabia (5.4%). The more diverse supply chain for aluminum imports shows that Japan's reliance is truly global – nearly 10% from South America, and another 4.5% from Africa. It also gives hope that the sourcing from more democratic countries can be increased.

Our trade and use of natural resources clearly has environmental implications. Fossil fuels are no longer viable in a world where climate change is a reality. At the same time, there is no such thing as "sustainable mining", despite how the industry may wish to promote itself. One solution includes the rapid expansion of renewable energy in place of crude

[1] The Observatory of Economic Complexity (OEC), originating out of the MIT Media Lab, graphically represents the 4-digit Harmonized System codes assigned by the World Customs Organization for imported and exported products.

petroleum, and when it comes to aluminum, we need efficiency and the creation of as circular an economy as possible.

All of this is not written as a critique of Japan, but rather, a recognition of the complications of materials and where they are sourced from. Beyond the environmental implications, we find social and political concerns in terms of the types of governments supported by this trade. Imports from (not to mention exports to) authoritarian rulers help to prop them up. Japan is not alone in its material bind. Korea, for example, also imports petroleum from similar countries, with a significant percentage drawn from those that are “not free”. However, a relatively larger amount of it is sourced from “free” countries, at 16.44% total. As of 2020 the United States still received 1.3% of its crude from Russia, with the vast majority, 60.4% from Canada (democratic, though known for its highly polluting tar sands). Consideration of the way energy and mineral resources are connected to authoritarian regimes should not be overlooked.

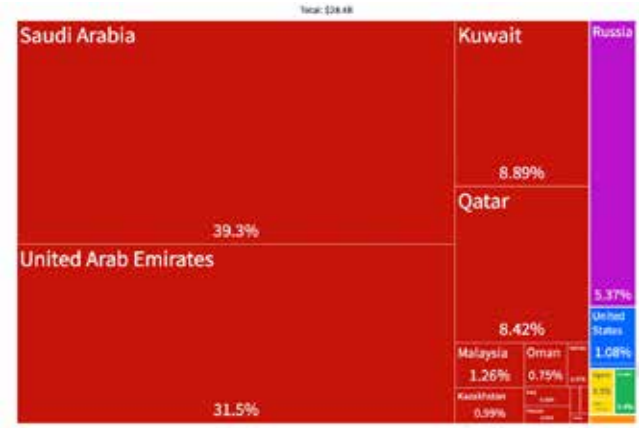

Fig. 1: Origin of Crude Petroleum Imported into Japan (2020)
Source: The Observatory of Economic Complexity (OEC)

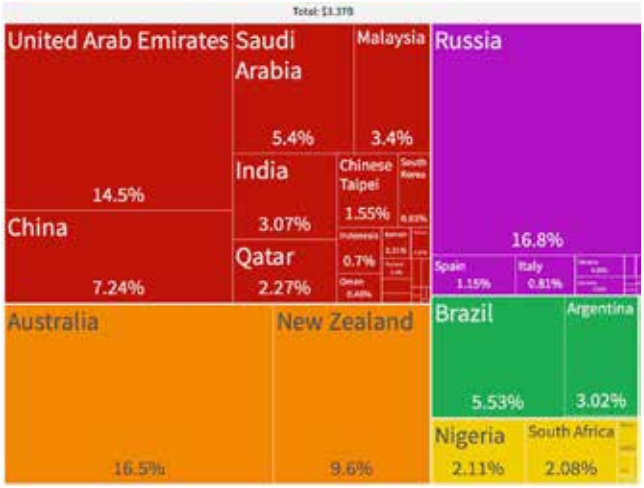

Fig. 2 Origin of Raw Aluminum Imported into Japan (2020)
Source: The Observatory of Economic Complexity (OEC)

Reference:

- Freedom House. 2022. “Global Freedom Scores”.
- Gamio, Lazaro and Ana Swanson. 2022. ‘’ How Russia Pays for War”, New York Times, 30 October.
- Kumagai, Takeo. 2022. “ Japan’s Russian crude oil imports fall to zero in June”, S&P Global Commodity Insights. 22 July.
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Current Status and Future of Renewable Energy in Japan

2022/12/16 Kazuhiro Okuma

The global shift to renewable energy is underway, with IRENA statistics showing that global renewable energy generation capacity nearly doubled between 2012 and 2020, from about 1,400 GW to 2,800 GW.

Japan was the world leader in the development and introduction of solar power in the 1970s and 1980s. Subsequently, the driving force behind the introduction of renewable energies shifted to Europe, and then China, and Japan's presence in this field declined. In recent years, however, the introduction of renewable energy has accelerated again in Japan, with the aim of further significant introduction in the future. We take a look at the situation.

Figure 1 shows the trend of renewable energy generation capacity from 2012 to the present and the target for 2030, along with a breakdown by type of renewable energy. The experience of the Great East Japan Earthquake in 2011 triggered the introduction of a feed-in tariff (FIT) in 2012, and the introduction of renewable energy has accelerated dramatically. The growth rate from 2012 to 2020 is about 17% per year and the increase is about 7 GW per year, indicating rapid expansion.

Following the decision in 2020 to aim for carbon neutrality in 2050, the Basic Energy Plan, which aims to make renewable energy the main source of power, was decided and the energy mix policy was set to provide 36-38% of electricity from renewable energy in 2030. The power generation capacity and breakdown in this policy are shown on the right side of Figure 1.

Looking at the policy until 2030 compared to the previous transition, the speed of expansion is about 7% per year in terms of growth rate and about 7 GW per year in terms of increase, which is the same rapid expansion policy. On the other hand, looking at the type of renewable energy, a different policy can be clearly seen. While solar power has been the main source of expansion to date, wind power is expected to expand most significantly toward 2030.

Japan has large potential for offshore wind and geothermal power, but it takes time for these to be introduced. For this reason, solar PV has progressed first since the introduction of the FIT in 2012. However, in order to make renewable energy the main source of power, we cannot rely solely on solar power. A goal has been set for a significant introduction of wind power, equivalent to an expansion of about 18% per year. Policies are being implemented to achieve this goal. For example, based on the Offshore Wind Power Generation Act, areas with high potential are being zoned sequentially, and offshore wind power generation is being located in stages. Figure 2 shows the status of zoning based on this law.

As a result of these goals and policies, the introduction of renewable energy in Japan is expected to further accelerate. Solar power will continue to grow, but offshore wind power in particular is expected to expand markedly. This is not only a climate change measure, but also a major business opportunity for related industries. The renewable energy industry is globalizing, and the expansion of Japan's renewable energy market is attracting attention from businesses around the world.

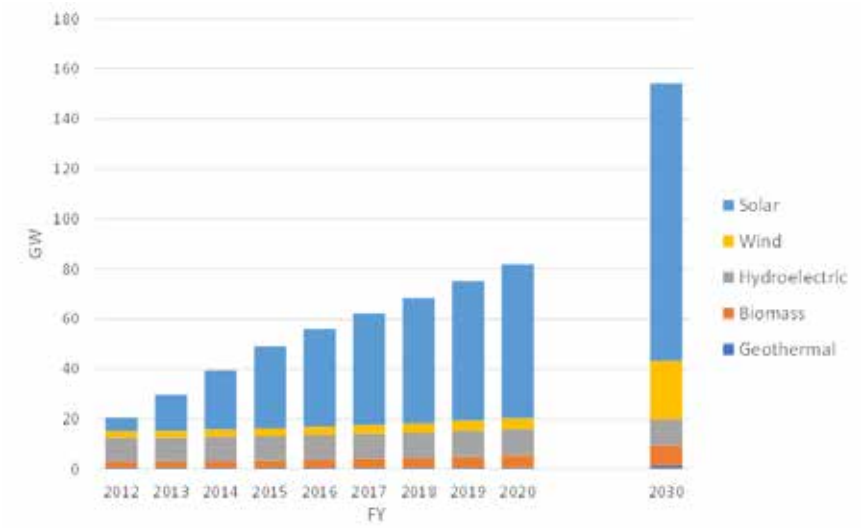

Fig. 1: Renewable energy generation capacity in Japan
Source: processed from METI data.
Note:
The value of FIT introduction until 2020, the value of energy mix in the 6th Energy Strategic Plan in 2030. Large-scale hydroelectric are excluded.

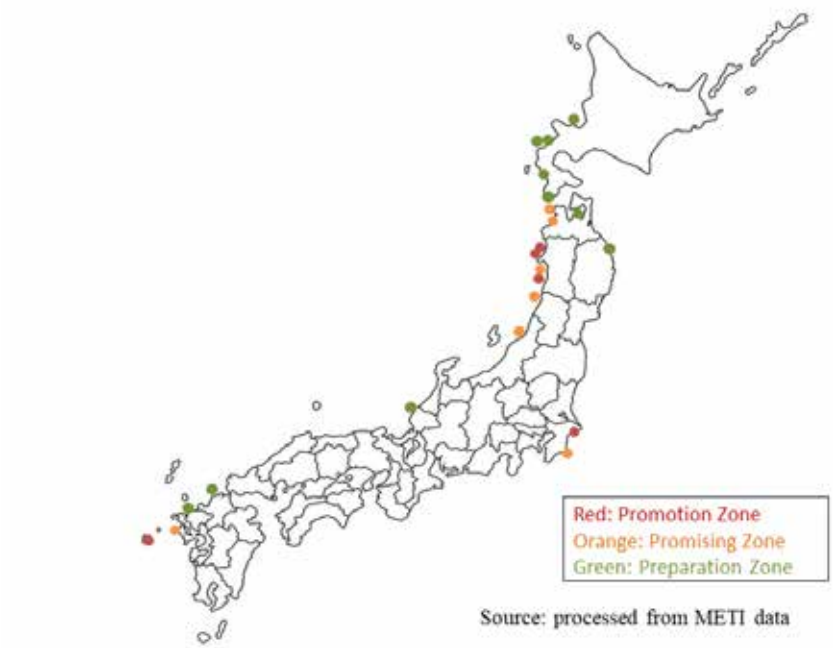

Fig. 2 Status of zoning under the Offshore Wind Promotion Act
Source: processed from METI data.

CO_2 Emissions from Fossil Fuel Consumption

2022/12/2 Haru-Hisa Uchida

Although global warming is becoming a growing concern, CO_2 emissions associated with the annual consumption of fossil energy resources in human activities continue to increase. (Around 36 billion tons of CO_2 per year). The following is a review of each of these figures around last two decades.

CO_2 emitted from fossil energy resources consumed by human activities is released into the atmosphere, while CO_2 in the atmosphere is assumed to be absorbed by the nature according to its partial pressure, by plants, by the ocean, and so on.

In nature, CO_2 is released through respiration of bio-substances and decomposition of organic matter, and the difference between the amount released into the atmosphere and the amount absorbed is observed as the atmospheric concentration. (i.e. in Steady State)

Figure 1-A shows past and recent atmospheric CO_2 concentrations and temperature changes relative to the year 2000 (NASA). Figure 1-B shows the amount of CO_2 in atmosphere calculated from the CO_2 concentration, assuming that the total amount of the earth's atmosphere is about 5200 trillion tons, CO_2 is uniformly distributed in the atmosphere, and the average atmospheric pressure is constant. The lower line shows the amount of CO_2 excluding the emission from the consumption of fossil energy resources, which is also shown in Figure 1-C.

If we look at the 14-year period from 2000 to 2014, we can see that the atmospheric concentration increased by about 28 ppm and the amount of CO_2 in the atmosphere increased by about 140 billion tons, while the amount of CO_2 resulting from the consumption of fossil energy resources increased by about 11.4 billion tons.

The amount of CO_2 generated from fossil energy resources due to human activities is equivalent to about 8% of the amount estimated to be increased in the atmosphere. It can be seen that the increase in the amount of CO_2 in the atmosphere, i.e., its concentration, is not due directly to the emissions associated with the consumption of fossil energy resources, but rather to an increase in the amount released in the balance between absorption and release to the natural world. The release of CO_2 from natural environment due to rising average temperatures or a decrease in the absorption capacity of the natural world can be considered, but if we look at the past 10 to 20 years, we can also consider that the amount released due to human activities has been amplified by a factor of 10 or more in the natural world.

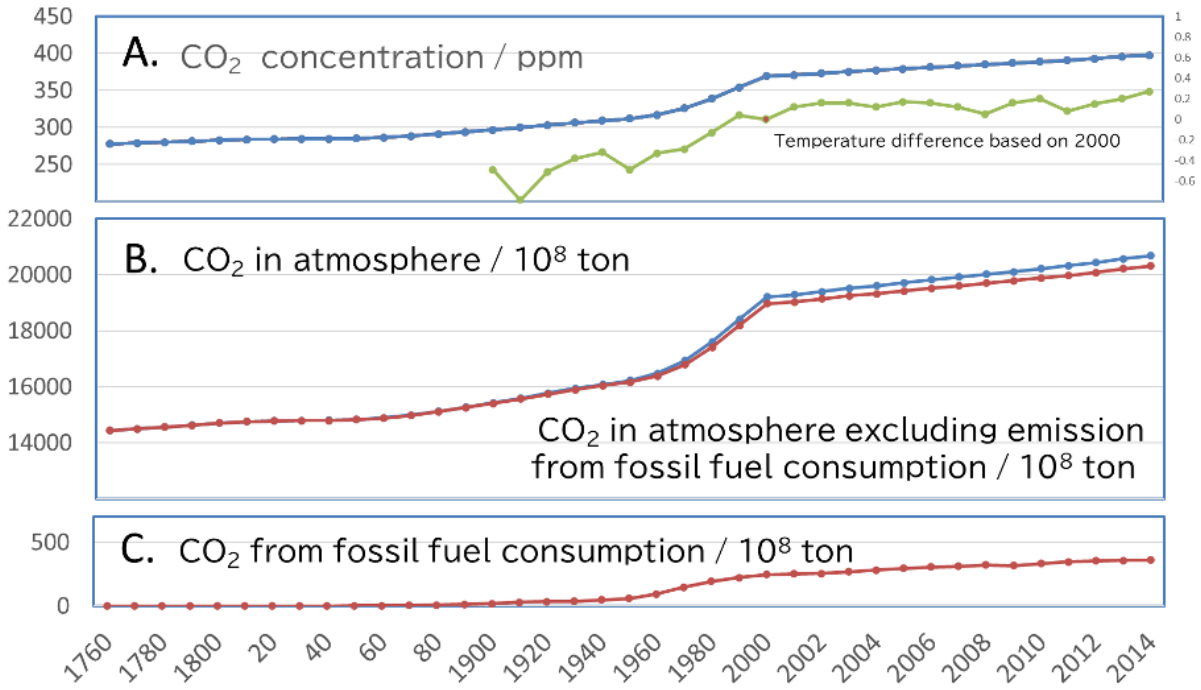

Fig. 1: Changes in Global Carbon Emissions
Source: CDIAC “Global Fossil-Fuel Carbon Emissions”, and WMO, “World Data Centre for Greenhouse Gases”

Factors of Food Price Instability From the Experience of the Ukrainian War

2022/11/18 Naoto Yoshikawa

It is generally accepted that stable food prices require a stable quantity of food supply and demand that matches its supply volume. However, the recent Russian invasion of Ukraine has had a more significant impact on food prices, especially cereal price fluctuations, than the quantity of its supply. It is people's uncertainty and feeling of insecurity about the food supply in the future. Let us look at the fluctuations in food prices since the beginning of the war in Ukraine and find out what affects food prices more than the actual supply.

World food prices rose steeply when Russia invaded Ukraine on February 24, 2022. Particularly prices for cereal and vegetable oil, which Ukraine and Russia have been exporting, skyrocketed from February, rising 33.6% compared to prices during the same period the previous year, and in March 2022, they reached their highest historical prices (FAO COUNCIL 2022). High prices then continued through June. In July, cereal exports from Ukraine were expected to resume due to an agreement between Ukraine and Russia (the Black Sea Grain Initiative), and prices began to fall rapidly in July; although the rate of price decline slowed in August, they continued to fall in September and October (FAO/a 2022). Cereal prices continued to fall until August, parallel to food prices, but since September and October, they have continued to rise gradually, as shown in Figure 1 (FAO/a 2022). According to FAO analysis, this rise is due to concerns about continuing the Black Sea Grain Initiative (FAO/a 2022).

The quantities of the global production, supply, use, and trade (the amount of cereal bought and sold on the international market) of cereal in FY2022/2023 are not significantly different from those in FY2021/2022 (FAO/b 2022). Given this cereal production, supply volume, and trade volume, cereal prices are not likely to increase much compared to the previous year. The trade volume of cereal is 469.5 million tons in FY2022/2023 compared to 468.9 million tons in FY2021/2022, a difference of only 0.6 million tons, or a decrease of 0.13% (FAO 2022/b). Trade volume is one of the essential indicators in terms of international food price since it is the amount of cereal imported by countries whose domestic production cannot meet domestic demand. It is necessary to look at the trade volume of "cereal," which, in addition to wheat, includes rice, corn, rye, barley, and other minor cereals. Corn for feed is also included in this cereal supply, which accounts for 14% of the international market in Ukraine alone (FAO COUNCIL 2022). However, an extremely significant concern in this Ukrainian war is wheat, which accounts for 30% of the international market in Russia and Ukraine alone; as of March/April 2022, the purchase of this wheat on the international market was most problematic for countries in the Middle East and North Africa (Khorsandi 2022; WFP 2022). The trade volume of wheat does not differ much from the one for 2022/2023 and the one for 2021/2022. The trade volume is 195.7 million tons in FY 2021/2022 versus 193.7 million tons in FY 2022/2023, a difference of only 2.0 million tons, a decrease of only 1%, as shown in Figure 2 (FAO 2022/b).

Today's changes in international market prices for food, especially cereal, are not due to changes in actual food supplies (availability) but rather to "uncertainty" about the near future. When food exports from Ukrainian ports exceed 120 days, if, for some reason, exports are delayed, if derail fields are attacked, or if storage facilities are attacked, the international market will react immediately, and food prices will rise sharply. In response to this international market reaction, food exporting countries will restrict their exports to meet domestic demand. Furthermore, with no end in sight to the war in Ukraine, Ukraine's next production and harvest exports will become uncertain, and cereal-exporting countries other than Ukraine may stop cereal exports altogether to ensure their own food security. Even now, 13 countries have placed restrictions on wheat exports, and in corn, ten countries have restricted exports (Nishino 2022). As long as the war in Ukraine continues, the international market could panic at any moment, causing food prices to skyrocket as they did in February 2022 or even higher, resulting in the lack of protection of

food security in cereal-importing countries. Cereal-importing developing countries will undoubtedly see a collapse in their food security, as food prices will surely skyrocket, significantly affecting the most vulnerable and poor.

This situation is different from crop failures due to bad weather, such as drought or extreme cold in some countries, which may cause psychological anxiety and fear as the world tries to secure its own food supply as quickly as possible and in large quantities. In today's global society, countries with food surpluses do not hesitate to sell when bad weather causes terrible harvests, and some neighboring countries have organized networks of mutual conservation. Furthermore, international aid agencies call on the world to assist when bad weather causes crop failures. This way, a cooperative relationship is built to maintain food security through various means.

However, in the case of the war in Ukraine, the fact that Ukraine and Russia are the world's important cereal-producing and exporting countries increases the possibility that a prolonged war will result in a decrease in harvest, storage, and exports. This possibility, this insecurity, is likely to raise the international price of food and collapse the food security of cereal-importing developing countries.

Fig. 1:Food Price Index

Source: FAO Food Price Index

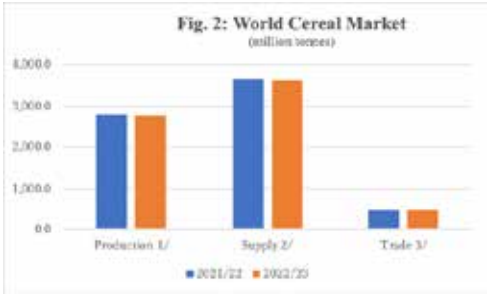

Fig. 2: World Cereal Market

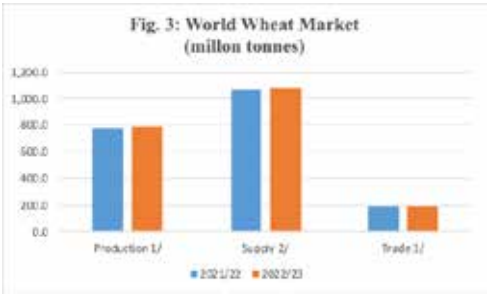

Fig. 3: World Wheat Market

Source for Fig2 and 3: FAO Cereal Supply and Demand Data (World Food Situation)
Note: 1/ Production data refer to the calendar year of the first year shown.
2/ Production plus opening stocks.
3/ Trade data refer to exports based on a July/June marketing season for wheat and coarse grains and on a January/December marketing season for rice (second year shown).

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Is decoupling successful for municipal solid waste in Japan?

2022/10/14 Eiji B. Hosoda

According to the principle of the waste hierarchy, priority is given to the avoidance of waste generation. Waste reduction comes first, followed by reuse, recycling, incineration and landfill. This principle is widely shared among advanced countries, being coupled with the concept of extended producer responsibility. However, it is easier said than done.

The principle is a core element of a circular economy, in which input of natural resources and generation of waste is minimized while value added is maximized, subject to certain economic and social constraints. Then, the fundamental question is whether we can successfully reduce the amount of waste, on the one hand, keeping economic growth on the other. In other words, it must be asked whether and how the decoupling of waste generation from economic growth can be made.

The following figure shows the relationship between the amount of municipal solid waste (MSW) and real GDP in Japan. Although there is a positive relationship between the amount of MSW and real GDP from 1980 through to 2001, such a relationship cannot be seen after 2001; we may say that a negative relationship between them is observed. Apparently, Japan has succeeded in realizing the decoupling of the generation of MSW from real GDP.

As is shown in the figure, there seem to be two stages for the decoupling; one from 2001 to 2008 and the other from 2009 to 2020. What happened to MSW generation around 2008? It must be remembered that 2008 was the year of the serious financial crisis, which possibly affected people's economic behavior. Although it is not so easy to answer why and how the two-stage decoupling happened in Japan around 2008, we may guess that the independent recycling laws enacted in the early 2000s were gradually effective and were enforced by the behavioral change which was triggered by the financial crisis. Yet, the question remains to be answered in a scientific manner.

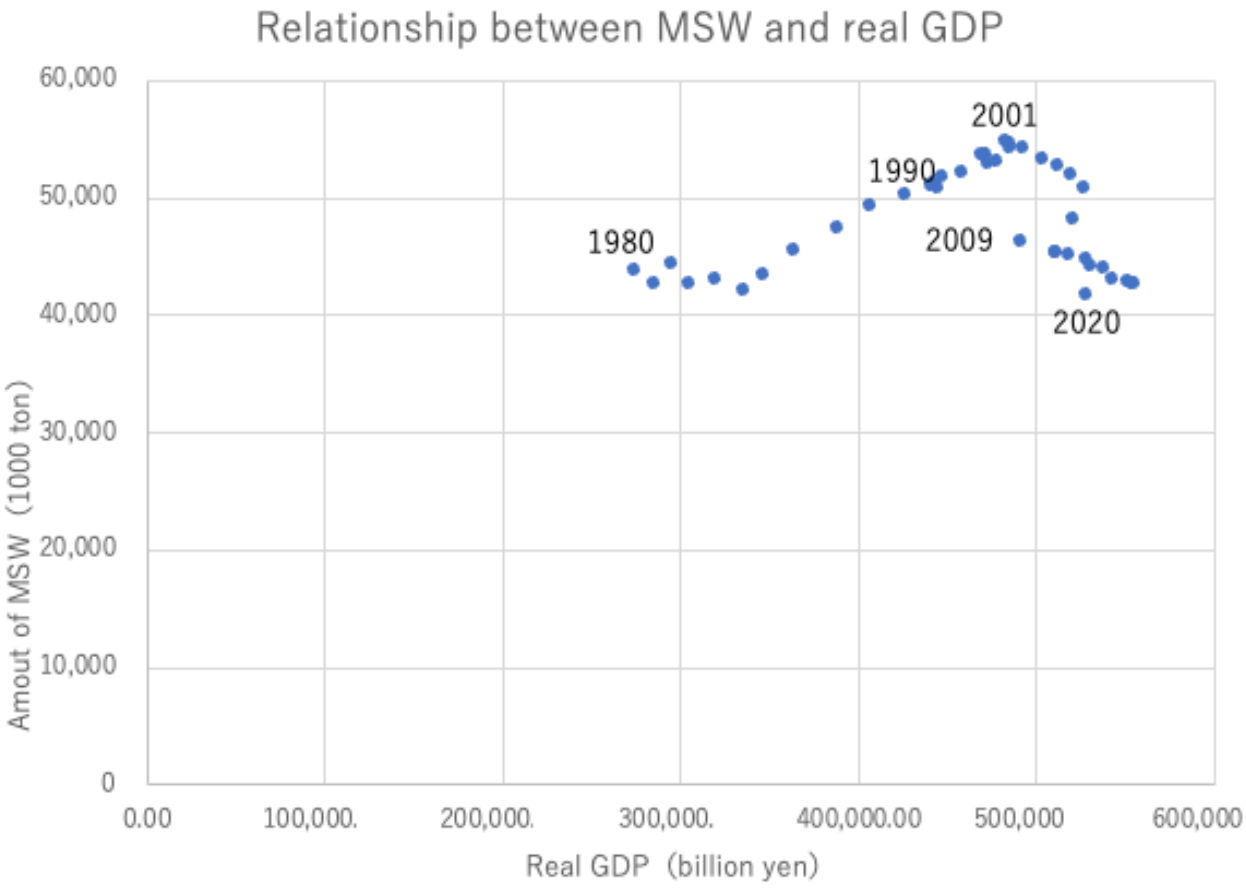

Fig. 1: Relationship between GDP and MSW
Source: Ministry of Environment and IMF

Economic impacts of carbon tax in Japan

2022/9/30 Farhad Taghizadeh-Hesary

This policy brief extracted from: Yoshino N., Rasoulinezhad E., and Taghizadeh-Hesary F. (2021). Economic Impacts of Carbon Tax in a General Equilibrium Framework: Empirical Study of Japan, Journal of Environmental Assessment Policy and Management. 23 (01n02), 2250014.

1. Introduction and Background

Over the last decades, environmental pollution caused by fossil fuel consumption has become a controversial issue among scholars and policymakers. The issue accepted by all scholars is that environmental pollution threatens all people of the world. Therefore, global consensus and unity are essential to solving this problem (Vohra et al., 2021; Chen et al., 2022). Despite various global and regional agreements (such as the Paris Agreement on climate change, The Kyoto Protocol, and the 2030 Climate Target Plan of the European Commission) and long-term plans to reduce fossil fuel consumption in countries around the world, this challenge is at the forefront of policymakers. This challenge is a threat to the environment and even to human survival. Zou et al. (2016) and Koengkan et al. (2022) argue that this challenge cannot be solved quickly, and they forecast that oil and gas production peaks will be around 2040 and 2060, respectively. Asselt (2021) and Taghizadeh-Hesary et al. (2021) believe that fossil fuels are the most critical factor in climate disruption, potentially threatening future human life. Table 1 reports the changes in carbon dioxide (CO_2) emissions and fossil fuel consumption from 1970 to 2019.

The challenge of climate disruption caused by CO_2 emissions from fossil fuel consumption is more profound for developed economies like Japan. The rapid industrialization growth of Japan in 1960 and 1970, linked the country's economic growth to fossil fuels consumption. Although Japan has tried to reduce its dependence on fossil fuel imports, increase energy security, and create sustainable development in recent years, it has not achieved significant success in the energy transition. Even after the 2011 Fukushima nuclear crisis, the country's domestic industry became increasingly dependent on fossil fuels (Taghizadeh-Hesary et al., 2017). Cong et al. (2022), Ishiguro and Yano (2015), and Kazama and Noda (2012) express that the 2011-The Great East Japan Earthquake (GEJE) has shifted Japan from nuclear energy to fossil fuel consumption. Figure 1 shows the changes in coal consumption in Japan from 1970 to 2019:

Despite some earlier plans and roadmaps for carbon neutrality in Japan, such as the "Law concerning Promotion of Measures to Cope with Global Warming" established in 1998 and Japan's Voluntary Emissions Trading Scheme (JVETS) in 2010, the country has tried to employ more efficient tools in the last decade. In October 2012, as the first country in Asia, Japan implemented the carbon tax of 2.65$ with the clear goal of an 80% reduction in Japan's Greenhouse Gas (GHG) emissions by 2050 (Nakano and Yamagishi 2021). Generally, to internalize the adverse externality of CO_2 and to motivate enterprises to develop greener productions, the Japanese government has used the carbon tax policy. Yoshino, Rasoulinezhad, and Taghizadeh-Hesary (2021) answered how can carbon tax affect the Japanese economy?" Their empirical study results is summarized in this policy brief (Section 3). Appelbaum (2021) believes that carbon tax policy can make a wide range of environmental-friendly results for the global society. According to OECD's Effective Carbon Rates statistics, in 2018, the best scores are for Switzerland, and Luxembourg (69%), Norway (68%), and Japan's score is 24%, among the lowest efficient carbon rates among OECD members.

2. Theoretical Background

Yoshino, Rasoulinezhad, and Taghizadeh-Hesary (2021) explored the impacts of the carbon tax on macroeconomic variables in Japan in a general equilibrium framework. Earlier studies mainly assessed the impact of the carbon tax policy on energy prices and not on all economic sectors.

Figure 2 shows the general framework of the impact of carbon tax on the economy, which was developed by Yoshino, Rasoulinezhad, and Taghizadeh-Hesary (2021). A summarization of the relationships mentioned above clarifies that an increase in energy prices due to carbon tax will change the households' consumption and saving behavior. Changes in savings will change the banking behavior, the capital markets behavior, and the flow of funds that would change the interest

Note: yd, ys, y, P, Pe, w,i,e, Eh,Ef,capital,EXP,IMP denote: household's demand, firms supply, total demand/income (GDP), general price level, price of energy, wage rate, interest rate, exchange rate, energy demand of households, energy demand of firms, capital flow, export, import respectively

rate. On the other hand, due to carbon tax, the final price of products would change, affecting the import and export that alter the current account balance. Changes in financial flow caused by the carbon tax will change the capital inflow and outflow from overseas, which will change the exchange rate. Changes in the exchange rate will change the firm production behavior.

3. Empirical Results

Yoshino, Rasoulinezhad, and Taghizadeh-Hesary (2021) developed a Structural Vector Autoregression (SVAR) model using quarterly data of Japan covering the period of 2005-2020 to assess the impacts of the carbon tax on the macroeconomic variables of Japan. The main findings from the empirical results are:

An increase in energy price (+ carbon tax) will increase the interest rate (lending rate). The main reason is that an increase in energy prices due to carbon tax will change the households' consumption and saving behavior. Changes in savings will change the banking behavior, the capital markets behavior, and the flow of funds that would change the interest rate.

By increasing energy prices, Japan needs to pay more foreign currencies (dollars) to import fossil fuels leading to a devaluation of the national currency (Yen) and an increase in the foreign exchange rate in the country.

Any increase in energy price due to carbon tax leads to the rise of Japan's commodities' general price level. The main reason is that if the price of energy as a major production input for the industrial sector, power plants, and transportation sectors in Japan increases, the cost of production jumps and consequently leads to an increase in the consumer price index and inflation rate.

An increase in energy prices due to carbon tax leads to a reduction in the real GDP of Japan. Due to the primary role of industrial production in the GDP of Japan, any increase in fossil fuel prices by carbon tax, will lead to a more expensive production cost for industries which may decrease production volumes leading to slower economic growth for Japan.

Variable	1970	1980	1990	2000	2010	2019	Growth rate 1970-2019
Crude oil consumption (Thousand barrels daily)	45313	361408	66364	76485	86856	98272	116.8%
Gas consumption (Billion cubic meters)	961.5	1423.8	1948.4	2400	3160.7	3929.2	308.6%
Coal consumption (Exajoules)	61.41	75.09	93.22	98.70	151.19	157.86	158.6%
CO2 emissions (Million tons)	14312.9	18433.6	21331.5	23676.4	31085.5	34169	138.7%

Table 1: Fossil fuels consumption and CO_2 emissions in the world, 1970-2019s
Source: Yoshino, Rasoulinezhad, and Taghizadeh-Hesary (2021)

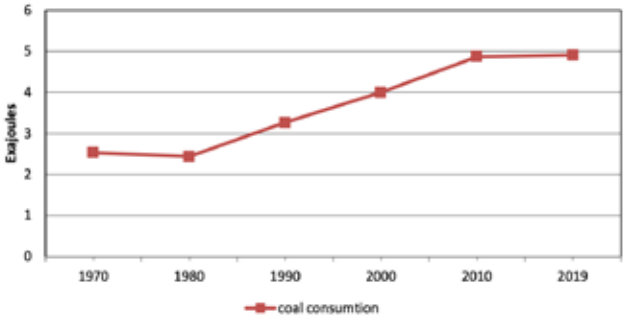

Fig. 1: coal consumptions in Japan, 1970-2019, exajoules
Source: Yoshino, Rasoulinezhad, and Taghizadeh-Hesary (2021)

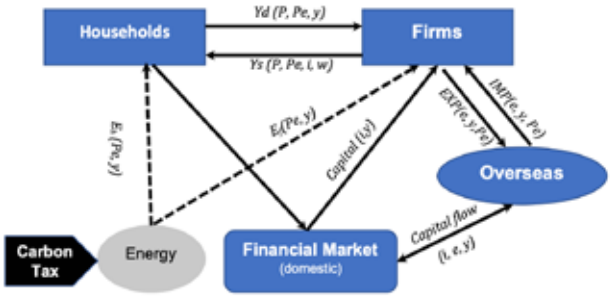

Fig. 2: Economic impacts of carbon tax in a general equilibrium framework
Source: Yoshino, Rasoulinezhad, and Taghizadeh-Hesary (2021)

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Is it possible to commercialize solar cars?

2022/9/16 Hideki Kimura

Fossil fuels such as oil and LNG are becoming more expensive. From the perspective of the SDGs, the use of renewable energy with low CO_2 emissions and energy-efficient vehicles will be necessary in the future. The solar car is the ultimate vehicle that can run using the PV energy, contributing to the realization of a sustainable society.

Do you think solar cars are still a long way off? Indeed, it was once thought to be impossible. However, with the development of various technologies, including solar cells, batteries, motors, inverters, tires, materials, and aerodynamics, commercial solar car is almost there. A comparison of the power consumption vs. speed of a solar car and commercial electric vehicle running on flat ground is shown in the following chart. Here, the solar car is a 2019 model of the Tokai Challenger, and the commercial EV are an estimated Nissan Leaf and Tesla Model 3.

This figure shows that the Tokai Challenger can run on about one-tenth of the power consumption of commercial electric vehicles. Tokai Challenger can run at about 0.8 kW at 80 km/h, which is equivalent to about 1 PS or 1 HP. Considering the environmental impact, this power is an appropriate value to carry one person. In other words, modern cars are too and too heavy.

Next, let us focus on the consumed power of the Tokai Challenger. The rated output of PV panels is 940W, which can reach a cruising speed of over 80 km/h. For example, in the central area of the Australian continent, it can generate about 7 hours of solar power per day. That is, it can travel at a speed of 85 km/h x 7 hours = 600 km.

If a commercial EV is driven, it needs 10 times more power than our solar car. In other words, 0.7h = 42min, which is equivalent to 1/10 of 7 hours, is enough time to run a commercial EV. Roughly, a commercial EV can be powered by solar energy for a range of 60 km per day. In November 2022, an automotive venture in EU will launch a new electric vehicle with 5m2 solar panels called “Lightyear 0” to the world. Lightweight materials of aluminum and carbon fiber, and improved aerodynamics, the car can travel 70 km using solar energy generated in a day. Although the price is very expensive, about 300,000 euros = 36 million yen, the solar car has just been made practical by the latest technology.

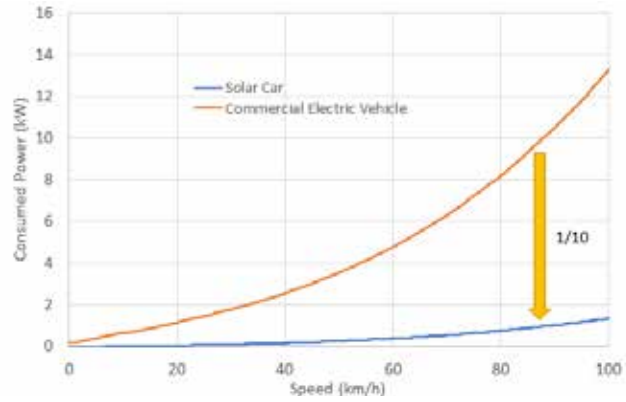

Fig. 1: Consumed Power of Solar Car and Commercial Electric Vehicle

Fig. 2: Solar Car “2019 Tokai Challenger” with 4m2 PV panels

Fig. 3: Commercial Electric Vehicle “Nissan Leaf” [1)]

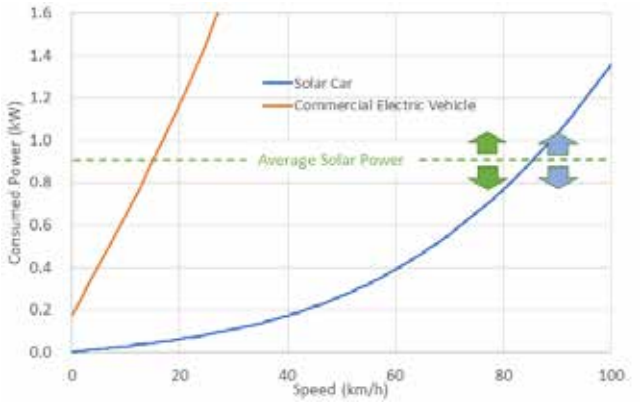

Fig. 4: Consumed Power of Solar Car

Fig. 5: New Electric Vehicle with Large Solar Panel “Lightyear [02)]

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Suicide cases and COVID-19 pandemic

2022/8/5 Ayako Wakano

The COVID-19 pandemic has brought severe economic consequences in Japan. In April 2020, the number of employed people reduced by 1 million, and the number of “works on leave” was increased by nearly 4 million in Japan. Not only economic indices, but its’ impact was observed in various dimensions. For example, the number of suicide cases was increased first time after 2009.

The economic crisis greatly affects the number of suicide cases in Japan. Figure 1 below shows the drastic increase from 1997 to 1998. The left y axis shows the number for male and the right shows that of female. Since the burst of the bubble economy in 1991, Japan had experienced the severe recession for long time. In 1997, it is the year that Yamaichi Securities Co., Ltd. collapsed and in 1998 the Long-Term Credit Bank of Japan failed. The difference of suicide cases in one year from 1997 to 1998 became approximately 8,200. The increase ratio in 1998 is 35 percent, compared to the number of cases in 1997. This is the tremendous increases in number.

After 2009, the number of suicide cases gradually reduces until 2019. It is from 30,707 to 19,425. This is 36 percent reduction, compared to the number in 2009. However, this trend suddenly stopped by the economic shock, again in 2020, during the time of COVID-19 pandemic.

Since the COVID-19 pandemic, female suicide case has been typically raised. From 2019 to 2021, it increases from 6,052 to 7,034 cases, which is 16.2% increase compared to that in 2019, while male suicide cases decrease 1.0%. It is much more obvious when we look at the breakdown of this figure into the employment category.

Female suicide of the unemployed increases 11.9% from 2019 to 2021 and that for employed workers in 2021 increases 35.3% compared to that in 2019. The increase ratio for the same employment category of male was low, compared to that of female. It is -1.6% for the unemployed and 1.7% for the employed.

Immediately after the state of emergency declaration in April 2020, Japanese labor market experienced the devastating shock. Further analysis for this impact is necessary for the suicidal prevention policy.

Fig. 1: Annual suicide cases from year 1990 to 2021 (Source: the Ministry of Health, Labor and Welfare)

Note:

Blue line shows the male cases and orange line shows the female cases

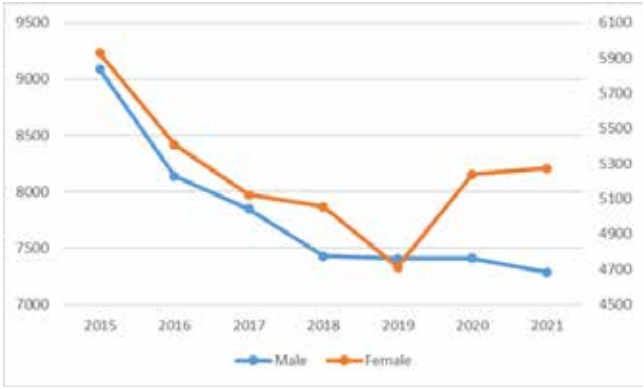

Fig. 2: Annual suicide cases from year 2015 to 2021 (Source: the Ministry of Health, Labor and Welfare)

Note:

Blue line shows cases for male unemployed and orange line is cases for female unemployed

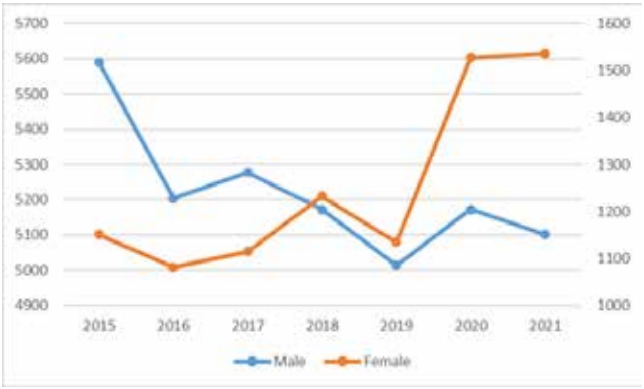

Fig. 3: Annual suicide cases from year 2015 to 2021 (Source: the Ministry of Health, Labor and Welfare)

Note:

Blue line shows cases for male employed and orange line is cases for female employed

The Return of Tourists - and Their Unsustainable Air Travel - to Japan

2022/7/15 David Sussman

One question in response to COVID-19's impact these past years has been whether it is possible to use the rebuild after the pandemic as an opportunity to simultaneously improve sustainability. Broadly referred to as a "green recovery", one area which deserves consideration is tourism, and specifically travel by plane. Research published in 2018 showed that 8% of global carbon emissions come from the tourist industry (Lenzen et al.). Air travel, which accounted for 3% of global emissions in 2021, could increase to 33% by 2050 (Vigeveno 2021). This staggering rise comes despite pledges by governments and airlines to make the industry carbon neutral.

Only two years ago, tourism and airlines were two of the industries hardest hit by customer's behavioral changes in response to the COVID-19 pandemic, with passenger numbers for leisure and vacation-related flights dropping almost to zero. Business travel was not hit as hard, and experienced a halving of customers (Scott 2022). The sharp decline in flying played a part in a global decrease of carbon emissions in 2021, though that was only a temporary reprieve. Recently, the International Energy Agency reported that "global CO_2 emissions rebounded to their highest level in history in 2021" (IEA 2022).

In 2020, countries rapidly closed their borders to visitors, and Japan similarly imposed tight restrictions. Two years later, as the world reconnects and travels again, the country has proceeded much more cautiously in accepting tourists, and only this spring expanded visa access to a select number of business travelers, family members, and students. The most recent statistics show a slight increase in tourists entering Japan in early 2022.

Other regions reveal what will happen when Japan really opens up its borders. Tourism is rebounding steadily, with a survey finding that 58% of experts say that tourism will reach pre-pandemic levels by 2023 in the Americas, 64% in Europe, but only 31% in Asia. TradingEconomics predicts that monthly travelers to Japan will reach 1.2 million in 2024, which is only 36% of the government's 2020 target of 40 million annual visitors (2022).

The point is that while there was a temporary decline in tourists and flights, the longer-term estimates portend a major increase in air travel-related carbon emissions. We all, including Japan, need to keep our eye on the ball when it comes to CO_2 from this mode of transportation. In other industries such as electricity generation or ground transport there can shifts to greater sustainability. With airlines, however, there is not yet a widely available alternative to using the energy-packed fossil fuels necessary for blasting people into the stratosphere. Any recent sense that there are declines in travel emissions are largely illusory.

The chart below shows that even the lowest growth scenario from the International Council on Clean Transportation, based on a projection of 2.4% annual growth, revenue passenger kilometers in mid-century will be about double their number in 2019.

Broadly speaking, there appears to be boundless enthusiasm for travel. The COVID-related drop-off in tourist flights in 2020 and 2021 looks to be (as long as no new virus variants appear) just a blip in the longer-term rise of emissions from air transport. There is also the concept of "revenge" travel, by which people fly even more to make up for lost trips and connections with family and friends. Admittedly, business travel will be impacted, based on fewer face-to-face meetings, and an approximate decline of 20-25% in travel (Scott, 2022). This is not insignificant, as in Europe it makes up nearly a third of emissions due to flights. However, this will inevitably be subsumed by greater demand for travel by other passengers. The world, for example, is adding 215,000 people to its population each day, and will cross the 8-billion threshold in September. That represents a lot of fledgling frequent flyers.

In the end, what does this mean? Japan, while receiving a

limited of visitors now, will someday fully open for tourists again – and when that happens millions more will be flying long-distance to get here. Perhaps there is more that the country can do in the meantime, to make travel more sustainable after passengers land. Or maybe there can be efforts to increase recognition among the Japanese population that the tourists arriving to its islands are, from the very outset, engaging in lifestyle choice (overseas flights) that is deeply unsustainable in its current form. At the same time, present-day awareness – or at least willingness to act – on carbon emissions from flights appears markedly lower in Japan as compared to other countries. For example, while 60% of Spaniards would pay higher prices for "carbon-neutral flights" (if such a thing can really exist), the figure was 2% in Japan (Ahmad et al. 2022). There appears to be an opportunity to increase awareness among Japanese about the unsustainability of modern air travel. Only then can they understand that the typical foreigner, soon to be seen in increasing numbers at temples and shrines, or walking down the street, is fundamentally a representation of unsustainability.

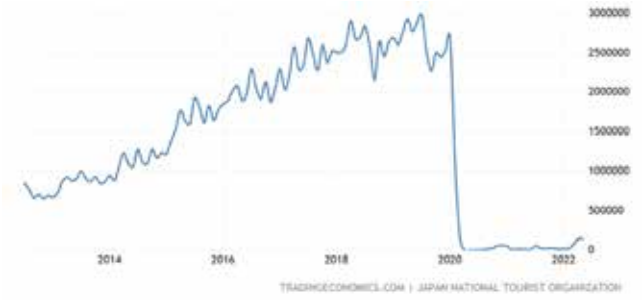

Fig. 1: Tourist Arrivals in Japan (Source: Trading Economics, 2022)

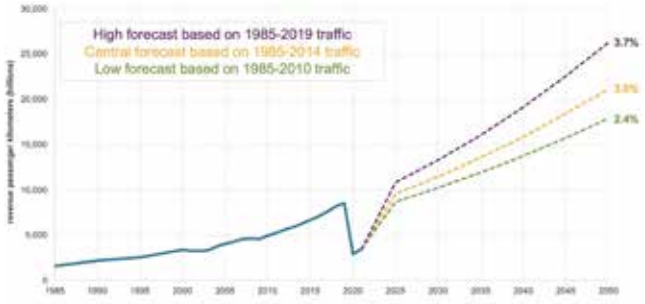

Fig. 2: Projections for Revenue Passenger Kilometers (2022-2050) (Source: Graver, 2022)

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2022 Upper House Election started: female candidates exceeded 30% finally

2022/7/1 Yuki Tsuji

The official campaigning period for the 2022 House of Councillors election in Japan began on June 22. The ratio of women among total candidates running for a national election has exceeded 30%, for the first time since 1946. Should we expect to see more female MPs in the Diet after July 10?

Trends in the percentages of female candidates and winners are shown in Fig. 1 and Fig. 2. The share of female candidates as well as that of elected women have been always higher in the House of Councillors (upper house) than in the House of Representatives (lower house). While women occupy 23.1% of the total seats in the upper house (before election), women's share falls to 9.7% in the lower house.

The largest reason for the small number of female MPs is the small number of female candidates. In particular, the Liberal Democratic Party (LDP), which is a center-right ruling party, as well as its coalition partner KOMEITO, have shown poor performances in political recruitment of female candidates. As Table 1 demonstrates, in the previous upper house election in 2019, the percentages of female candidates affiliated with these two parties were extremely low. While the situation has improved in 2022, perhaps thanks to the enhanced monitoring by media and concerned citizens, the LDP and KOMEITO have not caught up with opposition parties in their attempts to recruit more women.

On the other hand, we must pay attention to the women's chances of being elected. Table 2 compares winning rates between male and female candidates running from the same party in the 2019 upper house election.

It is noteworthy that female candidates of the LDP were more likely to be elected than male candidates of the same party, and the same applied to the KOMEITO candidates. In contrast, the winning rates of female candidates of opposition parties were lower than those of male candidates. Since the election rule of the House of Councillors has an effect of promoting not only competition among political parties but also competition among candidates running from the same party, it is likely that candidates' genders have some influence in both negative and positive ways, in the candidate selection processes by parties, resource mobilization in campaigns, and voters' choices. In any case, how many more women will take the seats in the upper house is left in the hands of voters.

Fig. 1:Percentages of women who ran for and won in the general elections for the House of Representatives (Source: Gender Equality Bureau, Cabinet Office)

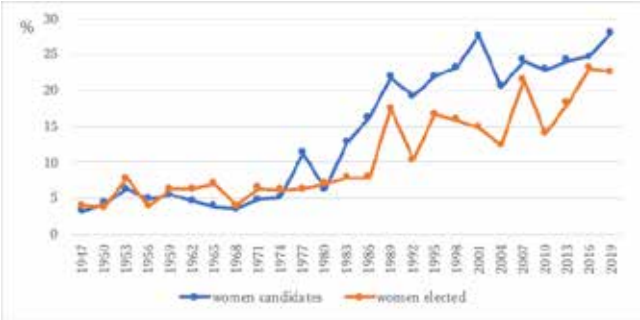

Fig. 2:Percentages of women who ran for and won in the regular elections for the House of Councillors (Source: Gender Equality Bureau, Cabinet Office)

Note:
The term of the House of Councillors is fixed. All members shall serve six years, with half of them up for election every three years.

name of major parties	female candidates in the 2019 election	target number for female candidates, voluntarily set by parties for the 2022 election	female candidates in the 2022 election
Liberal Democratic Party	14.60%	30% in the PR list	30.3% in the PR list, 23.2% in total
KOMEITO	8.30%	not announced	20.80%
Japan Innovation Party	31.80%	not announced	30.40%
Constitutional Democratic Party	45.20%	50% in total	51.00%
Democratic Party for the People	35.70%	35% in total	40.00%
Social Democratic Party	71.40%	50% in total	41.70%
Japan Communist Party	55.00%	50% in total	55.20%

Table 1:Targeted and actual percentages of female candidates for the upper house elections by major parties
Source: Ministry of Internal Affairs and Communications 2019, Asahi shimbun online May 25, 2022, and June 22, 2022.

	Women			Men		
name of major parties	number of candidates	number of elected	winning rates (%)	number of candidates	number of elected	winning rates (%)
Liberal Democratic Party	12	10	83.3	70	47	67.1
KOMEITO	2	2	100.0	22	12	54.5
Japan Innovation Party	7	1	14.3	15	9	60.0
Constitutional Democratic Party	19	6	31.6	23	11	47.8
Democratic Party for the People	10	1	10.0	18	5	27.8
Social Democratic Party	5	0	0.0	2	1	50.0
Japan Communist Party	22	3	13.6	18	4	22.2

Table 2: Number of candidates, winners, winning rates by gender and party affiliation in the 2019 upper house election
Source: Source: Ministry of Internal Affairs and Communications 2019, calculation by the author.

Japan's Gasoline Subsidy Policies Contrary to Decarbonization

2022/6/17

Satoshi Honma

On February 24, 2022, Russia invaded Ukraine. It had a wide-ranging impact on the world, including the surge in oil prices due to geopolitical risks.

Fig. 1 depicts the trend in crude oil prices (West Texas Intermediate) from January 2020 to present. Because of the sharp drop in global demand for crude oil due to COVID19, oil prices decrease; the monthly price fell to $16.52 per barrel in April 2020. However, crude oil prices have been rising since May 2020 due to the effects of vaccination.

The world is facing rising energy and resource prices as a result of Russia's invasion of Ukraine in February of this year. In particular, crude oil reached a recent high of $108.49 per barrel in March 2022 and reached a new high in May with a monthly price of $109.60 per barrel.

To combat the rise in oil prices, the Japanese government implemented a subsidy program for gasoline and other petroleum products in January 2022.

When the national average price of gasoline exceeds 170 yen per liter, the program provides fuel oil wholesalers with up to 5 yen per liter in subsidies. The subsidy cap was then raised twice, from 5 to 25 yen per liter and then from 25 to 35 yen per liter.

Fig. 2 depicts the Japanese Ministry of Economy, Trade, and Industry's position on policy effects (English translation by the author). Without the subsidy, the price of gasoline would have reached 206.5 yen per liter, but the subsidy has kept the price down to 169.8 yen per liter.

However, was this subsidy necessary? In the long run, the more important policy issue should have been to promote the energy transition from fossil fuels to renewable energy to achieve the Paris Agreement's goals.

Higher gasoline prices, in the absence of subsidies, could have partially replaced people's modes of transportation from cars to bicycles and public transportation like trains and buses. It may have pushed consumers to seek out hybrid and plug-in hybrid cars and electric vehicles to replace gasoline vehicles.

As illustrated in Fig. 3, Japan's gasoline prices were the lowest among major industrialized countries.

Government funds should be spent on preventing temperature increases over the next 100 years rather than on immediate price control measures.

The Ukraine crisis has slowed global decarbonization efforts, forcing a temporary return to coal-fired power. Meanwhile, as an additional sanction in response to the invasion of Ukraine, the European Union agreed to a ban on Russian oil imports at the end of May. Although energy supply and price trends will remain volatile, governments must not relax their commitment to achieving a decarbonized society.

Fig. 1: Crude oil price (Source: World Bank)

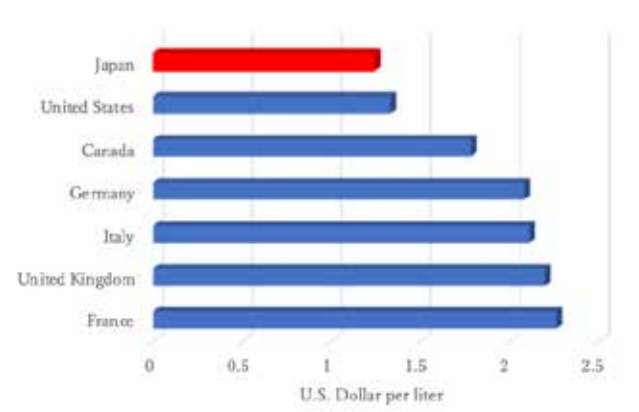

Fig. 3: Gasoline Prices in Major Developed Countries on June 6, 2022 (Source: Compiled from GlobalPetrolPrices.com.)

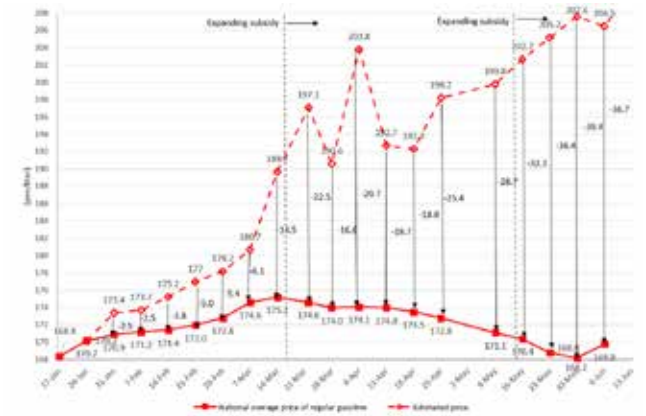

Fig. 2: Effects of gasoline subsidies (Source: Minister of Economy, Trade and Industry, Japan. English translation by the author)

Note 1:
The following formula was used to calculate the forecasted price for the period from January 31 to March 7: (Price survey results from January 24) + (Accumulated crude oil price fluctuation).

Note 2:
The method for calculating the forecast price after March 14 is based on the following formula, by increasing the subsidy: (Weekly price survey result) + (Amount paid the previous week) + (Amount of crude oil price fluctuation).

Japan's Environmental Sector Growing towards Decarbonization

2022/6/6 Kazuhiro Okuma

In step with the world's accelerating efforts to decarbonize, Japan has declared its goal of becoming carbon neutral by 2050 and announced a 46% reduction in greenhouse gases by 2030, with a lofty goal of a further 50% reduction by 2030. These policies have emphasized the need to promote decarbonization as a growth strategy. The focus is on how environmental industries can grow.

The Environmental Goods and Services Sector Accounts in the EU is a well-known statistic for measuring the environmental industries, and the Ministry of the Environment in Japan has also been conducting the Survey of the Market Size of the Environmental Industry.

Based on these statistical data, let us look at the trends in the renewable energy and energy saving related sectors for Japan and the EU, which are directly related to decarbonization. Figure 1 and Figure 2 show the share of these sectors in GDP for Japan and the EU, respectively, since 2000. Since the definitions and estimation methods differ between Japan and the EU, we have adjusted the Japanese data by narrowing down the sectors related to energy conservation to be closer to the EU statistics. Comparisons of the magnitude of the values need to be made with caution, but comparisons of trends are possible.

Renewable energy and Energy saving sactors in Japan and EU

The increase in the renewable energy and energy conservation sectors is evident in both Japan and the EU. They have reached 0.4 to 0.5% of GDP in both Japan and the EU, a level that does not seem to be significantly different.

Energy conservation has been increasing almost consistently in both Japan and the EU. In Japan, a peak can be seen around 2013, but this is mainly due to an increase in housing, etc., and may reflect reconstruction demand after the Great East Japan Earthquake. On the other hand, the renewable energy sector has shown different trends in Japan and the EU. In the EU, the renewable energy sector has consistently increased from 2000 to around 2012. In contrast, Japan's renewable energy sector was at a low level until 2011, but has been increasing rapidly since 2012. This reflects the introduction of a feed-in tariff in 2012 and the strengthening of policies to promote renewable energy. While this can be seen as a sign that the scale of the renewable energy sector has largely caught up with that of the EU, there is also the view that the policy delays up to that point have led to a delay in the competitiveness of related industries.

In Japan, a law to promote offshore wind power generation has been enacted, and demand for renewable energy-related industries is expected to expand even more rapidly. The question will be whether this growth in demand can be translated into growth in Japan's related industries.

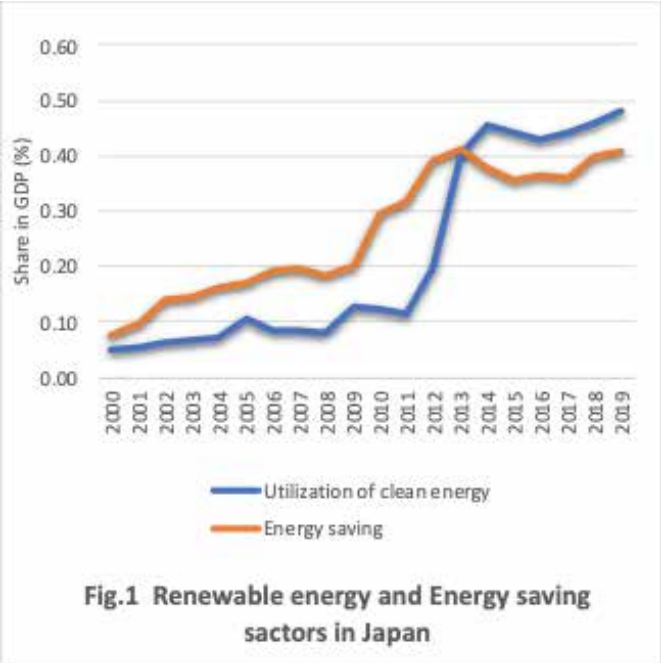

Fig.1 Renewable energy and Energy saving sactors in Japan

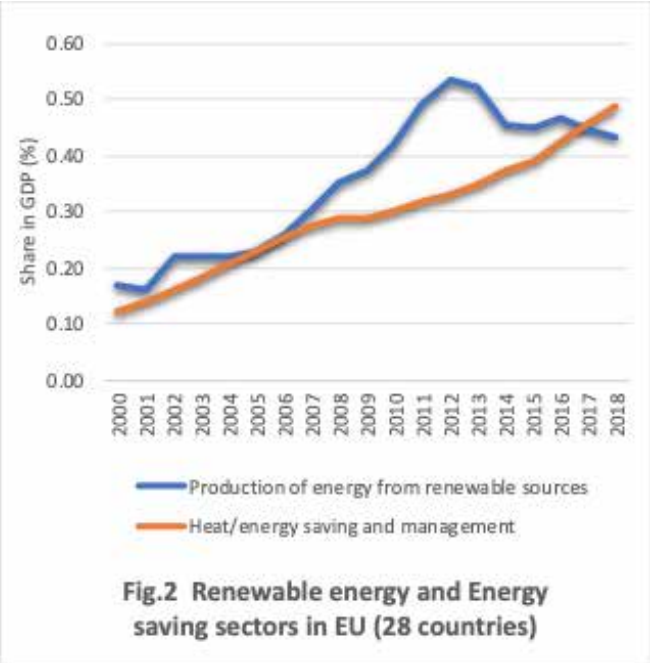

Fig.2 Renewable energy and Energy saving sectors in EU (28 countries)

Fig.1 &2 Renewable energy and Energy saving sactors in Japan and EU

Leave No Child Behind - SDG4: Quality Education for All Children in an Aging Society

2022/5/20 Sachi Ninomiya-Lim

On this year's May 5, "Children's Day" in the Japanese calendar, the Ministry of Internal Affairs and Communications reported that the percentage of children aged 14 years or younger in Japan's population declined for the 48th consecutive year to 11.7% (Figure 1).

This figure is the lowest among the 35 countries with a population of more than 40 million people, followed by South Korea's 11.9% and Italy's 12.9% (UN Demographic Yearbook). While the total population in Japan decreased from its peak at 128 million people in 2008 to 125 million in 2022, the number of children aged under 15 years is now only 14.65 million, less than half that at its peak at 29.89 million in 1954 (Figure 2).

This rapid decrease of young generations is one of the most urgent and serious issues threatening the sustainability of Japanese society. Thus, how can we in Japan overcome this historical demographic shift and sustain our society leaving no one behind?

First, Japan needs to transform its public systems in all areas including social welfare schemes such as pensions, medical and nursing-care programs, the economy and employment structure, immigration policies, city planning, and so on to quickly and appropriately operate society considering the changing composition of the population.

However, the transformation of such systems and schemes does not address the root cause of a declining birth rate. More importantly, we need to transform society and culture as a whole to create an environment that enables more people to have children without fear for the future, and for more children to live happily with confidence to lead the future.

Among the 17 United Nations Sustainable Development Goals (SDGs), Goal 4 "Quality Education" likely contributes much to children's happiness and confidence. According to the Sustainable Development Report 2021 (Figure 3, Sachs et al. 2021), Japan has already achieved Goal 4 with indicators such as the net primary education enrollment rate and lower secondary completion rate fulfilled by 100%. However, there is another reality behind the scenes.

In Japan, *"futoko,"* which can be translated into different terms in English including school absenteeism, school avoidance, school phobia, and school refusal, has become a serious social issue. In 2020, the percentage of pupils absent for 30 days or more in a year increased to a record high of 1% for elementary and 4% for junior high schools (Figure 4).

Although many such children are left behind without proper support to access any type of appropriate education, they are often counted as "enrolled" and "completed" students when of a certain age, and as such, the actual situation is not reflected in the SDG indicators. While the reasons for and situations of *futoko* vary among individual cases, this significant increase in number highlights the need for the Japanese school and education system to change. The relatively large number of students per class and per teacher, relatively smaller percentage of governmental expenditure on education, rigid rules forced upon students in schools, lack of alternative educational opportunities out of formal schools, and lack of support for children's mental health issues are some of the existing problems.

The happiness of children is the basic requisite for the sustainability of society and humanity. We in Japan and the world need to critically understand the real picture and work to create an empowering environment for children to realize a future that leaves no one behind.

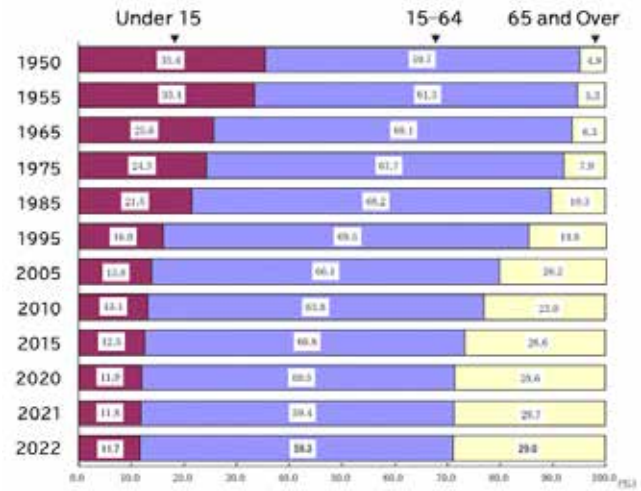

Fig. 1: Transition of Demographic Composition in Japan (Source: Statistics Bureau of Japan (English translation by the author))

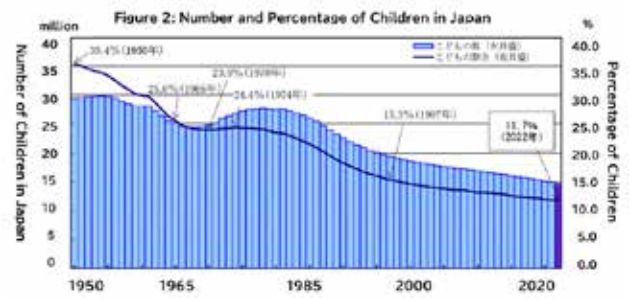

Fig. 2: Number and Percentage of Children in Japan (Source: Statistics Bureau of Japan (English translation by the author))

Fig. 3: Country Profile of Japan, Sustainable Development Report 2021 (Source: Sachs, J. D., Kroll, C, Lafortune, G., Fuller, G., and Woelm, F. 2021, Sustainable Development Report 2021: The Decade of Action for the Sustainable Development Goals: Includes the SDG Index and Dashboards, Cambridge University Press.)

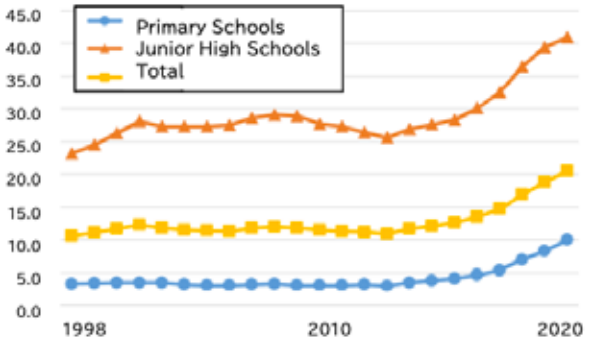

Fig. 4: Number of *Futoko* Children per 1,000 (Source: the Ministry of Education, Culture, Sports, Science and Technology, Japan「令和２年度児童生徒の問題行動・不登校等生徒指導上の諸課題に関する調査結果の概要」(English translation by the author))

Looking Back on 2015

2022/5/6 Hideka Morimoto

The year 2015 was a special year. When we look back, we may realize that it was a turning point, the first year in which the nature of our society changed dramatically.

The United Nations General Assembly adopted the Sustainable Development Goals (SDGs) in September, and the Paris Agreement was adopted at COP21 in December. In the same month, the TCFD (Task Force on Climate-related Financial Disclosures) was established under the Financial Stability Board (FSB) at the request of the G20 Finance Ministers and Central Bank Governors.

These three events are connected in the bottom line.

The SDGs are aimed at overcoming the limitations of "balancing the environment and the economy. Based on the reflection that "balancing the environment and the economy" alone will never benefit everyone and will not achieve sustainable development, the concept of "simultaneous solutions to environmental, economic, and social problems" was formulated with a strong determination to "leave no one behind. It also strongly emphasized that poverty, hunger, and other issues that had previously been the responsibility of international organizations and countries were now the responsibility of corporations.

The Paris Agreement and the IPCC's "Global Warming of 1.5°C " provided the impetus for countries and companies to move toward 2050 CN (carbon neutral). After a year and a half of discussions, the TCFD released its "Recommendations" in June 2017, which will guide the realization of the SDGs, ESG investment, and the flow of funds toward 2050 CN. In Japan, the Corporate Governance Code (CGC) has been revised, and compliance with the TCFD has become a requirement for participation in the Prime Market, which has the most stringent listing criteria and is positioned as the top market in the Tokyo Stock Exchange.

The EU is trying to "institutionalize" this trend further by making ESG measures mandatory for public disclosure and unifying evaluation criteria, based on a "taxonomy" as the axis, in order to control the flow of private capital and strongly guide corporate behavior through corporate evaluation. In addition, it plans to introduce the Carbon Border Adjustment Mechanism (CBAM) and aims to spread EU rules globally as a de facto standard to become a winner in the market. Another interesting move is the collaboration between China and the EU to form a common taxonomy, the Common Ground Taxonomy.

Japan, despite its many outstanding technologies and industries, seems to be lagging behind in these developments. I have been paying attention to the concept of "Taxonomy for Transition," which was raised in the Green Innovation Strategy Promotion Council, of which I am a member. The concept is to draw up a steady and strategic transition scenario toward 2050 CN in broad cooperation with Southeast Asia, Australia, India and other countries. If the EU taxonomy is "two-dimensional" and "static," this concept is "three-dimensional" and "dynamic. This is the path that Japan should take. I believe that this is the path that Japan should pursue.

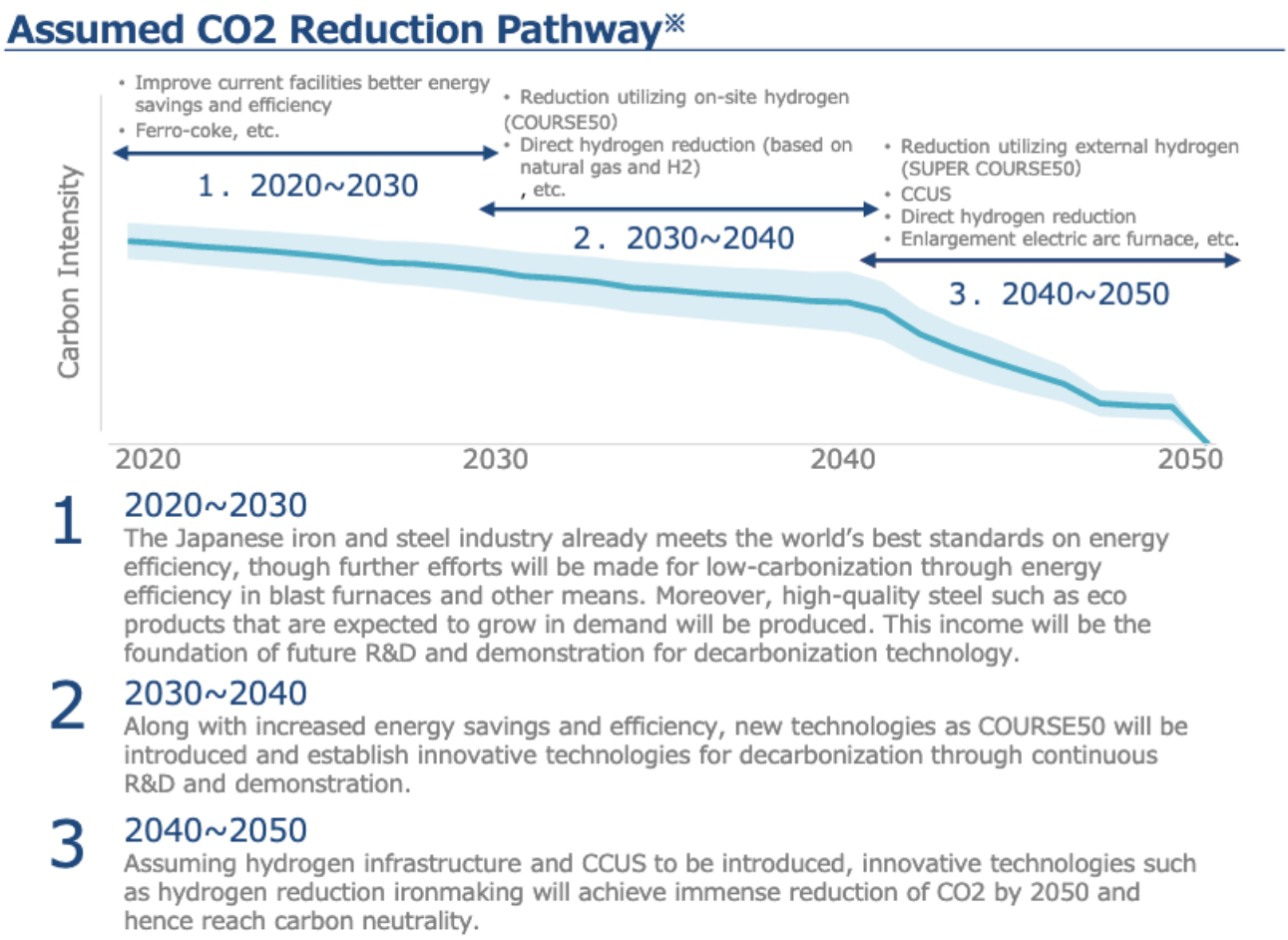

Fig: Transition on iron and steel industry (Source: METI website)

Note:
This only illustrates the assumption of overall Japanese iron and steel industry's decarbonization pathway. In reality, decarbonization will be achieved based on each company's long-term strategy and hence, will not necessary be the reflection of this assumption.

Reference:

- Working Group for Comprehensive Assessment of Biodiversity and Ecosystem Services, Ministry of the Environment, Japan, March 2021.
  https://www.biodic.go.jp/biodiversity/activity/policy/jbo3/generaloutline/files/JBO3_pamph_en.pdf

COVID19 reveals hidden inbound consumption?

2022/4/15 Masashi Yamamoto

Coronaviruses have had a variety of effects not only in Japan but also around the world. In this article, I would like to report on the unexpected effects on consumption observed in the data on households' expenditure trends in Japan.

The figure below is a plot of the " METI POS Retail Sales Index" published by the Ministry of Economy, Trade and Industry. The horizontal axis is the week and the vertical axis is the sales index of heathcare products at drugstores where the level of 2015 set equal to 100. The shading indicates the period of the first emergency declaration in Japan. The thick blue and red lines show the indexes for 2020 and 2021, and the other colorful lines show the trend from 2015 to 2019.

It can be seen that sales dropped significantly after the declaration in both plots. Then sales in the Kanto region recovered at least in 2020, while sales in the Kansai region remained sluggish. Why do only drugstores in Kansai continue to decline?

I interviewed several people in the industry, and I have come to the conclusion that this is due to the impact of inbound tourism. For inbound travelers, it is popular to enter Japan from airports near Tokyo and then visit Mt. Fuji, Kyoto, and Osaka respectively. One of the purposes of the trip for Asian travellers coming to Japan is to purchase health care products made in Japanese. Before COVID, the purchase tended to be done at Kansai, the last stop along the route, but now it has all gone.

It seems that inbound tourism is affecting more to the Japanese economy than I thought.

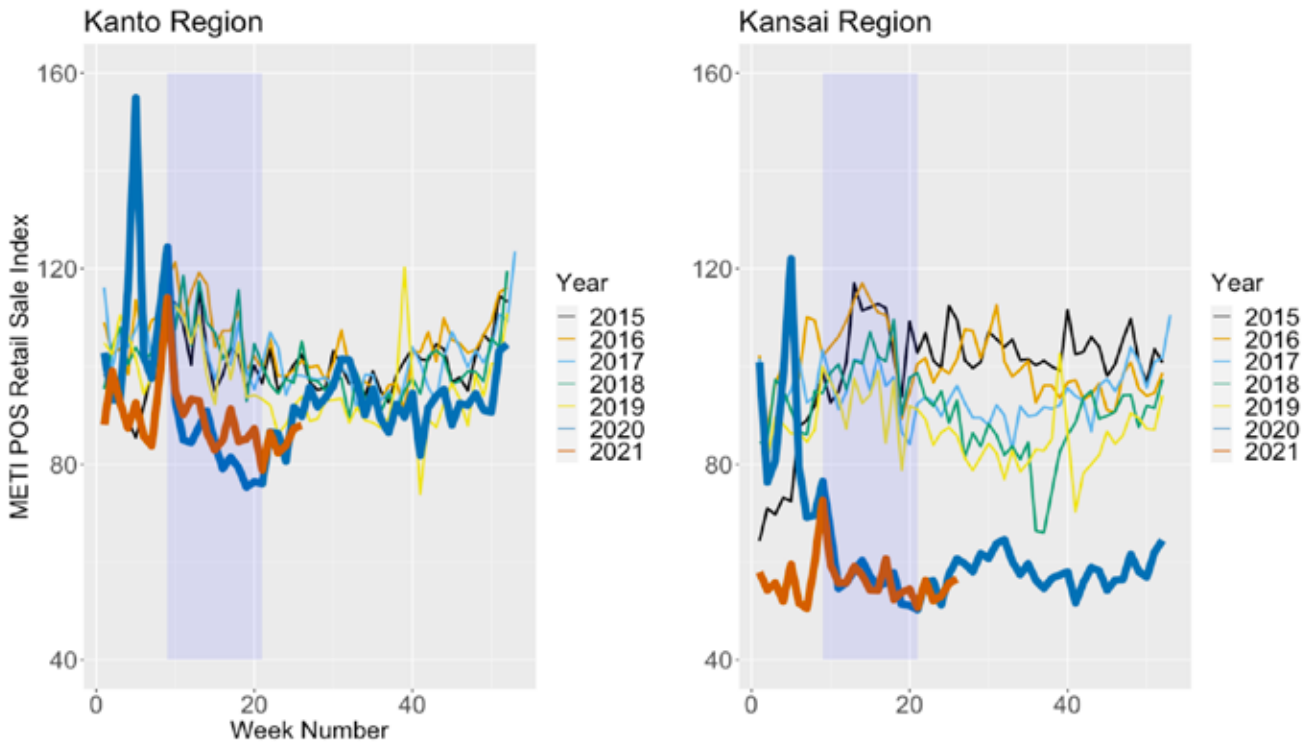

Fig: COVID19 and hidden inbound consumption

Reference:

- Working Group for Comprehensive Assessment of Biodiversity and Ecosystem Services, Ministry of the Environment, Japan, March 2021.
  https://www.biodic.go.jp/biodiversity/activity/policy/jbo3/generaloutline/files/JBO3_pamph_en.pdf

Waste Plastic Problem: there are many things we can do now

2022/4/1 Eiji Hosoda

The issue of plastic waste has been the subject of much debate recently. The problem of waste plastic in the ocean is particularly serious. Many of you may have been shocked to see a video of a sea turtle with a plastic straw stuck in its nose. The amount of plastic produced in the world every year is about 500 million tons, 40% of which is for single use. If discarded plastic products are not collected, they leak into the natural environment. Some estimates suggest that by 2050, the weight of waste plastic in the ocean will exceed the total weight of fish.

Even more serious is waste plastic called microplastics, which is less than five millimeters in diameter. Microplastics, which absorb harmful substances, are being ingested by many fish and shellfish. Nano plastics, which are smaller than 1/10,000 of a millimeter in diameter, can even pass through cell membranes. The effects of these micro- and nano-plastics on the human body are still unknown, but many researchers warn that we need to be vigilant about their likely harms on human health.

So what can we do about this problem?

Some countries in Europe and Africa are banning plastic one-way bags, containers and cutlery (knives and forks). There are also strong calls to reduce the use of plastic products in general.

Of course, it is important to use resources carefully for the sake of future generations, and it is necessary to reduce the use of products that are difficult to dispose of. Plastic products are convenient when they are in use, but it is difficult to dispose of them afterwards. Successful recycling is possible only when waste plastics are collected and transported in a proper way. This is why it is necessary to take measures to reduce the use of one-way plastic products.

However, we need to think about this more calmly. No matter how much people in developed countries reduce their use of one-way plastics, they may not be able to do much to reduce ocean plastic waste.

According to some estimates, half of all ocean waste plastic comes from China and five other developing Asian countries. When it comes to addressing the problem of marine waste plastic, the fastest way to do so would be to establish a proper collection and transportation system for waste plastic in developing countries such as Asia.

However, this does not mean that developed countries should do nothing. The first priority should be to reduce the generation of waste plastic. We can do this immediately, for example, by charging for plastic bags and reducing the use of one-way plastics.

Then, we must collect waste plastic so that it does not leak into the natural environment. The informal export of waste plastic overseas should also be banned immediately. There are many things we can do right now.

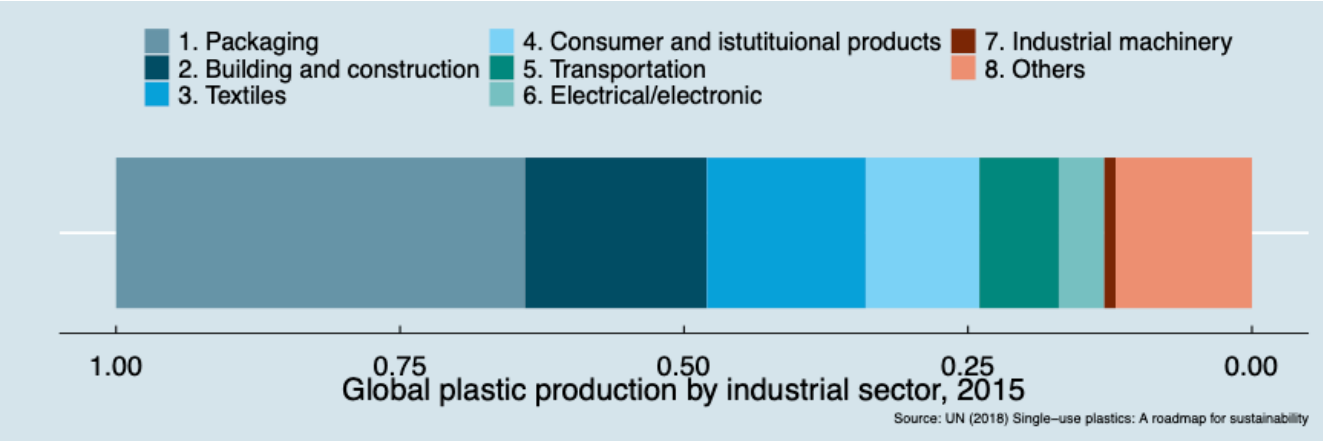

Fig: Global plastic production by industrial sector, 2015 (Source: UNEP (2018) Single-use plastics: A roadmap for sustainability)

Note:
This article was originally published in Sustainable Business Magazine “alterna” in Japanese.

2. 研究課題

Research Themes

TRIESでは、2023年度より、「エネルギーと金融」、「循環経済」、「地域カーボンニュートラルと環境・経済・社会の統合的向上」の３つの重点研究課題を設定し、研究活動を進めている。以下、研究課題毎に、研究活動の状況及び概要を紹介していく。

（1）エネルギーと金融 (Energy and Finance)

（2）循環経済 (Circular Economy)

（3）地域カーボンニュートラルと環境・経済・社会の統合的向上 (Local Carbon Neutrality and Integrated Improvement of Environment-Economy-Society)

(1)エネルギーと金融

Energy and Finance

本間聡・Farhad Taghizadeh-Hesary

気候変動問題の解決のためには、温室効果ガスの削減や再生可能エネルギーの普及、エネルギー効率の向上が必要である。さらに、これらを実現するために資金を供給するグリーンファイナンスも不可欠である。このような問題意識からTRIES所員の本間聡とタギザーデ・ファルハードは課題「エネルギーと金融」を研究した。本稿では本課題に関する2023年度の活動を時系列順に紹介する。

1. ESG Investments in East and Southeast Asiaカンファレンス(2023年5月12日、北九州国際会議場)

持続可能な社会を構築するために、ESGすなわちEnvironment(環境)・Social(社会)・Governance(企業統治)の3つの観点が重要である。従来の投資家は収益率と事業リスクを重視して投資判断を行ってきたのに対して、近年は国際連合が持続可能な開発目標(SDGs)を導入したことや機関投資家の間でESG目標が採用されたことで、先進国を中心に収益率、リスク、ESG目標の3つの要素を考慮して投資配分が決定されている。しかしながら、ESGの定義や評価が欠如していることが投資を歪め、ESG投資の収益率が低いことが民間部門の関心を限定的にしているという課題も残されている。ESG投資を加速させるためには、政府や金融機関の役割、ESG投資のリスク軽減、ESG投資の評価、グリーンウォッシング(見せかけの環境配慮)の阻止など多岐にわたる課題が論じられなければならない。

このような問題意識から、我々は5月12日に北九州市立大学、オックスフォード大学、World Scientific Publishingと共同で「ESG Investments in East and Southeast Asia」というテーマでカンファレンスを北九州国際会議場で開催した(写真1, 2)。同カンファレンスは、科学研究費基盤研究B「アジアの脱炭素化シナリオのためのエネルギー需要・供給両サイドからの研究」(研究代表者:本間、研究分担者:北九州市立大学経済学部牛房義明、タギザーデ)の研究活動の一環でもある。代表的な発表のタイトル、報告者をいくつかあげると、オックスフォード大学主任研究員で本学環境サステナビリティ研究所訪問研究員でもあるTroy Sternberg氏による「ESG and the mining industry: a Mongolian case study」、シンガポール社会科学大学准教授のYoungho Chang氏による「Environmental, Social and Governance (ESG) Performance and Firm Value: Perspectives and Evidence」、ノース・サウス大学(バングラディシュ)准教授のSakib Bin Amin氏による「Role of Banks and Non-Banking Financial Institutions in Accelerating ESG Investments: Perspectives from ASEAN」、江蘇大学准教授のMuhammad Mohsin氏による「ESG scores, green washing, and green bonds yield」、延世大学教授のSuk Hyun氏による「Study on the impact of market competition and environmental risks on ESG activities and value of a firm」、早稲田大学教授の根本直子氏による「ESG Investment and Revitalization of the regional economy」、本間による「Japan's Green Transformation Policy Challenges and ESG Investments」などの発表が行われた。最後に、タギザーデが当日の議論を総括した。内容が多岐にわたるためにまとめることは困難であるが、ESG投資について実証分析やケーススタディなど種々の観点から議論がなされた。当日は10か国以上の研究者が参加し、参加者数は会場とオンラインを合わせて40名程度であった。

写真1　ESG Investments in East and Southeast Asiaカンファレンス
(2023年5月12日、北九州国際会議場)

＊ 当日の内容は Youtube の以下のリンクで公開されている。
https://www.youtube.com/watch?v=jZjnpdpHmXc&t=97s
https://www.youtube.com/watch?v=5y5amAgTnMU

写真2　カンファレンス後の懇親会（2023年5月12日、小倉駅付近）

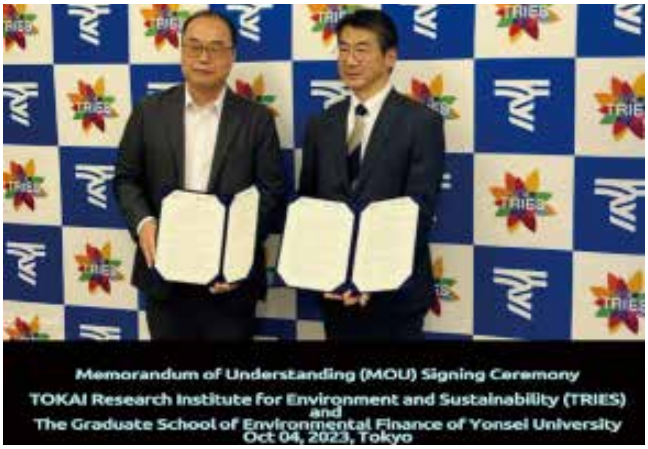

写真4　セミナー後の覚書署名式（10月4日、渋谷キャンパス）

2. 延世大環境金融大学院との覚書締結とセミナー（10月4日、渋谷キャンパス）

10月4日、TRIESは韓国の延世大学環境金融大学院とSustainability Advancements: Forging a Greener Futureというタイトルでセミナーを実施するとともに、連携強化に向けた覚書を締結した。TRIESからは森本英香、大熊一寛、本間、タギザーデが参加した。セミナーでは、延世大学からはSeong-Hoon Kim氏から「Economic impacts of climate change and the implications for financial markets」、Claire Young氏とJi Hong氏から「Determinants of private participation in renewable energy PPP projects」が報告された。TRIESからは、本間から「How do energy efficiency and renewable energy impact carbon emissions in Asia?」、タギザーデから「Towards a green energy system: How does CCUS technology innovation promote green total factor productivity?」が報告された。その後、討論者の大熊を中心に上記4つの発表に対して有益な議論がなされた（写真3）。

写真3　韓国・延世大学環境金融大学院とセミナー
（2023年10月4日、渋谷キャンパス）

セミナーの後、延世大環境金融大学院のスン・ヒュク専攻長とTRIES所長の森本が連携強化に向けて覚書に署名した（写真4）。

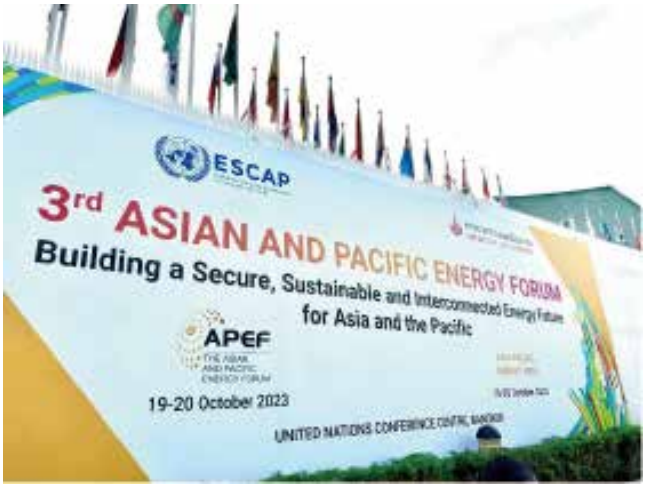

写真5　ISETS企画セッションの会場となったの国際連合アジア太平洋経済社会委員会（10月17日、バンコク）

3. 国際学会での企画セッション（10月17日、バンコク）

10月17日には、バンコク（タイ）の国際連合アジア太平洋経済社会委員会で開催された国際学会Inaugural International Society for Energy Transition Studies (ISETS) International Conferenceの中で、タギザーデがモデレータ、本間が討論者となってGreen Finance, Energy Transition, and Sustainability Sessionというセッションを企画した（写真5）。セッションには、慶応義塾大学名誉教授の吉野直行氏、シドニー工科大学准教授のChristina Nikitopoulos氏、Asian Climate Finance主任研究員のCedric Rimaud氏の3名が登壇した（写真6）。

写真6　ISETS企画セッション（10月17日、バンコク）

写真7　ISETS（10月17日、バンコク）

吉野氏は、日本はESG格付け、純炭素税、グリーンボンド発行基準に焦点を当てるべきとし、途上国と先進国で税率を異にする世界統一の純炭素税を提唱した。Nikitopoulos氏からはオーストラリアは、経済の脱炭素化におけるエネルギー転換の重要性が主張された。Rimaud氏はグリーンボンド市場を取り上げ、持続可能な開発に関連する市場の成長を促進するハイブリッド・ファイナンスの重要性を強調した。

写真8　ISETSに登壇するタギザーデ（10月17日、バンコク）

ISETSでは本間とタギザーデはそれぞれ個別にも発表や講演を行った（写真7, 8）。ISETSにおけるイベントやディスカッションは、持続可能性の課題に取り組み、グリーンファイナンスとエネルギー転換を促進するために、学界と教育機関が協力して取り組んでいることを示している。

4. 中国・清華大学エネルギー・環境・経済研究所との共同セミナー（11月24日、渋谷キャンパス）

温室効果ガスの削減は、持続可能な社会を実現するための最重要の課題の1つである。経済学の観点からは、温室効果ガスの削減、再生可能エネルギーの普及、エネルギー効率の向上、脱炭素技術の開発などを政策的に導くことが求められる。このような問題意識の下で、我々は11月24日に中国の清華大学エネルギー・環境・経済研究所（3E）と共同セミナー「Sustainable Solutions for Meeting the Carbon Neutrality Goals」を渋谷キャンパスで開催した（写真9A）。排出量取引制度や炭素税などのカーボンプライシングを用いた温室効果ガスの削減策や「気候変動ファイナンス」による低炭素プロジェクトへの資金供給が議論された。当日は、清華大3E所長のZhang Xiliang（☒希良）氏から「Overview of China's National Emissions Trading System」、慶應義塾大学名誉教授の吉野直行氏から「ESG investment and net taxation on GHG emissions」が報告された。TRIESからはタギザーデが「Role of green credit guarantee scheme in unlocking private investments in sustainable projects」、本間が「How do energy efficiency and renewable energy impact carbon emissions in Asia?」をそれぞれ報告した。

謝辞

この場を借りて、以上の学会・研究会等にご参加ご協力いただいた方々に感謝申し上げます。有り難うございました。

写真9　「Sustainable Solutions for Meeting the Carbon Neutrality Goals」セミナー（2023年11月24日、本学渋谷キャンパス）

(2)循環経済

Circular economy field

細田衛士・山本雅資

1. 背景

循環経済(Circular Economy)という言葉がメディア等で大きく取り上げられるようになったのは、EUが循環経済に関する文書を2015年に発表したことが大きく影響している。これまでのわが国の政策においては、資源循環型社会という言葉が広く使われていた。

公衆衛生の維持を主たる目的としていたわが国の廃棄物処理は徐々に姿を変えていき、廃棄物の処理及び清掃に関する法律の制定(1971年)を経て、2000年の資源循環型社会元年を迎えるに至った。その後、我が国は世界でも屈指の効率的なリサイクルの仕組みを作り上げていった。

本項では、TRIESメンバーとの関わりを織り交ぜながら、そうした政策立案の過程を簡単に振り返るとともに、循環経済の新しい動きについて述べてみたい。

2. TRIESメンバーの政策貢献

1990年代に、最終処分場の残余年数が少なくなるとともに、不法投棄が大きな社会問題となったことから、環境省及び経済産業省を中心に資源循環に関わる法律が制定されることになった。2001年には資源循環分野の基本的枠組み法にあたる「循環型社会形成推進基本法」が施行された。この枠組み法の下に各種個別リサイクル法が制定されることになったが、TRIESのメンバーは環境省職員として、また、各種審議会の委員として、これらのほぼ全てに制定直

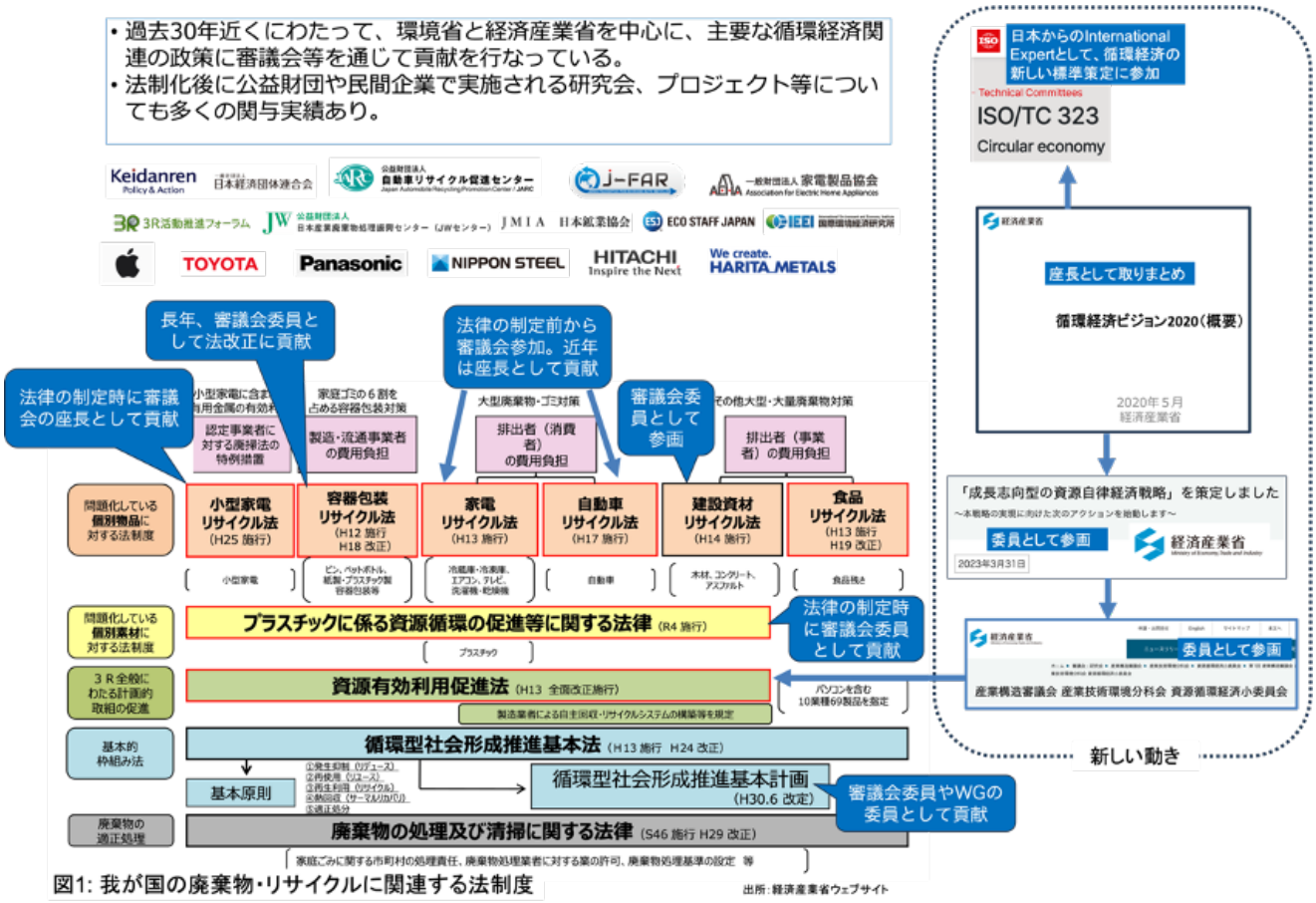

図1: 我が国の廃棄物・リサイクルに関連する法制度

出所:経済産業省ウェブサイト

後から深く関与してきた。循環型社会元年から20数年が経過したが、その間、ファインチューニングを続けてきたことにより、極めて効率的なリサイクルシステムが完成した。そして、その成果は、最終処分場の残余年数の増加として着実に現れている。

その後の世界的な循環経済(Circular Economy)への移行という流れをうけて、我が国でも、「循環経済ビジョン2020」が策定された。あまり知られていないが、1999年に通商産業省（当時）が「循環経済ビジョン」を発表していることは特筆に値する。また、これらのいずれのビジョンにおいても、TRIESメンバーが検討会の委員として、名を連ねている。このビジョン策定を受けて、2022年から「成長志向型の資源自立経済デザイン研究会」が開催され、多くのステイクホルダーを巻き込んだ議論が行われ、2023年3月には、「成長志向型の資源自立経済戦略」が取りまとめられた。この研究会にもおいてもTRIESメンバーが参画し、戦略の取りまとめの中心的役割を果たした。

循環経済は国際標準化の動きも進んだ。2018年9月にフランスの提案により、国際標準化機構（ISO: International Organization for Standardization）に循環経済（Circular economy）に関する専門委員会（TC: Technical Committee）が設置された(TC323)。その目的は、「持続可能な開発への貢献を最大化するため、関連するあらゆる組織の活動の実施に対する枠組み、指針、支援ツール及び要求事項を開発するための循環型経済の分野の標準化」を行うこととされ、このTC323にもTRIESメンバーが国際エキスパートして、議論に参画していた。

3. 循環経済の今後について

循環経済の構築は、バリューチェーン全体の変化を求めるものである。例えば、マイボトルやマイバックといった製品は、数回しか使わないと使い捨て容器よりも環境負荷が大きくなってしまう。仮に企業側が長期使用に適した製品(通常は使い捨てタイプよりも資源投入量が多い)を市場に投入したとしても、消費者がその意図をきちんと理解して使わなければ、結果として資源の無駄遣いになってしまう可能性もある。

その意味で、一つの企業だけでなく業界さえもまたぐ連携、そして何よりも消費者の行動変容も伴う必要がある。こうした連携、パートナーシップは循環経済の議論の中ではなくてはならないものであるが、その点で経団連や環境省等による循環経済パートナーシップ(J4CE)や経済産業省によるサーキュラーパートナーズ(CPs)といった取り組みには大きな期待が寄せられているところである。TRIESメンバーがJ4CEやCPsに有識者として参加しているだけでなく、TRIES自身もCPsに加盟している。企業とは違った立場から、我が国の循環経済の取り組みをさらに進化させるべく今後も活動を行っていく所存である。

(3)地域カーボンニュートラルと環境・経済・社会の統合的向上

Research on regional carbon neutrality and integrated improvement of environment, economy, and societyand society

大熊一寛、本間聡、二ノ宮リムさち、小坂真理、森本英香

1. はじめに

2050年カーボンニュートラルの実現を目指し、国の重要課題として政策の強化が進められている。その中心的な柱の一つが、地域からカーボンニュートラルの実現を進めて行こうとする地域脱炭素政策である。

国は、2021年に、「地域脱炭素ロードマップ」を決定し、そこで示された方針に沿って、「脱炭素先行地域」の選定及び重点的な支援措置など、これまでにない強力な政策を進めつつある。この政策の特徴は、地球温暖化防止という単独の政策目的を追求するのではなく、経済問題及び社会問題の同時解決を目指そうとしている点にある。また、政策を進める主体として、行政のみならず企業と市民とが重視されている点も重要である。そのことは、国が地域脱炭素の趣旨を、「地域の成長戦略であり、自治体・地域企業・市民など地域の関係者が主役になって、今ある技術を使って、再エネ等の地域資源を最大限活用することで実現でき、経済を循環させ、防災や暮らしの質の向上等の地域の課題をあわせて解決し、地方創生に貢献でき」ると説明していることにも、端的に表れている（国・地方脱炭素実現会議, 2021）。いわば、気候危機というピンチを、地域及び国が直面している課題を解決するチャンスに変えて行こうという戦略であると言える。

こうした地域脱炭素の取組を成果につなげていく上では、もとより様々な課題があるが、上記のような趣旨を重視すると、特に、脱炭素政策と経済的・社会的課題との関係をより明らかにしていくこと、及び市民や企業というアクターの主体的な参画を強化する方法を検討していくことは、特に重要な研究課題であると言える。

こうした考え方に立って、本研究は、環境対策と経済の関係及び関係主体の参画に焦点を当てて、研究を進めて行く。その際、これら課題に効果的に接近するために、狭義の温暖化対策に限定するだけでなく、より広い環境的・社会的取組から捉える方法も用いていく。研究開始初年度に当たる2023年度においては、環境対策と経済の両立、環境効率性、人材育成、及び企業行動の4つの側面から研究を進めた。以下、それぞれについて、研究内容及びこれまでの成果の概要を紹介する。

2. 環境対策と経済の両立に関する研究

地域CN（カーボンニュートラル）の取組が地域の発展につながるためには、気候変動対策及び関連する環境対策が地域経済にポジティブな効果を持つことが重要である。一般に、環境対策を強化することは、費用を上昇させ、経済成長を低下させる可能性があるが、同時に、対策のための需要を増加させ、経済成長を上昇させる可能性もある。これまで経済学研究においては、前者のマイナスの効果を評価するものは多いが、後者のプラスの効果を説明する研究は少ない。特に理論的にこれを説明する研究は極めて少なく、「グリーン成長」等の現実の政策的議論を理論的に説明することができないという課題が生じている。実証的分析においては、産業連関分析により個別的な対策の波及効果を評価する研究が行われているが、経済

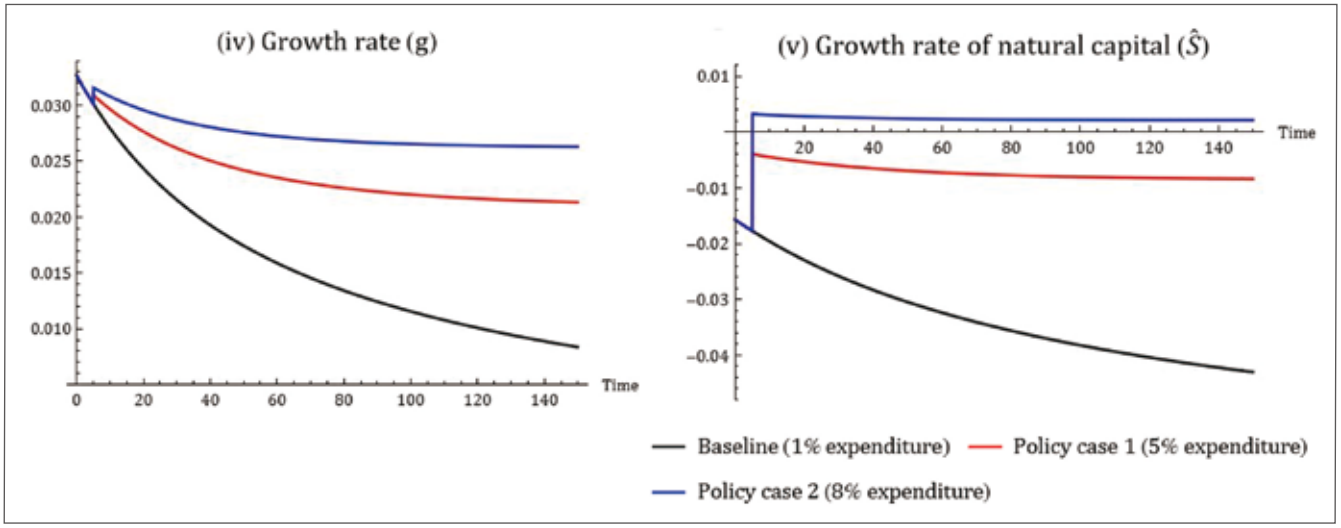

図1　モデルによるシミュレーション結果
注：ベースラインと2種類の政策ケース（第5期に政策強化）について、成長率と自然資本蓄積率の推移をシミュレーションしたもの。

全体の動態や長期的な変化を視野に入れた分析は課題として残されており、これを支える理論的な研究も求められている。本研究では、環境対策と経済の関係を需要面を含め理解するための理論的研究として、ポストケインズ派理論を基礎とし、自然資本ないし社会的共通資本への投資と経済成長の関係を分析する研究を進めている。まず、社会的共通資本、特に社会インフラの供給に焦点を当て、経済成長への効果を分析する理論モデルを構築した（Nishi and Okuma 2023）。財政支出の需要効果と社会的共通資本の生産性上昇効果を組み込むとともに、成長と分配の異なるレジームを考慮することで、安定的な成長のための条件を分析した。このモデルでは長期的には財政支出ではなく供給サイドの条件が成長を規定するが、安定性とレジリエンスを確保する上で政府は重要な役割を果たしうることを示している。

次に、特に自然資本に焦点を当てて、自然資本への投資の短期的及び長期的な経済効果を分析する理論モデルの構築を進めている（国際学会（EAEPE）で発表後、ジャーナル投稿中）。自然資本への投資の需要増加の効果を考慮するとともに、自然資本の蓄積と人工資本投資及び環境生産性の変化の長期的な動学を組み込むことで、対策強化が短期的に成長を加速するとともに、長期的にも、対策がなければ起こったであろう経済成長の低下を抑制し、安定的な成長経路の実現につながりうることを、理論的に示している。モデルの動学をシミュレーションにより示した結果の一部を図１に示す。成長率を見ると、政策ケースにおいて、対策強化の時点（第５期）で成長率が上昇し、その後もベースラインと比べ高い水準で成長率が維持されている。自然資本蓄積率を見ると、ベースラインにおいて成長率がマイナスの領域でさらに低下し続けるが、政策ケース２ではプラスに引き上げ維持している。これらは、短期及び長期において、政策強化により成長にも資する「グリーン成長」を実現する可能性を示している。

このほか、本研究では、実社会のニーズに対応する実証的研究として、地域CNの経済効果シミュレーションのための研究を進めることとしている。地域において長期的にCNを実現することが、地域経済構造をどのように変え、GRP（域内総生産）にどのような影響を与えるかをシミュレーションするものであり、その成果を地域における政策検討や合意形成に活用することを想定している。今年度においては、産業連関分析の応用により長期的総合的シミュレーションを行うための方法論を研究し、推計のプロトタイプの作成を進めた。来年度において、具体的地域を対象として、推計の試行を行う方針としている。

【参考文献】
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Nishi H., Okuma K. (2023) Fiscal policy and social infrastructure provision under alternative growth and distribution regimes. Evol. Inst. Econ. Rev. 20(2): 259 – 286. https://doi.org/10.1007/s40844-023-00262-y.

3. 地域の環境効率性に関する研究

1節で述べられたように、2050年までにカーボンニュートラルを実現するために、国は2021年に「地域脱炭素ロードマップ」を決定した。そこでは脱炭素を成長の機会と捉えて、温室効果ガスを削減するとともに地域の課題を解決することが方針とされている。この方針を実現するためには、温室効果ガス削減において、一定の経済効率性が求められていると言える。本節では、本間が2023年度にTRIESで行った「地域の環境効率性に関する研究」として、Hu, Honma and Chang (2023)の内容の一部を紹介したい。

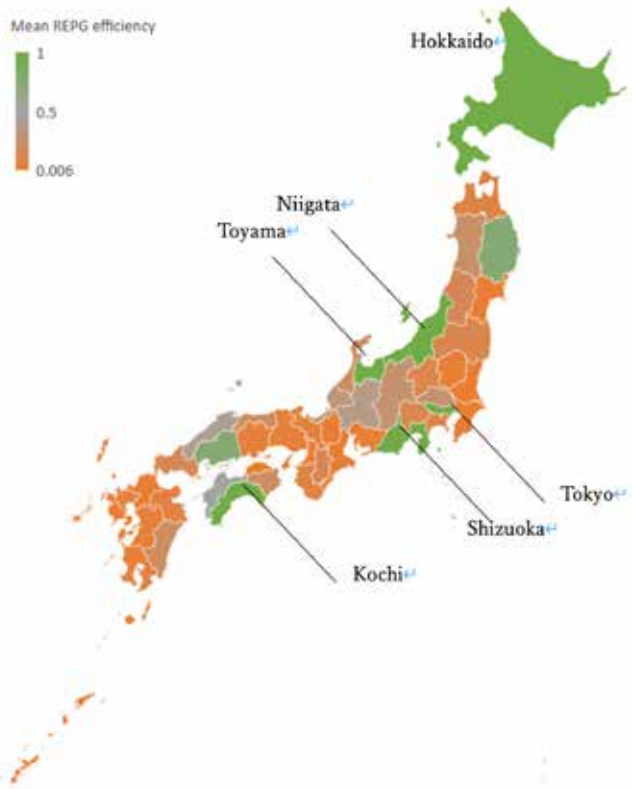

図2　都道府県別の再生可能エネルギー発電効率（2016-2019年度の平均）
（出典）Hu et al. (2023), Fig.1。

一般に、生産プロセスにおいては、GDPや売上などの産出を一定とすれば、労働や資本、エネルギーなどの投入はできるだけ少ない方が効率的であると言える。筆者（本間）が研究してきた包絡分析法（data envelopment analysis、以下DEA）では、線形計画法を用いてこのような効率性を評価する研究が多数行われてきた。

地域脱炭素では、再エネポテンシャルを最大限活用するとともに、地域経済を活性化することが求められる。Hu et al. (2023)では、データ面の制約から都道府県単位ではあるが、2016年度から2019年度までの期間で、このような観点から地域の効率性を評価した。投入に再エネ設備容量、森林面積、自然公園面積、降水量、日照時間、風速、産出に再エネ発電量、人口密度、1人当たり実質所得をとった。効率性評価には、動的な効率性を考慮できるdynamic slacks-based measure DEA モデルを適用した。ここでの効率性は、自然的条件のみならず社会的・経済的条件も加味したことを考慮して論文内では再エネ発電効率（renewable energy generation efficiency）と名付けた。図2は都道府県別の再生可能エネルギー発電効率（2016-2019年度の平均）を示したものである。DEAによる効率性評価では、効率値は0と1の間をとり、効率的な主体は1となる。効率的な地域は、北海道、東京都、新潟県、富山県、静岡県、高知県の6都県であった。

ランダム効果Tobitモデルによる推定結果によれば、効率性は人口密度と負の相関があり、地域所得とともに上昇する。東京のような人口密度の高い地域でも、その設備容量と潜在能力を十分に活用することで、効率性を高めることができる。このことは、グリーンファイナンスが低所得地域における再生可能エネルギー開発を促進するために重要であることを示唆する。以上の分析は利用可能なデータの制約から都道府県レベルであったが、今後は市町村レベルの分析も手掛けていきたい。

参考文献
Hu, J. L., Honma, S., and Chang, S. Y. (2023) Renewable energy generation efficiency of Japan's administrative regions: An application of the dynamic slacks-based measure. Next Energy, 1(3), 100029.

4. 気候変動教育・CN人材育成に関する研究

本研究は、地域CNを社会経済システム全体の変革を通じて実現するために、学習者・組織・社会の変容・変革を支える教育・人材育成とはどのようなものか、それはどのように構築し推進することができるかを問うものである。特に大学と地域に焦点を当て、環境教育・持続可能な開発のための教育（ESD）研究が蓄積してきた議論と実践を踏まえつつ、大学や地域が組織・社会で取り組むCN・気候変動対策と連動しながら、変容・変革を実現する教育プログラムを開発するとともに、評価枠組を構築することを目指している。

「我々の世界を変革する：持続可能な開発のための2030アジェンダ（2030アジェンダ）」は、持続可能な開発を、多様な市民の「参

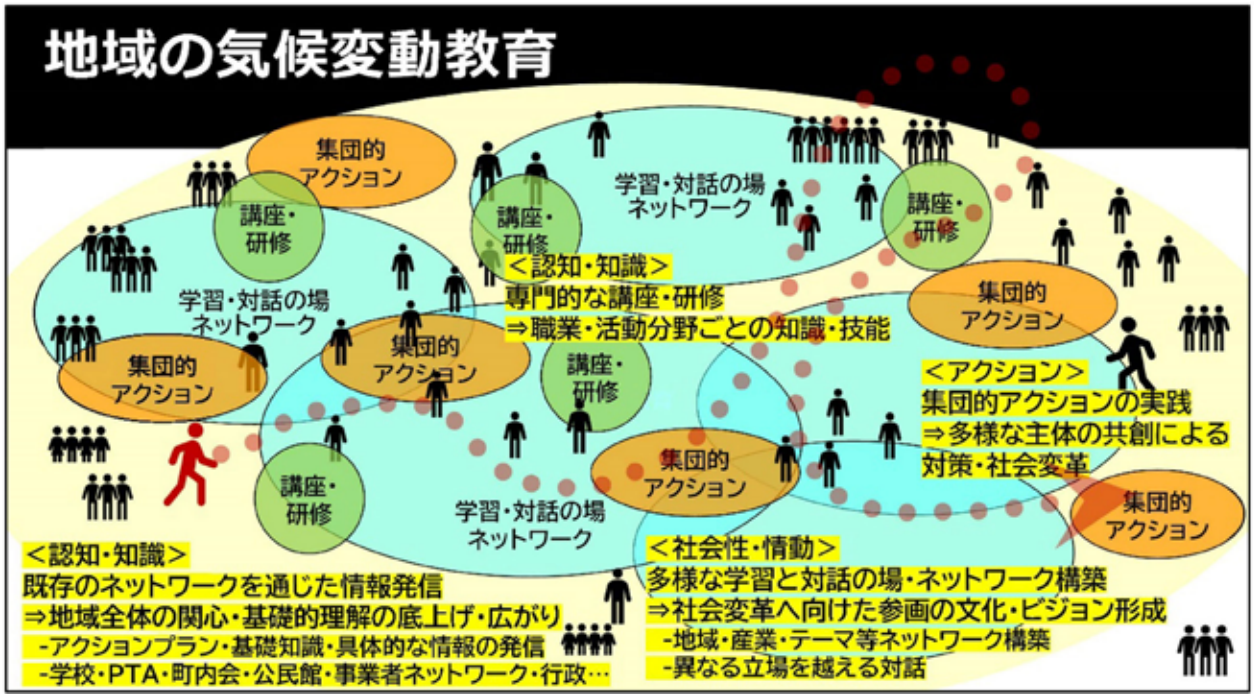

図 3：地域の気候変動教育（二ノ宮リムさち（2023）「普及啓発をどうやってすすめるか・アクションプラン～市民の行動変容へ：環境教育学の視点から」あつぎ気候市民会議シンポジウム発表資料より）

画」による社会全体の「変革」として実現する必要性を強調する。既存の社会経済システムを前提とした技術・制度開発や個人の善行促進では持続可能な開発は実現できず、社会全体の「変革」が必要だという認識が広がるなか、そのためには市民の「参画」を支える「教育」の役割が重要となることが、教育分野全体で強調されるようになっている（UNESCO 2021 *Reimagining Our Futures Together: A New Social Contract for Education*）。

CNを含む気候変動対策にも、市民の参画による社会経済システム全体の変革が必要であり、そのために不可欠なのが気候変動教育・CN人材育成である。「国連気候変動枠組条約」には、「気候エンパワメント行動（Action for Climate Empowerment: ACE）」として、対策を支える教育、訓練、啓発、市民参画、情報へのアクセスの重要性が明示されている。気候変動に関わる教育の拡大・質向上を目指す大型国際共同研究プロジェクト「The Monitoring and Evaluation of Climate Change Education and Communication (MECCE)」の2021年報告書（*Key Activities in 2021: A Progress Update on the Monitoring and Evaluating Climate Communication and Education Project*）は、気候変動に関する教育は各国の法律・政策に明記され教育現場での取組が始まりつつあるが、多くの場合最低限・表面的にすぎず、知識偏重で、心理的・行動重視型学習への取組が不十分であり、高い教育効果を生むには学習者が集団的アクションを経験する実践が必要だと指摘している。なお、このMECCEにはTRIES所員1名も参画している。

今期の研究・実践活動は以下のとおりである。

第一に、TRIES所員が「カーボンニュートラルに貢献する大学等コアリション」の人材育成ワーキンググループ（WG）に幹事大学代表として参加し、大学のCN人材育成のあり方を整理・理解しつつ、その発展・促進に向けた議論・研究を展開した。WGの活動の一環として、他大学と連携し、大学教員を対象に、関連する教材・プログラムに関するアンケート等を実施しており、今後、分析や教材の共有を進める予定である。

第二に、気候変動教育・CN人材育成のあり方を、環境教育分野等の先行研究論文や国際政策文書等のレビューをもとに整理した（図3、4参照）。環境教育・ESD研究においては、以前から、認知面にくわえ社会・情緒・行動の側面を含むエンパワメントとしての学習を、教育の内容・成果・方法・環境を連動させながら、組織全体の取組として支え、学習者・組織・社会の変容・変革につなげる過程として検討・実践・評価する試みが広がってきた（UNESCO 2020, *Education for Sustainable Development: A Roadmap*）。環境教育・ESDの4アプローチ「①環境・持続可能性『についての』教育（知識・認知）」「②環境・持続可能性『を通じた』教育（体験・情緒）」「③環境・持続可能性『のための』教育（コンピテンシー・行動）」「④環境・持続可能性『としての』教育（教育そのものの変容・組織としての取組）」をもとに、気候変動・気候アクション・気候正義・持続可能性と教育の関係をまとめたのが図4である。

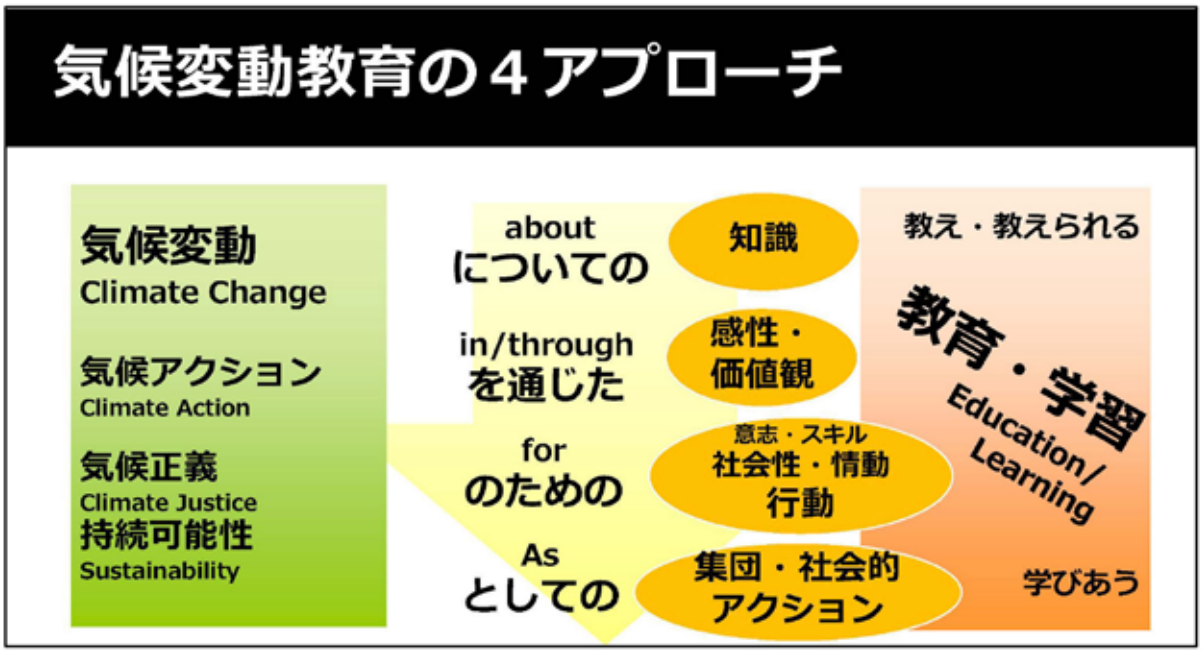

図4：気候変動教育の4アプローチ（二ノ宮リムさち（2023）「普及啓発をどうやってすすめるか・アクションプラン～市民の行動変容へ：環境教育学の視点から」あつぎ気候市民会議シンポジウム発表資料より）

第三に、教育・人材育成の実践として、気候変動・CNをテーマにした講座（ワークショップ）や講演をおこなった（2023.11全国地域婦人団体研究大会、2023.10あつぎ気候市民会議、2023.6昭島市公民館・昭島市民大学等）。

5. 企業行動に関する研究

5.1 中小企業の政策への関与に関する研究

気候変動に関する国際交渉にみられるように、環境政策への大企業の関与はそれほど目新しいことではなく、それゆえ大企業は政治や行政との関係で分析の対象となってきた。他方で、地域に根ざした活動を行う中小企業がサステイナビリティ課題の政策にどのように関与しているかについてはあまり明らかにされていないが、政治的CSRのアプローチを用いたWickert (2016)、政治参加アプローチを用いたWestman et al. (2020)など、欧米を中心に示唆に富む研究がいくつか展開されている。

日本における中小企業のCSRに関する既存研究は、利益を追求する経営的な視点の研究が主流である。さらに自治体研究では、企業は自治体政策を推進する一アクターとして扱われてきた。そのためいずれも、中小企業は本業とは関係ないかもしれないサステイナビリティ課題への政治や政策の形成に関与する可能性のあるアクターとしては論じられてこなかった。

本研究では、日本の中小企業がサステイナビリティ課題の政策にどのように関与しているかを明らかにすること、具体的には、先駆的なSDGsの取組を行っている中小企業の政策への関与の形態について、政治参加のアプローチを用いて現状を把握することを目的とした。事例として、国内あるいは海外で事業活動を行いながら先駆的なSDGs活動に取り組む14件の国内中小企業を選定し、聞き取り調査を行った。また、欧米の中小企業の政治参加の形態を分析したWestman et al.（2020）による表1に示すカテゴリーと指標を用いて分析を行った。

結果として、分析対象となったすべての企業が本業また公共のことがらに関する分野において、3つのカテゴリーに該当する活動をしていた。特に気候変動については、政治的行動のカテゴリーで市の対策推進協議会の委員として参加すること、事業活動ではCO2を排出しない機材を用いるというバイコットがあげられた。市民的関与のカテゴリーについては再エネ100にする、自動車による排出を削減する（エコドライブに取り組む、カーシェアリングを用いる、電気自動車を用いる）、SBTに参加するといった活動が確認された。

また、創業年数が長い企業のほうが政治過程に直接的あるいは間接的に働きかける傾向があり、公共団体への委員任用や官僚との接触を通じて、食品、健康、廃棄物の政策や制度に影響を与えたり、業界内のインフォーマルなルール設定を行ったりする行動が確認できた。ルール設定のような行動は、Westman et al.など既存研究で明らかになっている欧米の中小企業の動きとも一致する。

すべての中小企業が政策へ関与すべきとは言えないが、サステイナビリティ課題解決に向けて中小企業がもつ能力と可能性を評価すること、このような企業が政策への関与をしやすい環境づくりを支援することは必要だろう。

5.2 企業のSDGs取組みに関する認証制度の構築

SDGsの認知度は高まったが、中小企業のSDGsへの取組みは芳しくないと言われている。そのため中小企業の取組みを促進するために、これまでに80以上の自治体がSDGsの宣言や登録の制度を導入して、地域企業を登録してきた。一方でSDGs認証制度については、6つの自治体が制度を設けており、今後さらにいくつかの自治体が制度運用を予定しているものの、その数は限られていることが現状である。自治体の資源には限りがあるため、自治体が独自の認証基準を作成し、その基準に従って企業を審査することは容易ではないことがひとつの要因としてあげられる。このことは、認証制度を確立していない自治体で事業を展開する企業にとって、SDGs認証を取得したくてもできないという別の課題を生む。

そのため今年度は、中小企業を対象としたSDGs活動の認証制度の構築を目指した共同研究（慶應義塾大学SFC研究所xSDGラボが実施）に参加することにより、認証基準の作成を行った。今後は、これらの基準を用いて認証制度が運用される予定である。

以上

伝統的な政治参加	政治家との接触、公的機関の審議会や委員会の任命など（本研究では、投票や選挙活動は除く）
政治的行動	私的な政策志向団体への参加やインフォーマルなネットワークを通じた取組、バイコット・ボイコット
市民的関与	政治的結果に直接的な影響を与えることは意図しないが、社会的状況に影響を及ぼす活動

表1：企業の政治参加の形態と指標 (Westman et al. 2020を修正)

3. 研究成果一覧(2023年度)

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・主催・共催(Host)

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【参考資料１】

東海大学　環境サステナビリティ研究所の理念と目的

Principles and Objectives of the Tokai University Institute of Environment & Sustainability (TRIES)

本研究所は、本学の建学の精神に則り、社会科学を基礎として、様々な分野の枠組みを越えた学際的な視点から、人と社会と自然が共存できる社会システムの構築に関わるあらゆる事象を総合的に研究・検証し、また、サステナブルな社会の達成を推進することにより、グローバル社会の恒久的な安定と恒常的な発展を目指すことに寄与することを目的とする。

この目的を達成するために、（1）東海大学における環境およびサステナビリティ分野における研究を結集し、相互に連携を深めることで個々の研究の質的向上が可能になる。また、この研究所の活動の推進により、全ての学生がグローバルシチズンとしてサステナブルな社会実現のための学修の活性化に役立つことができる。この研究所は研究・教育に留まるものではなく、（2）日本の優れた環境政策を国際的に包括的かつ高頻度で英語により発信していくことで、世界の研究者・為政者の環境問題解決の一助と成りえることも目指している。更に、この研究所の目的達成のために、（3）産官学の人材交流プラットフォームを構築し、持続可能性フォーラムなど企業・自治体等へのアウトリーチ活動を積極的に行い、これまでに蓄積されてきた環境人材の知見を着実に次世代に繋いでいくことも重要な活動のひとつである。

現在、世界では経済発展促進のために温室効果ガスが増加し、気候変動が避けられない状況になってきている。グローバル化された経済システムの中では、この現象に拍車がかかっている。しかし、同時に、世界で多くの研究者がこの社会・環境問題に取り組み、また、各国では地球温暖化・気候変動に対応するために、様々な政策が立てられ、実行されてきている。日本の研究・環境政策をこの研究所を国際的に話し合えるフォーラムとして活用できる場所とすることにより、早急に方向性を求めてられている社会・環境問題への解決につながることが期待できる。

本研究所は、グローバル社会のサステナビリティ構築のための環境問題解決に資する研究活動・情報発信を本務とし、その中には、政策提言の練成、人的ネットワークを生かした社会への働きかけ、学部・大学院教育への貢献、国内・海外からの研究者との共同研究、留学生の受け入れなどを含むものである。

以上

Reference materials1

Principles and Objectives of the Tokai University Institute of Environment & Sustainability (TRIES)

Following the founding spirit of Tokai University, the Institute's purpose is to comprehensively research and substantiate all aspects related to the creation of a social system in which people, society, and nature can coexist harmoniously. Based on social science and an interdisciplinary perspective that transcends various fields, it will contribute to ongoing global development and economic stability by promoting the attainment of a sustainable society.

In order to achieve these objectives, the Institute will focus on three main areas. It will (1) bring together researchers in the field of environment and sustainability at Tokai University, and deepen cooperation, thereby enabling the enhanced quality of their individual research. Through various educational activities, it will contribute to and promote the development of a sustainable society. For example, all students will be able to enhance their studies to realize a sustainable society as global citizens. In addition, the Institute will (2) disseminate Japan's excellent environmental policies to the international community in English consistently, thereby helping researchers and politicians around the world with information to better solve environmental problems. Furthermore, to achieve its objectives, the Institute will also (3) build a platform for human resource exchange between academia, government, and industry, including outreach activities to local governments and companies. This will be accomplished in part through sustainability forums in order to constantly pass accumulated knowledge of environmental human resources to the next generation.

At present, the world is facing the critical situation of climate change due to the increase in greenhouse gas emissions resulting from human economic development. In a globalized economic system, this phenomenon is accelerating. At the same time, however, many researchers worldwide are working on social and environmental issues in various countries; distinct policies have been formulated and implemented to deal with climate change. By making the Institute a forum for international discussion of Japan's research and environmental policies, it is hoped that this will lead to further, urgently needed solutions to social and environmental problems.

The Institute's primary mission is to conduct research and disseminate information that will solve environmental problems and build a sustainable global society. This includes the formulation of policy proposals, outreach through social networks, contribution to undergraduate and graduate education, including the embrace of international students, and joint research with domestic and foreign researchers.

【参考資料2】

環境サステナビリティ研究所（TRIES）メンバー

Research Institute for Environmental Sustainability (TRIES) members

2023年 10月 1日現在

所長

森本英香（政治経済学部・政治学科）

所長代行

大熊一寛（政治経済学部・経済学科）

事務局

中澤康治（グローバルシチズン・カレッジ所属）

森永晴子（グローバルシチズン・カレッジ所属）

研究所員 *Alphabetical Order

本間　聡（政治経済学部・経済学科）

細田衛士（政治経済学部・経済学科）

木村英樹（工学部・機械システム工学科）

小坂真理（教養学部・人間環境学科）

二ノ宮リムさち（スチューデントアチーブメントセンター）

タギザーデ, ファルハード：Taghizadeh-Hesary, Farhad（国際学部・国際学科）

辻　由希（政治経済学部・政治学科）

内田晴久（教養学部・人間環境学科）

若野綾子（政治経済学部・経済学科）

山田清志（教養学部・人間環境学科）

山本雅資（政治経済学部・経済学科）

吉川直人（国際学部・国際学科）

研究員

鷺坂長美　公益財団法人埼玉県国際交流協会理事長

スターンバーグ，トロイ: Sternberg, Troy (School of Geography and the Environment, University of Oxford)

浜島直子　環境省自然環境局生物多様性主流化室長**

ヒュン，スク：Hyun, Suk (Graduate School of Environmental Finance, Yonsei University)

チャン，ヨンホ：Chang, Youngho (School of Business, Singapore University of Social Sciences)

東海大学

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