Chapter 1

Major Issues in the Asia-Pacific Region in 2021-22

Section 1
The Process of Recovery and Adjustment of the World Economy from the COVID-19 Pandemic: The Three Main Points

SHIBATA, Kenji; INOKI, Takenori

Issues the World Economy Will Be Facing

According to the International Monetary Fund (IMF), fiscal policies implemented by governments in response to the economic hardship caused by the novel coronavirus (COVID-19) pandemic are estimated to be worth USD 16.0 trillion as of April 2021[1]. It is believed that the impact of the deterioration of the fiscal balance of economies will impose strong limitations on economic management in the future.

Today, a year and a half after the arrival of COVID-19, some countries such as the US and China are beginning to enter a recovery phase and are posting positive economic growth rates. Even by industry, there is a clear division between industries that were hardly hit at all and those that were forced into severe recessions. We must be careful not to generalize, because the circumstances are specific to each country in terms of the policies that were or were not effective.

In the near future when this pandemic subsides, the world economy is expected to face various issues and enter a new phase. Many issues need to be studied, including 1) how each country will deal with the accumulating public debt resulting from fiscal spending that was expanded for COVID-19 measures, 2) under what kind of economic and trade structures will emerging countries aim for economic growth, and what will be the impact of rising resource prices

1) Estimates from IMF, *Fiscal Monitor*, April 2021.

on emerging countries, 3) what kind of economic and technological relationships will be established between emerging countries and technological hegemonies such as the US following the accelerated spread of digital technologies under the pandemic, 4) what changes did the pandemic cause to the income gap between nations in the global economy, as well as to income gaps within nations, and 5) what changes can be observed in trends in trade in goods and in services, and in direct investment.

Structure of This Section

Regarding this wide range of issues, in this section we will go over some of the things we know now about the issues in the process of recovery and adjustment from the COVID-19 pandemic. In the first part of this section, rather than a macroeconomic effectiveness perspective of the fiscal policies, we will introduce a US study that used big data to examine the impact of policies on the economic behaviors of consumers and firms, as well as to determine which policies were effective. For Japan, we will look at the impact of COVID-19 on effective demand by industry and region.

In the second part that follows, we will present vaccine measures according to data, the cause of their delay in Japan, and a glimpse of the strategies of the leading nations with regards to their distribution. We will discuss the issues around the development, production, and distribution of the COVID-19 vaccines, whose speedy rollout and administration is desired.

In the final third part, among the global environmental problems that nations worldwide must tackle continuously and as a priority, we will briefly summarize the climate change issues that are being addressed fully on a global scale. Some are of the view that climate change and the COVID-19 pandemic are not entirely unrelated. This is because the possibility cannot be ignored that environmental changes due to climate change caused an imbalance in the ecosystem for which the virus serves as a medium, resulting in the arrival of a new virus.

1. Examination of the Effectiveness of COVID-19 Measures

(1) Example of a US Study

Simply measuring the amount and content of fiscal spending as well as its impact on consumption and employment as macro variables is not sufficient to accurately estimate the causal relationship between policy and effects. In recent studies, methods using anonymized so-called “big data” of personal information, such as credit card company, bank account, and salary data, as well as sales data

of retailers, etc., gathered by private firms, are becoming mainstream. As an informative study, Chetty, Friedman, Hendren, Stepner, The Opportunity Insights Team (2020) obtained some interesting results, which we will summarize and introduce[2)].

What kind of policies were implemented on what timing, and what changes did those policies bring to the behaviors of consumers and firms? Monthly, quarterly, and annual data from official statistics cannot detect policy effects that change by day and by week. What distinguishes the study by Chetty et al., is that it uses granular data (so-called big data) gathered by private firms to uncover the impact of COVID-19 on consumer spending, income, employment, etc.

This approach integrates data collected by credit card processors and human resources companies that manage salaries or data recorded by financial transaction service firms into a single publicly accessible data set over a short period of time (about seven days) and connects it to existing national statistics to create and edit data by region (county), industry, and income class, and it has advanced these studies dramatically. In the US, a system that can track data that has been broken down by region, industry, and income class at high speed is being built jointly by industry, government, and academia.

By analyzing such data, the study by Chetty et al., first reveals the following three points. 1) A decrease in consumer spending among the high-income class due to health reasons (fear of becoming infected), 2) a decrease in income among small and medium-sized firms in the service sector, such as food deliveries targeting the high-income class, and 3) a worsening of the employment situation among low-income employees in the delivery industry, in particular, verifying the increase in the unemployment rate in high-income areas.

The following are worth noting:

1) High-income households (top 25%) accounted for more than half of the decrease in spending between January and May. On the other hand, spending in low-income households (bottom 25%) saw no significant decrease or change.
2) This decrease in spending is not due to a decrease in income. Decline in spending due to a "fear of infection" is notable in industry sectors that are based on face-to-face transactions, such as food services and transportation.
3) The pattern of the decrease in spending is different from depressions in the past where decreases in spending in durable goods (such as furniture and automobiles) were prominent.

2) Chetty, Friedman, Hendren, Stepner, The Opportunity Insights Team (2020).
See also the New Version (27431) by the same authors from November 2020 published after this paper.

4) The impact of the decrease in consumer spending on restaurants and small local businesses was significant.
5) In areas where the wealthiest households live (determined by zip code), there were many deliveries of meals to wealthy households. However, due to COVID-19, the income of small businesses decreased by more than half.
6) Loss of employment in small businesses was significant in wealthy areas.
7) Businesses in which income declined were forced to lay off employees. In areas where the wealthy live, more than 50% of the low-income workers in small businesses were laid off within two weeks of the start of the COVID-19 pandemic. Meanwhile, in areas with the lowest rent, job creation was less than 30%.

Next, as to which types of policy contributed to mitigating the economic impact of the pandemic, the effects of 1) orders by state governments to resume economic activities, 2) stimulus payments for households, and 3) loans for small firms, were examined and were found to lead to the following notable results.

1) Orders to resume economic activity had only a small effect. Some states resumed so-called non-essential businesses on April 20, while others waited until May. Comparing these two groups, spending and income increased very little as a result of the order to resume.
2) The effect of the CARES Act (Corona virus Aid, Relief, and Economic Security Act) stimulus payments

They had the effect of increasing spending particularly among the low-income group. When the payment was received on April 15, spending among the low-income group immediately increased. However, they were not effective for the businesses hit hardest by COVID-19, nor did they help increase employment.

This spending was aimed at durable goods that do not require face-to-face transactions. The increase in income was relatively small among businesses hit hardest by COVID-19 and small businesses in wealthy areas.

The effect on employment takes longer to appear than the increase in spending. Employment in wealthy areas is weak and no recovery effect from the stimulus payment has been observed.

3) A small business loan is a loan that firms with 500 employees or less are eligible for that does not require repayment if employment is maintained at the same level as prior to the crisis. But this loan system has had hardly any effect on employment.

As described above, the study by Chetty et al., shows results that can be useful for Japan as well. Of note is that it points out that the recovery of economic activity is difficult without strong measures against the virus.

Of the three policies discussed above, the stimulus checks were effective in increasing spending among the low-income group but did not lead to additional spending for businesses hit hardest by COVID-19. Small business loans also are not leading to employment. For short-term effects, stimulus payments should be used to compensate for the loss of income in order to stop the decline in consumer spending, while consumer confidence is restored through public health policies, leading to increased spending.

We would also like to note that the study by Chetty et al., emphasizes the possibility of the COVID-19 shock hurting the economy in the long run. The problem is education. In low-income areas where equipment for online education is not widely available, the numbers of users of the educational app platform for math (Zearn) used in remote classes remain at low levels, below the 50% baseline. These numbers indicate the possibility of a decrease in social fluidity and stagnation in human capital development in the low-income group.

(2) Example of a Japanese Study

As a high-quality Japanese study, we would like to introduce an analysis using the inter-prefectural input-output table to study how final demand (particularly household consumption, accommodation, and exports) changed with the COVID-19 shock, and its impact. Ochiai, Kawasaki, Tokui, and Miyagawa (2021) used various data to analyze the impact of the spread of the novel coronavirus on the economy in 2020[3)].

First, they used the 2005 Inter-Prefectural Input-Output Table to ascertain the changes in household consumption, accommodation, and exports by month and by prefecture and measured how these exogenous demand shocks spread across prefectures to all areas. Since this COVID-19 shock mainly originated in industries close to final demand and spread to upstream industries, they used backward linkage analysis from downstream to upstream.

1) Regarding household consumption, they explained based on the monthly prefectural data of the Ministry of Internal Affairs and Communications (MIC) Family Income and Expenditure Survey that while there are industries heavily damaged by consumer lifestyle changes during the COVID-19 pandemic, there are industries where new consumer demand has been created. The study looked at the decline in consumption by dividing the expenditure into

3) Written and edited by Miyagawa, T. (2021), *Economics of the COVID-19 Shock* (Japanese title: *Korona Shokku no Keizaigaku*), Chuokeizai-sha (RIETI's research results), Chapter 4 "Industrial and Regional Impacts of the COVID-19 Shock" (Korona Shokku no Sangyomen, Chiikimen eno Eikyo)

more detailed items.

Food expenses decreased year-on-year in April and May of 2020, by 4.6% and 3.4% respectively. These are not big decreases, but when broken down to meals outside the home and others, meals outside the home decreased significantly by 64.8% in April and 58.9% in May, while "Food expenses other than meals outside the home" increased year-on-year, indicating that the decrease in opportunities to eat out due to the COVID-19 pandemic converted consumption to cooking at home and deliveries. Likewise, breaking down "Transportation & communication" expenses into transportation expenses and communication expenses, transportation expenses significantly decreased year-on-year, while communication expenses roughly increased, showing that communication expenses increased in place of the decrease in transportation expenses. This is more or less the same as the results of the US study mentioned earlier.

2) For accommodation, the Overnight Travel Statistics by the Japan Tourism Agency were used to explain the impact on accommodation at the destination. Hotel occupancy nationwide was around 70% in 2019 but dropped to in the 10% range in April and May 2020 during the state of emergency. In July when "Go To Travel" was launched, the occupancy rate rose to around 30% and then to in the 40% range when Tokyo was added in October, but it has not reached 50%.

   The study also points out that the biggest factor behind the difference in occupancy rate by prefecture is the ratio of international guests. Prefectures such as Kyoto where the ratio of international guests is high saw a significant drop in the number of guests, while prefectures such as Fukushima where the ratio of international visitors has always been low only saw a small drop in the number of guests. Additionally, based on the Report on Prefectural Accounts by the Cabinet Office, Ochiai, Kawasaki, Tokui, and Miyagawa (2021) point out that when comparing the share not only of accommodation businesses, but also accommodation and restaurant service businesses including restaurant businesses in the local economy, tourism prefectures such as Okinawa, Yamanashi, and Nagano had a large share of international visitors, and therefore require more time for an economic recovery.

3) Exports were already weak with Japan's total exports decreasing 5.6% year-on-year in 2019 according to Trade Statistics due to the US-China trade conflict, and then the COVID-19 crisis spread globally and caused them to plunge. The double-digit year-on-year decrease continued until August in manufacturing products, which account for most of the exports, delivering a serious blow to the domestic economy.

Next, what has been the ripple effect of the impact of the COVID-19 shock on household consumption, accommodation, and exports? Results from an analysis using the inter-prefectural input-output table is introduced to explain this point. First, the monthly value-added based ripple effects up to September for all industries nationwide are broken down into domestic demand and foreign demand (exports), and domestic demand is further separated into intraregional and extraregional. As a result, comparing the intraregional effect and the extraregional effect of domestic demand, we can see that in general, the impact on intraregional effect was greater. For exports, May was the peak of the impact due to the worldwide chaos, but since then, a decrease in the negative effect has continued.

How about when compared by industry? The top industries whose value added were negatively impacted between March and September were industries led by domestic demand such as textiles, petroleum and coal products, services (private and non-profit), and transportation and communication. Transportation equipment also saw its largest drop in early May, but export-led transportation equipment disappeared from the top decline spot in September due to improved exports.

Lastly, Ochiai, Kawasaki, Tokui, and Miyagawa (2021) explained the impact by prefecture in the order of impact on domestic demand (intraregional and extraregional) and foreign demand (exports) as of May. In May, the boost from exports was significant and prefectures impacted by exports were at the top in terms of the overall size of the impact. For the prefectures most impacted based on the change in value adjusted according to the economic size of each prefecture, the overall impact was most significant in Tokyo, Aichi, Osaka, Kanagawa, and Saitama in that order; for domestic demand, Tokyo, Osaka, Kanagawa, Aichi, and Saitama; and for exports, Aichi, Tokyo, Kanagawa, Shizuoka, and Osaka.

In conclusion, the following points were revealed as a result of the careful analysis by Ochiai, Kawasaki, Tokui, and Miyagawa (2021). The biggest downturn of the Japanese economy due to the COVID-19 shock was observed in May 2020, and while half of this was due to the impact of domestic activities being suppressed under the state of emergency, the remaining half of the impact was due to the level of economic activity being reduced via domestic input-output because of the significant drop in exports. Subsequently, the drop in exports became smaller, with foreign demand factors mostly removed after September and domestic demand factors remaining.

Additionally, an analysis of the breakdown of consumable items related to domestic demand showed that demand for some items grew due to teleworking during the COVID-19 pandemic and from demand related to “nesting” (staying

at home), while demand for other items such as those in the field of clothing dropped significantly, resulting in a stark divide.

Furthermore, since the suppressing effect on consumption is mainly occurring in the services field and where input-output is likely to complete within each prefecture, the intraregional effect is believed to exceed the extraregional effect, which supports the validity of making decisions on the balance between infection control and economic activity on a regional basis.

2. Current State of the COVID-19 Vaccinations and Outlook for the Economic Recovery

(1) Current State of Vaccine Development in Japan

In Japan, vaccinations began on February 17, about two months after in Europe and the US. The following description is based on information as of the end of May 2021.

Table 1-1-1 shows the state of the COVID-19 vaccine development by the major pharmaceutical companies (firms selected for the Urgent Improvement Project for Vaccine Manufacturing Systems) as of March 2021. They are all in the clinical study phase. On the other hand, the COVID-19 vaccines currently administered worldwide, including in Japan, were approved by regulators for administration to humans in less than a year. For example, the phase I trials[4] for the mRNA vaccine jointly developed by Moderna and the National Institute of Allergy and Infectious Diseases began on March 16, 2020, only nine weeks after the Chinese government published the base sequence of the virus causing COVID-19 on January 11. In Europe and the US, vaccine development began immediately after the COVID-19 pandemic began, with authorization for emergency use obtained in the US in December. In Japan, AnGes and Shionogi have finally started their phase I/II trials.

Thus, COVID-19 vaccine development in Japan lags behind that in other countries and the following factors have been indicated.

(i) Scale of R&D Expenditure

Vaccine R&D requires facilities that can accommodate the large volume of vaccines required for clinical study following development. The Ministry of Health, Labour and Welfare (MHLW) launched the Urgent Improvement Project for

4) Vaccine development is carried out in three steps: the basic research, the non-clinical study, and the clinical study. There are three phases in the clinical study, of the phase I trial to the phase III trial.

Table 1-1-1 State of vaccine development by major pharmaceutical firms in Japan

(As of March 2021)

Developing firm	Vaccine type	Basic information	Clinical study status	Prospect of manufacturing system
Shionogi, National Institute of Infectious Diseases (NIID), UMN Pharma	Recombinant protein vaccine	Viral protein (antigen) is produced using genetic modification technology and administered to humans.	Phase I/II trials started (Dec 2020)	- Aims to build a manufacturing system for 30 million people by the end of 2021 - JPY 22.3 billion subsidy provided by the Ministry of Health, Labour and Welfare (MHLW) under the Urgent Improvement Project for Vaccine Manufacturing Systems
Daiichi Sankyo, The Institute of Medical Science, The University of Tokyo (IMSUT)	mRNA vaccine	mRNA of the virus is administered to humans and viral protein (antigen) is synthesized inside the human body.	Phase I/II trials started (Mar 2021)	- JPY 6.03 billion subsidy provided by MHLW under the Urgent Improvement Project for Vaccine Manufacturing Systems
AnGes, Osaka University, Takara Bio	DNA vaccine	Virus's DNA is administered to humans and viral protein (antigen) is synthesized inside the human body from the DNA via the mRNA.	Phase I/II trials started (Osaka City Univ., Osaka Univ.) Phase II/III trials started (eight facilities in Tokyo and Osaka) (Nov 2021)	- Planned to be manufactured by Takara Bio, AGC, Kaneka, etc. - JPY 9.38 billion subsidy provided by MHLW under the Urgent Improvement Project for Vaccine Manufacturing Systems
KM Biologics, IMSUT, NIID, National Institute of Biomedical Innovation, Health and Nutrition (NIBIOHN)	Inactivated vaccine	Cultured virus, which are processed so that infectivity and pathogenicity are lost, is administered to humans as an inactivated virus (conventional vaccine).	Phase I/II trials started (Mar 2021)	- JPY 6.09 billion subsidy provided by MHLW under the Urgent Improvement Project for Vaccine Manufacturing Systems

Note: Takeda Pharmaceutical Company, a firm not chosen for the Urgent Improvement Project for Vaccine Manufacturing Systems, signed a contract to develop and distribute the COVID-19 vaccines developed by Moderna and Novavax for Japan.

Source: Compiled by the author based on the MHLW website (https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000121431_00223.html)

Vaccine Manufacturing Systems[5] aimed at improving the manufacturing systems for biopharmaceuticals, including for new types of vaccines. Six firms were chosen in the first selection in June 2020 and a total of JPY 90 billion in subsidies for domestic manufacturing of COVID-19 vaccines is expected.

Meanwhile, in the US, development subsidies from the Biomedical Advanced Research and Development Authority were announced one after another from February to July 2020 to Johnson & Johnson (J&J) (USD 456 million), Moderna (USD 483 million), AstraZeneca-University of Oxford (USD 1.2 billion), Novavax (USD 1.6 billion), etc. under the Department of Defense's special project Operation Warp Speed (OWS)[6].

A simple comparison shows that the amount of support per firm and the speed with which the measures were taken affect vaccine development.

(ii) Vaccine Development System

A difference between the key nations that are leading in vaccine development and Japan is whether the idea that "vaccines are a pillar of security" exists. The governments of countries such as the US, UK, Germany, France, China, and Russia, which have the leading vaccine manufacturers, position vaccines as an important strategic item to prepare for infectious disease risks when sending their troops overseas. Protecting their people from a pandemic is the first goal, but vaccines are positioned as a tool for national defense and diplomacy, not as a COVID-19 emergency support measure, and the market is managed under a national policy as part of security. Differences in the national development system are also clear depending on whether daily life is viewed as in peacetime or in a time of emergency.

(iii) Differences in Vaccine Development Technologies

The vaccines developed by major countries that are being administered worldwide today are shown in Table 1-1-2.

Focusing on the types of these vaccines, we can say that development of the following three types was rapid: mRNA vaccines from Pfizer (US) and Moderna (US), viral vector vaccines from AstraZeneca (UK) and J&J (US), and recombinant protein vaccine from Novavax (US). There is no infrastructure for developing these vaccines in Japan, and the fact that Japan is only equipped with the

5) The Urgent Improvement Project for Vaccine Manufacturing Systems is a project for the early development of a system for actual manufacturing (large-scale manufacturing) of biopharmaceuticals including the COVID-19 vaccine in Japan, and it is aimed at promoting the early supply of the COVID-19 vaccine in Japan.

6) A project that the US started to accelerate the development and manufacturing of COVID-19 vaccines. Around USD 10 billion (around JPY 1.2 trillion) was invested, with the Centers for Disease Control and Prevention (CDC), Department of Defense, Department of Energy as well as private firms participating.

Table 1-1-2 Major COVID-19 vaccines developed worldwide

	Pharmaceutical firm/ Vaccine type	Date approved for use in key countries	Initial forecast for manufacturing/ supply
A	Pfizer (US) *mRNA vaccine	UK: 12/02/2020 Emergency US: 12/11/2020 Emergency EU: 12/21/2020 Conditional JP: 02/14/2021	Plans to manufacture up to 50 million doses by the end of 2020 and up to 2 billion doses of the vaccine by the end of 2021.
B	AstraZeneca Oxford University (UK) *Viral vector vaccine	UK: 12/30/2020 EU: 01/29/2021 Conditional JP: 05/21/2021	Plans to supply for 2 billion people worldwide, 300 million people in the US, 100 million people in the UK, 400 million people in EU, and 1 billion people in emerging countries.
C	Moderna (US) *mRNA vaccine	US: 12/18/2020 Emergency EU: 01/06/2021 UK: 01/08/2021 JP: 05/21/2021	Plans to supply 500 million to 1 billion doses per year worldwide. Plan to supply 20 million doses within the US by the end of Dec 2020.
D	Johnson & Johnson (Janssen) (US) *Viral vector vaccine	US: 02/27/2021 Emergency EU: 03/11/2021 Conditional UK: 05/28/2021 JP: 05/24/2021 Approval application	Aims to start mass supply (gradually up to around 1 billion people per year worldwide) in 2021.
E	Sanofi (FR) *(i) Recombinant protein vaccine (ii) mRNA vaccine	(i) Phase IIb trials under way since Feb 2021 in the US, etc. (ii) Phase I/II trials under way since Mar 2021.	Announced that a recombinant protein vaccine is expected to be put to practical use in 2021 Q4, if things go well.
F	Novavax (US) *Recombinant protein vaccine	Phase III trials under way in the UK since Sep 2020. Phase III trials under way since Dec 2020 in the US, etc.	Overseas, the production goal is 100 million doses per year by late 2020.

Source: Compiled by the author based on materials on MHLW website and reports from each firm

traditional technology of inactivated vaccines[7] is another reason for the delay in development. Additionally, since the new vaccines developed overseas were found to be effective, Japanese pharmaceutical manufacturers that are lagging behind in development may be having a hard time conducting clinical trials.

In Japan, Shionogi is developing a vaccine using a recombinant protein technology with the goal of manufacturing vaccines domestically. We look forward to the manufacturers of such domestic vaccines applying for approval soon, and also as a measure for addressing the worldwide vaccine shortage.

(2) Current State of Vaccine Production in the World and the Challenges

Next, we will explain about the overseas vaccine production systems, listing

7) An inactivated vaccine is a traditional method where viruses are grown in eggs and inactivated.

Table 1-1-3 Countries developing vaccines and their manufacturing sites

Country	Developer	Vaccine name (vaccine approved by WHO)	Manufacturing sites (example)	Scale
US	Pfizer /BioNTech	(mRNA type vaccine) Product name: Comirnaty Dec 2020 Emergency Use Authorization	Pfizer - US (Chesterfield, Missouri) - US (Andover, Massachusetts) - US (Portage, Michigan) - Belgium (Puurs) BioNTech - Germany (Marburg) *China (Fosun): Manufacturing, sales	Manufacturing capacity scheduled to expand to 2.5 billion doses by the end of 2021 (As of Mar 30, 2021)
UK	AstraZeneca /Oxford University	(Viral vector vaccine) Product name: Covishield, Vaxzevria, etc. Feb 2021 Emergency Use Authorization	Manufacturing - UK (Oxford, Keele) - India (Pune: Serum Institute of India) - Netherlands (Leiden) - Korea - Japan (JCR Pharmaceuticals) Vial filling and packaging - UK (Wrexham)	Annual manufacturing target is 3 billion doses (As of Feb 21, 2021)
US	Moderna	(mRNA type vaccine) Moderna COVID-19 vaccine Apr 2021 Emergency Use Authorization	Manufacturing (Contract with Lonza Group) - US (Portsmouth, New Hampshire) - Switzerland (Visp) Vial filling and packaging - US: Catalent - Spain: Laboratorios Farmacéuticos Rovi	- Manufacturing scheduled for 2021: 800 million to 1 billion doses - Manufacturing scheduled for 2022: 3 billion doses (As of Apr 29, 2021)
US	Johnson & Johnson	(Viral vector vaccine) COVID-19 vaccine Mar 2021 Emergency Use Authorization	Manufacturing - US (Bloomington, Indiana) large-scale manufacturing - Italy (Anagni): Catalent facility - US (Grand Rapids, Michigan) - Spain (Barcelona) - France (Marcy-l'Étoile): Support, infrastructure provided - Japan (Takeda Pharmaceutical Company announced manufacturing support plan, March 16, 2021)	Up to 3 billion doses scheduled for manufacturing in 2022
China	Sinopharm	(Inactivated vaccine) BBIBP-CorV May 2021 Emergency Use Authorization	Manufacturing - China (Beijing, Wuhan) Manufacturing site: plan (i) UAE: New plant in operation in 2021 (ii) Serbia: Manufacturing scheduled to start in October (iii) Egypt: Agreed to manufacture vaccines locally (iv) Bangladesh: Local manufacturing approved	Expected to manufacture amount for 1 billion doses in 2021 (As of Feb 26, 2021) (i) Up to 200 million doses scheduled for manufacturing per year (ii) Up to 24 million doses scheduled for manufacturing per year
China	Sinovac Biotech	(Inactivated virus COVID-19 vaccine) CoronaVac Jun 2021 Emergency Use Authorization	Manufacturing - China (Beijing) First plant: Beijing (Jul 2020) Second plant: Beijing (Feb 2021) Third plant: Beijing (Apr 2021) - Indonesia: Plans to expand manufacturing of Sinovac vaccines Manufacturing site: plan (i) Brazil: Began construction of manufacturing facility for 100 million doses/year (Scheduled for completion in Sep 2021) (ii) Malaysia: Obtained approval for vaccine "filling/finishing" (iii) Turkey: Obtained manufacturing license (iv) Hungary: Manufacturing plan exists	As of beginning of April 2021, 100 million doses are expected to have been administered worldwide. The Chinese government manufactured 10 million doses for COVAX thus far and plans to manufacture 3 billion doses by the end of the year

Source: Compiled by the author based on press releases from each firm
Compiled by the author based on articles of each firm for which the source is the English version Wikipedia (https://en.wikipedia.org/wiki/COVID-19_vaccine#Efficacy)

some examples from the major countries developing them. Table 1-1-3 summarizes the manufacturing sites and manufacturing scale of the COVID-19 vaccine developers approved by the World Health Organization (WHO) based on press releases from each firm, etc. It shows that each developer has manufacturing sites overseas and that they are aiming to establish a stable manufacturing system for domestic and international supply.

Such developments around manufacturing sites are also linked to political aspects referred to as vaccine diplomacy. For example, India was expected to become a key export base for COVID-19 vaccines, but on the start of the COVID-19 pandemic, supply problems occurred such as export restrictions. Additionally, China is actively engaging in vaccine diplomacy in the Indo-Pacific region, including with the Philippines with which it is in conflict over territorial rights and maritime interests in the South China Sea, and it is attempting to increase its influence. Furthermore, China is pursuing diplomacy that capitalizes on vaccine inequity by promoting vaccine distribution to middle-income countries such as Mexico and Brazil.

There is the harsh reality in international politics that vaccine distribution not only helps to save lives, but it is also being used as a diplomatic tool with the

Table 1-1-4 Cumulative number of infected persons and the vaccination status

(As of July 29, 2021)

Country	Number of infected persons (1,000)	Number of vaccinations administered per 100 people	Total number of vaccinations administered (1,000)
World	196,630	52.27	4,074,032
China	93	112.5	1,619,218
US	34,751	102.88	344,072
India	31,572	33.05	456,034
Brazil	19,839	65.88	140,029
UK	5,828	124.82	84,738
Germany	3,772	109.43	91,688
France	6,142	107.64	72,728
Italy	4,337	111.86	67,631
Russia	6,139	41.17	60,086
Indonesia	3,331	24.11	65,959
Japan	904	68.5	86,641
United Arab Emirates	678	168.62	16,677
Israel	869	128.77	11,146

Note: The total number of vaccinations administered is the number of vaccines administered and is different from the number of people to whom a vaccine has been administered.
Website last viewed on August 6, 2021.
Source: Compiled by the author based on "Our World in Data, ONS, and UK government website"

post-COVID period in sight.

However, needless to say, to mitigate the risk of the COVID-19 pandemic, each country must promote vaccinations systematically, build manufacturing plants domestically for vaccines that have been approved overseas, and act swiftly for a domestic supply and exports to neighboring countries. In Japan, there are developments, such as JCR Pharmaceuticals announcing it will build a new plant for the AstraZeneca COVID-19 vaccine stock solution, while establishing a vaccine supply chain in all parts of the world is also an urgent issue.

(3) Issue of Vaccine Distribution in the World

Table 1-1-4 shows the cumulative number of infected persons and the vaccination status by country as of July 2021. Key countries developing vaccines and countries with deep economic ties with these developer countries show higher numbers of vaccines administered. We can also assume from this table that vaccine distribution to developing countries is not progressing well.

To respond to this situation, the World Health Organization (WHO) is working on supplying vaccines to countries around the world through the COVAX Facility[8]. COVAX is aiming at supplying at least two billion doses of the vaccine in 2021 and since its first international transportation to Ghana on February 24, it has delivered vaccines to more than 100 countries in 42 days. The number of doses exceeded that of the 38 million doses provided by AstraZeneca, Pfizer-BioNTech, and Serum Institute of India (SII)[9]. However, Serum Institute of India (SII) which was the largest vaccine supplier under COVAX, subsequently stopped its exports in March due to a sudden increase in infections in India, and the issue of achieving a fair supply of vaccines has not been resolved.

As seen above, the divide between developed countries and developing countries in terms of vaccination status is clearly growing. In Japan, vaccines needed for domestic vaccinations are being secured with supplies from Pfizer, AstraZeneca, and Moderna. The development of a domestic manufacturing system as soon as possible is desired.

3. Is the Pandemic Unrelated to Climate Change?

Thus far, we have discussed the relationship between the pandemic and eco-

8) COVAX Facility is a framework led and launched by the World Health Organization and the United Nations Children's Fund (UNICEF) for the procurement and equal distribution of vaccines in the world.

9) From the website of Japan Committee for UNICEF (https://www.unicef.or.jp/news/2021/0087.html).

nomic policy and the issues Japan faces with the vaccine rollout. What should be noted is that because of the arrival of COVID-19, it was a year in which interest in the other important issues faced by the world economy and in people's lives has faded.

COP26 that was scheduled for October 2020 was postponed by one year to the fall of 2021. This is not surprising, since the urgent issue now is how to end this pandemic. However, this does not mean we can view climate change and the novel coronavirus pandemic as totally unrelated mutual phenomena. Simply put, some experts say the COVID-19 pandemic occurred when the balance in the ecosystem was lost via the virus due to environmental changes caused by climate change. We must not allow our awareness and interest in climate change to fade while focusing our attention solely on issues at hand, such as poverty, famine, health, and hygiene.

Below, we will briefly describe the most recent measures against climate change in major countries and their greenhouse gas (GHG) reduction targets.

Climate Change Policies and Numerical Targets of Major Countries

1) Japan

In light of Prime Minister Suga's declaration in October 2020 of achieving a carbon neutral and decarbonized society by 2050, the Cabinet decided on December 8 of the same year on support funds for developments of technologies for carbon neutrality. Since approximately 85% of greenhouse gas emissions in Japan are energy-derived CO_2, the realization of a hydrogen society, including switching to green electricity, was announced. This policy can be seen as mostly aligned with those in Europe and the UK. The "Green Growth Strategy Through Achieving Carbon Neutrality in 2050" formulated mainly by the Ministry of Economy, Trade and Industry (METI) specifies the current challenges and future actions in each of the 14 priority fields[10)] and formulates action plans covering various policies.

10) For further details, see materials for the Growth Strategy Council on the METI website (the 14 priority fields are listed below).
1. Offshore wind power industry 2. Fuel ammonia industry 3. Hydrogen industry 4. Nuclear power industry 5. Automobile, storage battery industries 6. Semiconductor and ICT industries 7. Shipping industry 8. Logistics, people flow and infrastructure industries 9. Foods, agriculture, forestry and fishery industries 10. Aircraft industry 11. Carbon recycling industry 12. Housing/building industry, next generation solar power industry 13. Resource circulation industry 14. Lifestyle-related industry

2) The US

As soon as President Biden was sworn in in January 2021, the US rejoined the Paris Agreement, and announced its target of reaching net zero GHG emissions by 2050. Climate change measures are positioned as a central issue for the administration and an executive order was issued aiming to conserve at least 30% of federal lands and ocean territories by 2030. Specific policies include the announcement of an "infrastructure and clean energy investment plan," which will invest USD 2 trillion over the four years of the administration's first term to increase environmental investment in areas such as automobile, public transportation, and power. However, it is worth noting that this policy is exercised through executive (presidential) privilege and may be cancelled by a future president.

3) China

Decarbonization in China, the country with the world's largest CO_2 emissions, is important to meet the global goals for tackling climate change. China is developing decarbonization technology industries such as EV and FCV and allocating large subsidy budgets for new energy vehicles (JPY 450 billion in FY 2020).

In "The 14th Five-Year Plan for Economic and Social Development of the People's Republic of China (2021–2025)" passed by the National People's Congress in March 2021, plans to continue addressing climate change were presented with a goal set of reducing carbon dioxide emissions per unit of GDP by 18% during the period. However, while the transition period from peak carbon emissions to carbon neutrality is said to be around 50 to 70 years in Japan, the US, and Europe, the transition period in China is only 30 years (2030 to 2060). Considering that coal-fired thermal power plants are being newly constructed in China even today, we can assume that transitioning from an energy ratio centered on coal will take much time and face many problems.

4) Europe

European nations including Germany, the UK, and France that identify themselves as environmentally advanced countries have a longer history of working on this issue than other developed countries. In 1994, the European Environment Agency was established as an agency of the European Union (EU) with jurisdiction over environmental issues, and in 2005, the EU was the first in the world to start a carbon dioxide (CO_2) emissions trading system for its 25 member states.

A new European Commission started on December 1, 2019, and on the 11th

Table 1-1-5 Greenhouse gas reduction targets for the major countries

Country/ region	Greenhouse gas reduction target		Share of CO_2 emission in the world (2018)
	Medium-term target	Long-term target	
US	-50% to -52% in 2030 (compared to 2005)	Become carbon neutral by 2050	14.7%
Japan	-46% in FY 2030 (compared to 2013)		3.2%
EU	-55% in 2030 (compared to 1990)		9.4%
UK	-78% in 2035 (compared to 1990)		
Canada	-40% to -45% in 2030 (compared to 2005)		1.70%
China	- -65% or more in 2030 in CO_2 emissions per GDP (compared to 2005) - Peak out CO_2 emissions by 2030	Become carbon neutral by 2060	28.40%
India	-33% to -35% in emissions per GDP in 2030 (compared to 2005)	No remarks at this time	6.90%
Russia	-30% in 2030 (compared to 1990)	No remarks at this time	4.70%

Note: Regarding India's "per GDP" target, if GDP grows more than the emissions by the target year, it is possible that emissions are increasing.
Note: Red characters are items whose target has been raised and added due to the climate summit held in April 2021.
Source: Compiled by the author based on materials published by JETRO

of that month, they announced the European Green Deal[11]. The new European Commission reached a provisional agreement on the European Climate Law on April 2021 to write into legislation their goal of becoming the first "climate neutral continent" by 2050.

The UK amended its Climate Change Act[12] in June 2019 to set the policy goal of net zero carbon dioxide emissions by 2050.

Table 1-1-5 shows the greenhouse gas reduction targets and the timing on which carbon neutrality will be achieved for the major countries.

To achieve carbon neutrality by 2050, each country has set a greenhouse

11) The European Green Deal is a set of action plans, such as raising the EU climate target for 2030 and reviewing related regulations accordingly, with the goal of the EU achieving "climate neutrality" with net zero greenhouse gas emissions by 2050.
12) A law enacted in the UK in 2008 as the first in the world to stipulate climate change measures for the next 50 years. It aims to improve carbon management and to promote the UK's transition to a low-carbon economy, as well as to enable the UK to demonstrate leadership for global reductions in emissions based on international agreements.

gas reduction target for 2030, but the base years have not been unified, making side-by-side comparisons of the level of contribution difficult. For example, the Biden administration announced that it would reduce greenhouse gas emissions by half, but its emissions per capita as of 2030 are higher than other countries with high emissions that also have reduction targets set for 2030. Additionally, China and India set their emission reduction targets not in terms of total emissions, but in terms of emissions per GDP.

In other words, countries have set reduction targets in different ways, and there is no denying the fact that the targets are in some way convenient for themselves. However, there is no doubt that 2030 will serve as a milestone year in determining how serious the countries are about achieving carbon neutrality by 2050.

Lastly, we will touch on nuclear power generation, which is unavoidable when countries address climate change and consider energy alternatives to coal that is the source of greenhouse gas emissions.

Some countries, including Japan, are beginning to review their energy policies in the direction of reducing their dependence on nuclear energy. However, there are many countries that are not reviewing their positions on nuclear power generation. Rather, some say we need to consider the idea that depending to what extent climate change is addressed, dependence on nuclear power generation is unavoidable. Furthermore, some predict that nuclear power generation in emerging countries and developing countries will increase dramatically in the future. It is undeniable that how the global energy supply system will change in the future is an important issue for industries, as well as for the daily lives of people.

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