

Chapter 2 Long-Term Prospects for the Global Economy

Section 2 Increasing global trends

The global economy, which fell sharply due to the COVID-19 crisis at the beginning of 2020, has recovered strongly, mainly due to support from governments thereafter. The increase in demand during economic recovery has brought inflationary pressure, and there has been a shift from monetary easing in the U.S. and other countries. This kind of increasing demand is expected to subside and although this leaves uncertainties such as the resurgence of COVID-19 and the impact of Russia's aggression against Ukraine going forward, it is currently important for Japan to take advantage of the global economic growth to grow its economy for the foreseeable future.

In order to increase external demand, companies need to promote exports, foreign direct investments, and expand local production while making use of economic partnership agreements such as the RCEP, CPTPP, Japan-EU EPA, Japan-US trade agreement and the Japan-UK EPA. In addition to extending the existing business model of expanding exports and local production, companies need to strengthen their organizational capabilities through thorough global management, i.e., utilizing overseas human resources, cooperating with overseas companies, etc. They also need to build a new business model to acquire overseas markets by formulating and developing strategies, especially strategies for Asia where Japan's supply chains are connected and where there is market potential, to develop high-growth markets based on the actual conditions of overseas markets.

In order to support corporate activities, the Government of Japan must continue to work to maintain a rules-based order under the multilateral trading system and improve cooperation with Asian countries while maintaining the leverage of their involvement in the U.S. and European markets as well create a growth strategy that is united with Asia.

In addition, the COVID-19 crisis has led to the acceleration of four global trends i.e., digital transformation, increased geopolitical risks, focusing on shared values, and government shifts in industrial policy. These trends influence future developments in international relations and the global economy, creating significant uncertainties in corporate management, and changing the source with which companies add value.

In particular, with regard to geopolitical risks and shared values, rules have been blocked due to the formation of international rules by governments and differences in policy positions, and blocking in affected markets is progressing further. Furthermore, with the government strengthening industrial policies, specific sectors in major countries and regions such as in the U.S. and Europe (aerospace, semiconductors, green sectors, etc.) have seen large-scale markets being created and it is possible that, depending on the policy position of their country, there will be a difference in the opportunity of companies to acquire markets.

In these sort of circumstances, it is important for companies to actively promote the transformation of their business models and industrial structures from the conventional emphasis on cost reduction and low-priced products to those that focus on differentiation, high added value, and efficient operations to enhance their earning power. Companies also need to promote, in light of the four trends that have accelerated due to the COVID-19 pandemic, company transformation through digitalization,

capturing demand created by governments, business models that convert economic security, social impact, and shared value into added value in core businesses and achieve business models and industrial structures that create added value in the New Form of Capitalism.

In order to support corporate activities, the government needs to participate in discussions on the establishment of an economic order within the G7 and other organizations early on, create an environment in which Japanese companies can work on societal implementation in the U.S. and European markets, which have excellent market power and international rule-making power. In addition, it is important that the government strives to build bridges that can help make inclusive rules in order to achieve shared values that take into account the current situation of Asian countries. It's also important for the governments to communicate the shared values that came from the experience of being a developed country which has new problems, set problems, and create markets.

1. Digital transformation

After entering the 21st century, the exponential development and growth of digital technologies and global data flows are rewriting the rules of the economy. Especially since the 2010s, digital transformation has progressed rapidly on a global scale, and the Fourth Industrial Revolution, which involves the innovation of core technologies such as the Internet of Things (IoT), big data, artificial intelligence (AI), including the redesign of economic and social systems and the digital transformation (DX) of corporate management is progressing.

The technological innovations of the Fourth Industrial Revolution will make it possible to (A) provide individually customized production and services from mass production and uniform service provision, (B) effectively utilize existing resources and assets, (C) use AI and robots to supplement and replace conventional human labor¹⁷⁹.

In fact, AI, big data, IoT, FinTech, 3D printing, drones, robots, biotechnology, quantum computers and other emerging technologies are advancing dramatically, and investment and R&D in these fields are increasing globally. Further technological advancements like these that come with the Fourth Industrial Revolution may lead to significant changes in industrial structures.

Under these circumstances, innovation is also essential for Japan to maintain its economic superiority and to develop its economy. For existing Japanese companies, in addition to expanding customer contact channels and providing value through DX, it is becoming more important than ever before to transform the company and improve productivity through expansion of intangible asset investments, DX investments, R&D investments, and human capital investments, and to shift to new business models that create new added value through collaborations with startups and utilization of DX and other technologies.

Also, considering that innovation is born from competition in technological development, creating a level playing field between countries that is fair and equitable, promoting innovation such as the

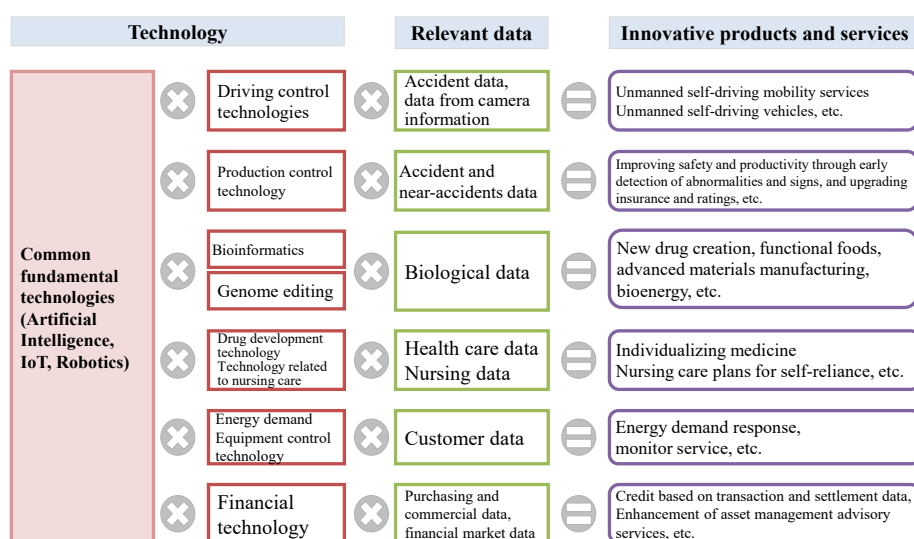
¹⁷⁹ https://www5.cao.go.jp/keizai3/2016/0117nk/n16_2_1.html

development of emerging technologies, the startups responsible for these promotions, and the free cross-border activities of data as a source of added value are important. Trade agreements also play a major role in this regard.

(1) Changes in industrial structures brought by the Fourth Industrial Revolution

The breakthroughs of the Fourth Industrial Revolution have led to the creation of innovative products and services in all fields, enabling us to respond to social and structural issues that have been difficult to solve, and industrial structures are undergoing major changes (Figure I-3-2-1).

Figure I-3-2-1. Creation of innovative products and services brought by the Fourth Industrial Revolution



Source: *New Industrial Structure Vision - Japan's future for Solving Global Issues by Each Person (The New Industrial Structure Committee, the Industrial Structure Council, May 2017)* (METI, 2017).

In light of these major technological innovations, many companies that create new added value have been created around the world. In fact, as of April 2022, unicorns (unlisted venture companies that have been unlisted for ten years or less and valued at \$1 billion or more) that were created using innovative technologies around the world have been present in 46 countries and regions (1083 venture companies worth a total of \$3,629,400 million). The U.S. and China account for about 70 percent of the total value, and both the valuation and number of unicorn companies in the top 10 countries and regions cover about 90% of the total. FinTech is the top technology area. (Figure I-3-2-2).

Figure I-3-2-2. Distribution of unicorns by country (April 2022)

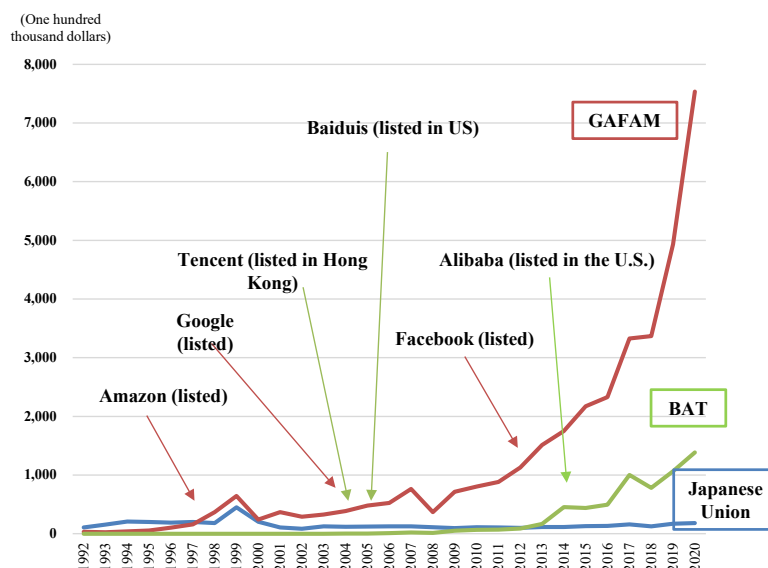
| Ranking | Country | Value (Billion dollars) | Overall ratio (%) | Number of companies | Major technological fields | | |
|---------|---------|----------------------------|----------------------|---------------------|----------------------------|-----|-----|
| | | | | | 1st | 2nd | 3rd |

| | | | | | | | |
|-------|----------------|-------|------|-------|-----------|-------------------------------------------------------------|-------------------------------|
| 1 | United States | 1,902 | 52.4 | 569 | FinTech | The Internet Software and services | Others |
| 2 | China | 677 | 18.6 | 173 | Ecommerce | AI | Hardware |
| 3 | India | 193 | 5.3 | 65 | FinTech | The Internet Software and services | Edtech |
| 4 | United Kingdom | 190 | 5.2 | 43 | FinTech | Hardware | Others |
| 5 | Germany | 74 | 2 | 28 | FinTech | The Internet Software and services | Data management and analytics |
| 24 | Japan | 8 | 0.2 | 5 | Others | AI and Mobile communication | FinTech |
| Total | - | 3,629 | - | 1,083 | FinTech | The Internet Software and services Software and services | Ecommerce |

Source: CB Insights.

As of April 2022, there were only five unicorns in Japan, which is a huge difference compared to the U.S. which has 569 unicorns. They are ranked 24th in terms of value (\$7.8 billion), accounting for only 0.2% of the world's total. It goes without saying that Japan is greatly inferiority even when compared to the market capitalization of major digital companies who have been creating added value and who had an understanding of the Fourth Industrial Evolution early on, i.e., the so-called U.S. GAFAM (Google, Apple, Facebook (now Meta Platforms), Amazon, Microsoft) and China's BAT (Baidu, Alibaba, Tencent) (Figure I-3-2-3).

Figure I-3-2-3. Trends in the Market capitalization of major digital companies in Japan, the U.S. and China



Note 1: Japanese union (Fujitsu, NEC, NTT, Hitachi).

Note 2: The market capitalization of each year is as of the end of year.

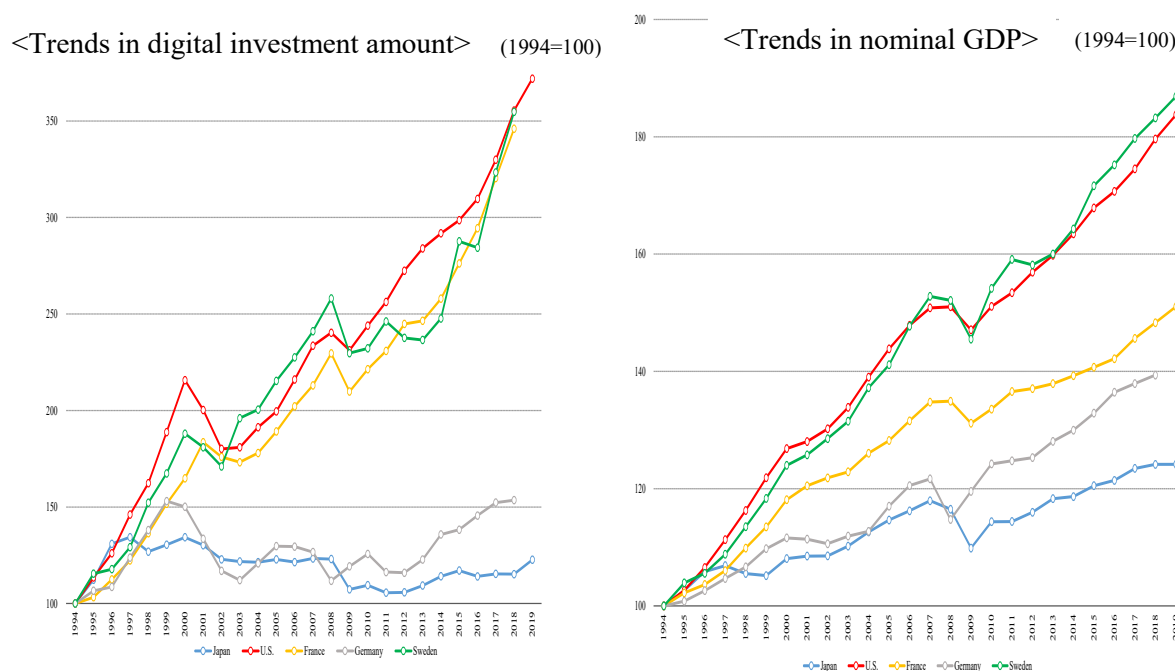
Source: *New Direction of Digital Industrial Policies (Materials of The 4th Semiconductor and Digital Industry Strategy Review Conference)* (Ministry of Economy, Trade and Industry, 2021).

(2) Status of Japan's digital investment

With digital transformation accelerating around the world and industrial structures changing, it will be important for existing companies to expand customer contact channels and provide value through DX, and to transform their businesses through DX-related investments and improve productivity. Looking at Japan's DX, it is inferior in some aspects when compared to the investment amounts, etc., of other countries. Around the globe, many new technologies and business models are being created by digital companies while, in Japan, the public and private sectors lack awareness of the " extent of the change," the "importance," and the " sense of speed " that digital technology brings, and as a result of the digitalization of individual parts assuming that existing organizations, operations, and lifestyles would continue, the response to digital transformation was late, and the industry as a whole lost its competitiveness.

Looking at Figure I-3-2-4, it shows that the amount of digital investment and the nominal GDP are strongly linked, and the delay in digital investment in the country as a whole is one of the causes of low economic growth. Due to this, it is necessary to revitalize a wide range of digital investment in the whole industry as a driver of growth going forward. In the U.S., the nominal GDP has grown significantly in tandem with active digital investment. In Sweden and France, digital investment is growing at an annual average rate of 5% and they have been actively making adequate digital investment. In Japan, on the other hand, digital investment is at a low annual average of 0.8% and the nominal GDP growth rate was only 0.9%. In Germany the growth of digital investment is sluggish, like Japan, at 1.8%, and the nominal GDP growth rate is only 1.4%.

Figure I-3-2-4. Trends in the amount of digital investment and nominal GDP in Japan and other countries



<Average annual growth rate of digital investment and nominal GDP>

| | Japan | U.S. | France | Germany | Sweden |
|--------------------|-------|------|--------|---------|--------|
| Digital investment | 0.8% | 5.4% | 5.3% | 1.8% | 5.4% |
| Nominal GDP | 0.9% | 2.5% | 1.7% | 1.4% | 2.6% |

Note 1: Calculated as 1 USD = 114.28 JPY = 0.88 EUR = 9.19 SEK.

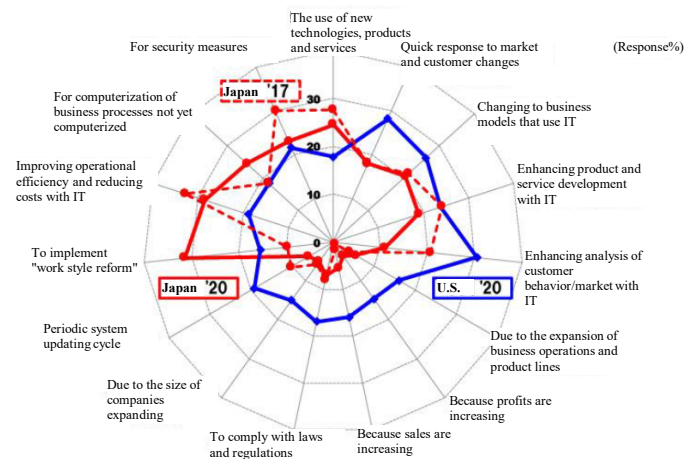
Note 2: Annual average growth rates are calculated from 1994 to 2019 for Japan and the U.S., 1994 to 2018 for France, 1995-2019 for Germany and 1994 to 2018 for Sweden.

Source: *FY2021 Global Economy Survey for Formulating an Integrated Domestic and External Economic Growth Strategy (Survey on Long-term Trends in the World Economy)* (Ministry of Economy, Trade and Industry).

The reason why the amount of digital investment in Japan is inferior to that of other countries is due to companies lagging behind in establishing diverse management systems and implementing business restructuring, which are considered to be one of the factors behind "efficiency focused digital investment."

In fact, when comparing the use of IT budgets in Japan and the U.S., U.S. companies are making digital investments to serve markets and customers, transform business models, and to enhance product and service development while Japanese companies are concentrating on cost reduction and work style reform (Figure I-3-2-5). Business transformation through real DX will be necessary going forward.

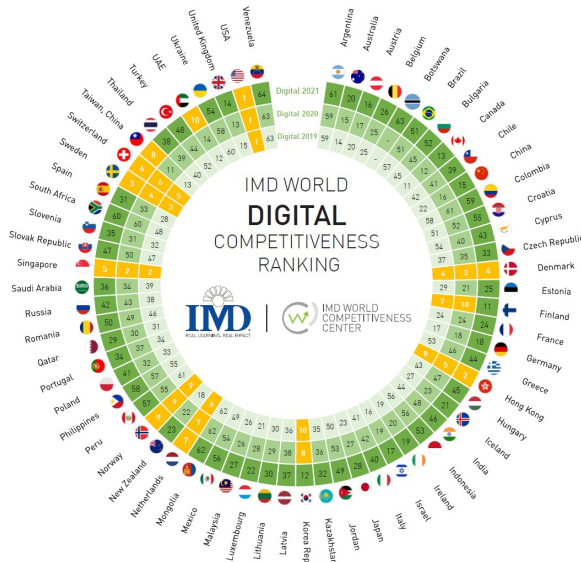
Figure I-3-2-5. The use of IT budgets in Japan and the U.S.



Source: Survey regarding DX for Japanese and U.S. companies 2020 (JEITA/IDC Japan, January 2021)

Looking at the IMD World Digital Competitiveness Ranking, Japan is sluggish ranking 28th. Japan ranked high in the categories of "Pupil-teacher ratio," "Global share of robots," "E-Government," "Software piracy compliance," etc., but reasonably ranked low in the category of "International experience," "Business agility," "Use of big data analytics," and "Digital/technological skills" (Figure I-3-2-6 and Figure I-3-2-7).

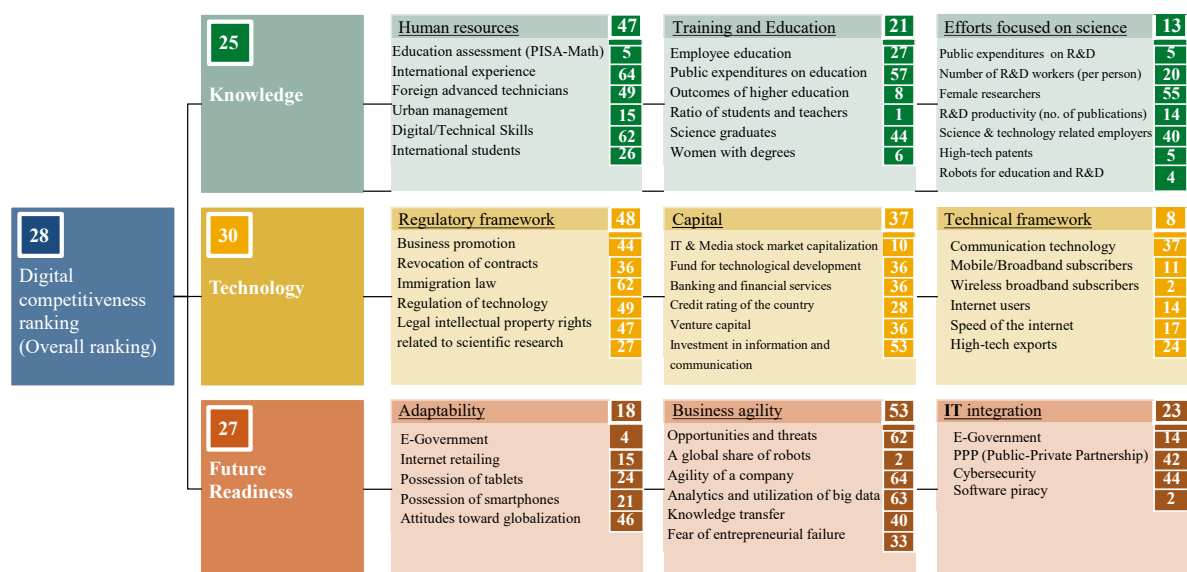
Figure I-3-2-6. IMD World Digital Competitiveness Ranking



| | 2019 | | 2020 | | 2021 |
|---------|------|---|------|---|------|
| U.S. | 1st | — | 1st | — | 1st |
| Sweden | 3rd | ↓ | 4th | ↑ | 3rd |
| Germany | 17th | ↓ | 18th | — | 18th |
| France | 24th | — | 24th | — | 24th |
| Japan | 23rd | ↓ | 27th | ↓ | 28th |

Source: IMD World Digital Competitiveness Ranking 2021 (IMD).

Figure I-3-2-7. Japan's evaluation in the "IMD World Digital Competitiveness Ranking"

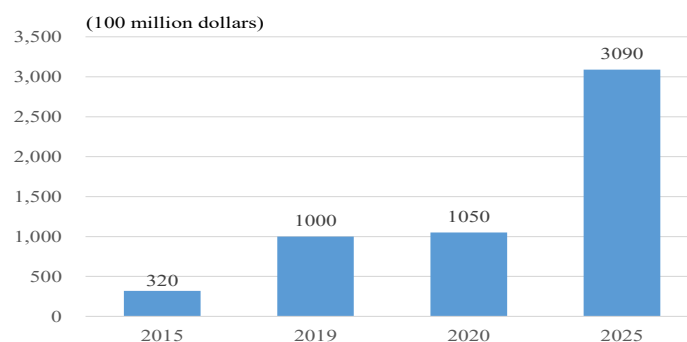


Source: *IMD World Digital Competitiveness Ranking 2021* (IMD).

(3) Creating added value by utilizing Asia DX¹⁸⁰, etc.

Among these circumstances, looking at emerging markets of ASEAN, businesses that use digital technology to solve problems are emerging (Figure I-3-2-8) while its facing various challenges, e.g., trying to get away from the "middle-income trap," expanding regional disparities, and enhancing access to healthcare. In ASEAN, the lack of social infrastructure and development of laws has led to the so-called "leapfrog" phenomenon, in which technologies from advanced countries, such as FinTech and Rideshare, are suddenly adopted.

Figure I-3-2-8. Trends in the scale of the digital economy in Southeast Asia



Source: *e-Conomy SEA 2020* (Google, TEMASEK, and Bain & Company).

In ASEAN countries, the social implementation of digital innovation based on business has become an important policy issue, and this movement is accelerating further, partly due to the spread of COVID-19 (Table I-3-2-9). It is also necessary for Japan to strategically invest funds, human

¹⁸⁰ Japanese companies collaborating with emerging companies in Asia to create new businesses that solve social issues using digital technology.

resources, technology and know-how in emerging Asian countries, and promote Asia DX, which aims to create new businesses through collaboration with local companies in Asia.

Table I-3-2-9. Examples of Adopting Asian DX demonstration projects




| | |
|-------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <First time> A total of 23 projects from 9 countries were adopted | |
|  | [Hitachi, Ltd. together with Thailand: Major Medical Institutions] <ul style="list-style-type: none"> Introduced a local AI system that predicts the risk of disease of individuals for hospitals and other facilities. |
|  | Thailand <ul style="list-style-type: none"> Gathered medical data such as health conditions and medical examination data and gave it to local medical institutions and insurance companies. Created medical big data. Contributed to curbing rising medical costs and reducing health care disparities between regions. |
|  | [Sojitz Corporation together with Vietnam: Pig farmers and related traders] <ul style="list-style-type: none"> Built an ICT platform that provides a one-stop service for overseas expansion through the EC market, site management and breeding data management using IoT for pig farmers and related traders. Contributed to the enhancement of added value (quality improvement, branding, strengthening safety management, etc.) of food and agricultural products promoted by local and state governments. |
|  | [Artisan Inc. together with Malaysia: IT providers] <ul style="list-style-type: none"> Established a system to provide location information for local buses traveling in the Special Economic Zone, "CyberJaya." Improved user satisfaction and promoted bus usage by reducing the worsening traffic congestion and by eliminating the negative economic effects of traffic congestion. |
| <Second time> A total of 18 projects from 8 countries were adopted | |
|  | [Nippon Koei Co., Ltd. together with Singapore: Public offices and carsharing companies] <ul style="list-style-type: none"> Improved the efficiency of road inspection work, supported the formulation of road repair plans based of predicted data and proposed effective road safety measures by analyzing the state of roads using the data obtained from cameras installed in carsharing vehicles. Contributed to measures against fast aging road infrastructure and new road development, as well as improved the efficiency of road maintenance and management operations, which are handled by human wave tactics. |
|  | [ELM Inc. together with Brunei: Farmers] <ul style="list-style-type: none"> Demonstrated a cultivation technique for tropical crops in tropical Brunei by introducing a container-type cultivation system. All the equipment necessary for cultivation is provided in these containers, enabling low-cost, short-term introduction and remote control. Contributed to food security and improving quality of life by establishing cultivation techniques that control the harsh environment there that experiences high temperatures and humidity as well as heavy rain, and by promoting domestic production of high-value vegetables that are usually imported. |
|  | [IHI Jet Service Co., Ltd. and the Philippines: Customs service providers and public offices] <ul style="list-style-type: none"> Provided a system that can ascertain, in real time and at once, the information of containerships' position by means of satellite technology, delay prediction by means of AI and the status of import customs clearance, and improved the efficiency of ship operations and import operations. Also improved the efficiency of customs clearance work by digitizing all import-related documents using AI, reducing errors from writing documents by hand, etc. Contributed to improving the efficiency of the customs clearance in the Philippines, which is the worst in the ASEAN countries in terms of the time it takes at and the cost of the import customs clearance at ports due to increased cargo movements and container shortages. |

Source: JETRO.

(4) Trends in digital rules

As it is becoming increasingly important to establish a fair and equitable competitive environment among nations in order to achieve digital transformation, governments in each country and region are developing cross-cutting rules to enable large platformer companies to conduct appropriate market activities (Table I-3-2-10).

Table I-3-2-10. Trends in digital platforms in foreign countries

| | |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|  | Made the EU Platform to Business (P2B) Regulation applicable from July 2020. Announced the Digital Markets Act which stipulates, among other things, a "list of prohibited practices" deemed to be unfair in prior regulations (preferential treatment of a company, tie-in sales,) |
|  | · · Competition (Amendment) Bill 2021, made effective from January 2021. Introduced regulations against abuse from companies* that are very important to cross-market competition (preferential treatment of a company, elimination of competitors, the use of data) *Started investigating Facebook in January, 2021, Google and Amazon in May 2021 and Apple in June 2021. |
|  | · In October 2020, the House Judiciary Committee (Subcommittee on Antitrust) released a report following their investigation into large technology platforms. · In June 2021, antitrust reform packages were introduced by a bipartisan group of House lawmakers including Chair Cicilline and Ranking Member Buck. · In September 2021, A bipartisan group of U.S. state attorneys general sent a letter to lawmakers urging them to pass a series of bills that tighten antitrust laws aimed at Big Tech companies. |

Source: Materials prepared by the Cabinet Secretariat of the Headquarters for Digital Market Competition.

In addition, in order to take advantage of the new economic value brought by data, we need free, cross-border flow of data. However, in some countries, there is concern about expanding the movement of digital protectionism and authoritarianism, e.g., data hoarding. That is why it is important for Japan to take the lead in promoting DFFT by preventing the spread of digital protectionism and authoritarianism, which can hinder business opportunities for companies, and by gaining trust in privacy protection and security thereby, contributing to the creation of new value and to further economic development brought by data.

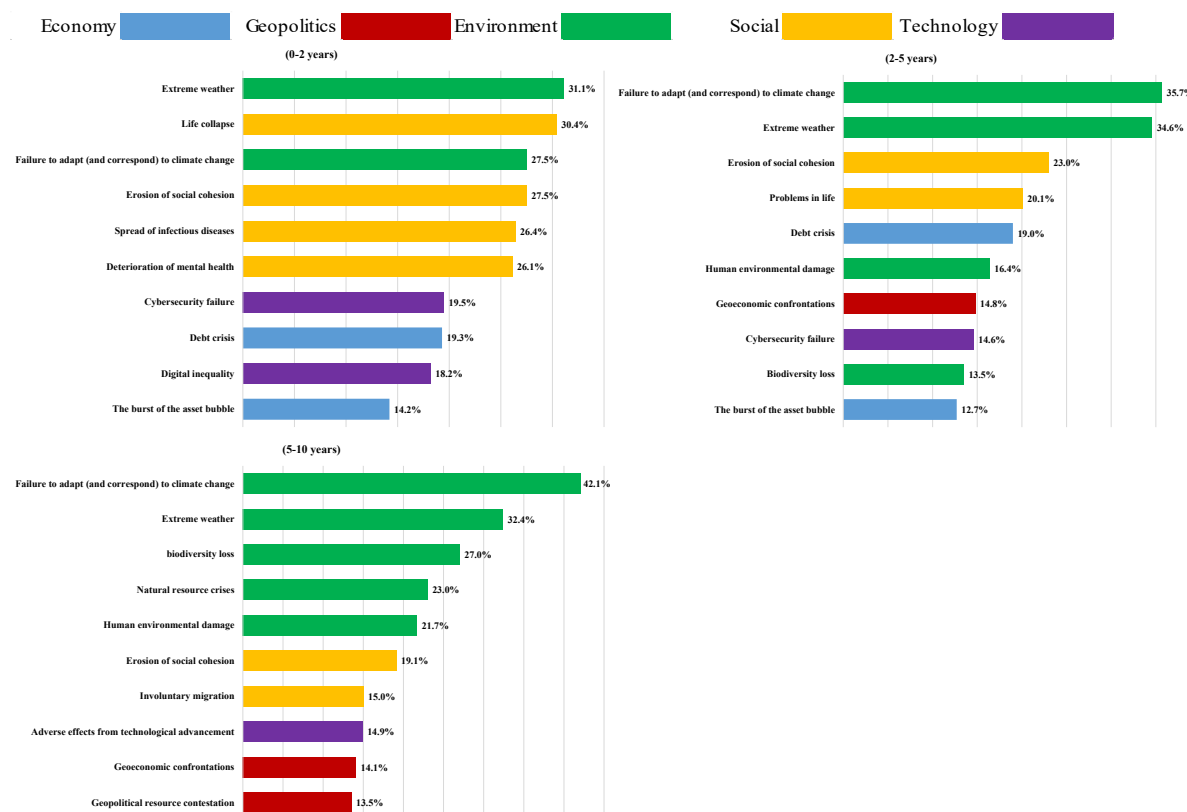
2. Increased geopolitical risk

In addition to the intensifying conflict between the U.S. and China and the UK's exit from the EU, there have also been major political shocks such as the period of time until COVID-19 subsides being prolonged and Russia's aggression against Ukraine, increasing geopolitical risk substantially and bringing uncertainty around the world to an unprecedented level.

(1) Increasing uncertainty

The Global Risks Report 2022¹⁸¹ published by the World Economic Forum shows how long it takes for potential global risks to become a critical threat in the short term (0-2 years), medium term (2-5 years), and long term (5-10 years) (Figure I-3-2-11).

Figure I-3-2-11. When will each global risks become a critical threat to the world? (Response rate)



Source: *The Global Risks Report 2022 17th Edition* (World Economic Forum).

The report cites future environmental societal, technological and geopolitical risks that will become critical threats in the future. Among environmental risks, climate-related risks, such as climate action failure and extreme weather are comparatively high across all the terms and as we reach the long term, environmental risks other than climate-related risks, such as biodiversity loss, natural resource crises, and human environmental damage rise above other risks as well. Geopolitical risks, such as geoeconomic confrontations and geopolitical resource contestation are expected to become a critical threat in the medium to long term. In addition, risks that will become a critical threat due to progressing digitalization are also cited for each term, with cybersecurity failure and digital inequality seen as short-term risks, and adverse tech advances as a long-term risk.

¹⁸¹ *The Global Risks Report 2022 17th Edition* (WORLD ECONOMIC FORUM), WEF_The_Global_Risks_Report_2022.pdf

On the other hand, looking at "TOP RISKS 2022"¹⁸² published at the beginning of the year by the political risk consulting business, Eurasia Group, the biggest risk is "No zero Covid," pointing out the risk of global economic turmoil without completely containing the variants of COVID-19.

It also mentioned a "Technopolar world" as the next major risk with concerns about economic and social control from big tech companies. It said that while governments in the U.S., Europe and China are trying to tighten regulations, they can't stop investment in giant high-tech companies, and because governments and companies are not in agreement on ethical issues of AI, there is a risk of tensions increasing between the U.S. and China and between the U.S. and Europe.

Furthermore, the fifth risk listed in the top risks was cited as "Russia," focusing on President Putin's next move over Ukraine in early 2022 and stated that if there were no concessions from the U.S. and Europe, there could be some form of military operation in Ukraine. Russia's aggression against Ukraine did actually take place on the February 24, 2022, with the risks pointed out materializing (Figure I-3-2-12).

Figure I-3-2-12. TOP RISKS 2022

| | Risk |
|----|------------------------------------|
| 1 | No zero Covid |
| 2 | Technopolar world |
| 3 | US midterms |
| 4 | China at home |
| 5 | Russia |
| 6 | Iran |
| 7 | Two steps greener, one step back |
| 8 | Empty lands |
| 9 | Corporates losing the culture wars |
| 10 | Turkey |

Source: Eurasia Group.

Russia's recent aggression against Ukraine is an act that shakes the foundation of international order that the world has built up in solidarity, and is absolutely unacceptable. The international community, including the G7 countries, are quickly implementing comprehensive economic sanctions, including asset freezing, financial sanctions, and trade sanctions. Under these circumstances, the division, blocking, and multipolarity of the world economy between authoritarian and liberal democracies are accelerating more than ever. The risk of dependence on specific countries for energy and food has become apparent around the world, especially in Europe and developing countries, and the importance of economic security, including the stable supply of energy and food, is being recognized again. It is possible that strategic actions in every country will become more active taking into account geopolitical risks going forward.

¹⁸² TOP RISKS 2022 (Eurasia Group)

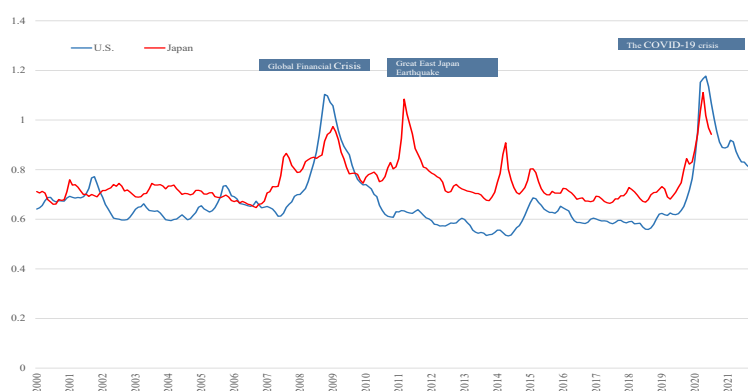
https://www.eurasiagroup.net/siteFiles/Media/files/EurasiaGroup_TopRisks2022_Japanese.pdf

In this world of increasing uncertainty, Japan must, while working closely with the G7 countries and other countries that share their fundamental values, including the rule of law and democracy, tackle new issues such as economic security as well, together with, and while further deepening solidarity with countries that share their views, including emerging and developing countries with the multilateral trading system that has supported the development of the world economy as the foundation.

These increasing geopolitical risks are reflected in the following four indices of uncertainty¹⁸³.

Looking at the Macroeconomic Uncertainty Index of Japan and the U.S., the increase in uncertainty caused by the COVID-19 crisis has exceeded the level of uncertainty when it increased during the Great East Japan Earthquake for Japan and the global financial crisis for the U.S. (Figure I-3-2-13).

Figure I-3-2-13. Macroeconomic Uncertainty Index (Japan-U.S. comparison)



Note: The Macroeconomic Uncertainty Index is based on the prediction errors of the realized and projected values against various economic indicators, including financial indicators. It tries to capture the uncertainty caused by various factors in a simple but comprehensive manner.

Source: *FY2021 Global Economy Survey for Formulating an Integrated Domestic and External Economic Growth Strategy (Survey on Long-term Trends in the World Economy)* (Ministry of Economy, Trade and Industry).

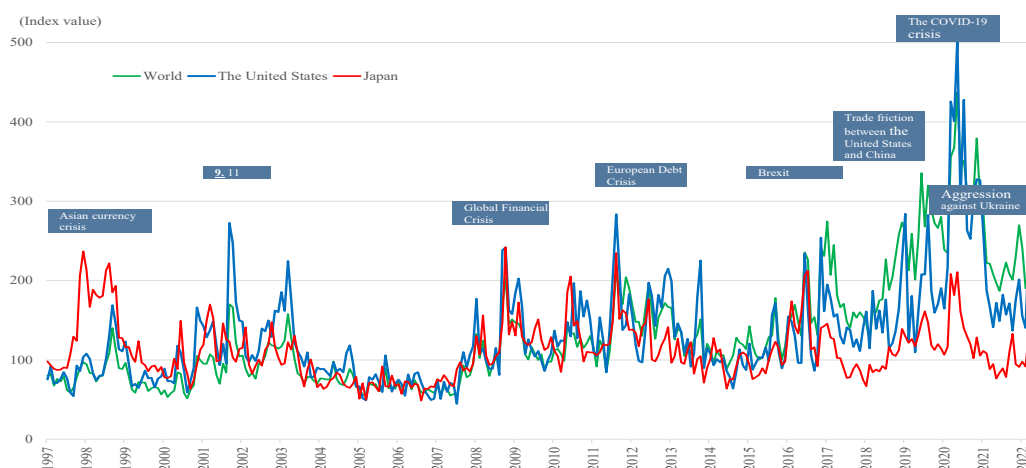
Even looking at the "Economic Policy Uncertainty Index" and the "Economic Surprise Index," the spread of COVID-19 has caused the indices to rise remarkably around the world, indicating that uncertainty has increased the most in recent years (Figure I-3-2-14, Figure I-3-2-15). Looking at Japan's reaction to the spread of COVID-19 in the "Economic Policy Uncertainty Index," it is a lower level than the rest of world and the U.S.. One of the reasons for this is that there was relatively little government intervention due to both the mortality rate and the unemployment rate being kept under control.

¹⁸³ *Characteristics of Uncertainty Indices*

in the Macroeconomy (Bank of Japan)

https://www.boj.or.jp/research/wps_rev/wps_2020/wp20j07.htm/

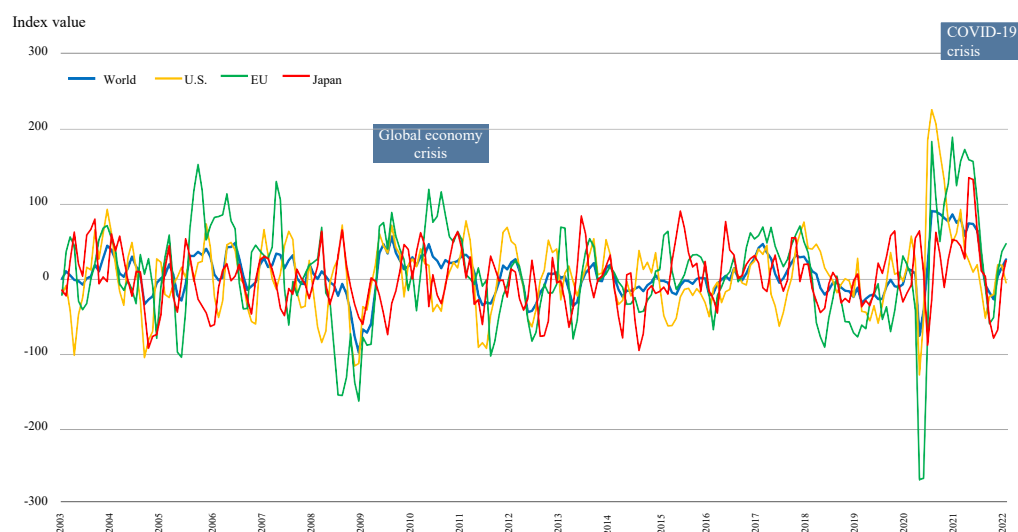
Figure I-3-2-14. Economic Policy Uncertainty Index (World-Japan-U.S. comparison)



Note: The Economic Policy Uncertainty Index is an index that captures the increasing uncertainty regarding economic policy that people feel through the media, based on newspaper articles.

Source: *Economic Policy Uncertainty* (<https://www.policyuncertainty.com/>).

Figure I-3-2-15. Economic Surprise Index (Comparison of the World, Japan, U.S. and EU)

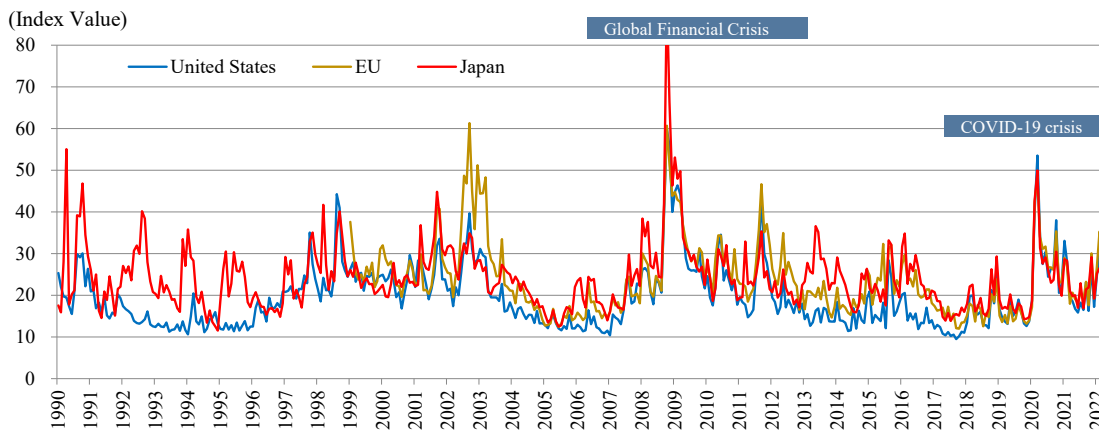


Note: Economic indicators with regard to the real economy are prepared based on the forecast errors of experts' forecasts immediately prior to the release of those indicators. Therefore, macroeconomic fluctuations that could not be predicted even when using various information are considered to be the source of uncertainty. Focuses on uncertainty arising from the real economy rather than the financial environment.

Source: *Economic Surprise Index* (CITI Group).

In addition, the Volatility Index (VIX) also showed a rise for the first time since the global financial crisis, showing increasing uncertainty in Japan as well as in the financial environment (Figure I-3-2-16).

Figure I-3-2-16. Volatility Index (VIX index)

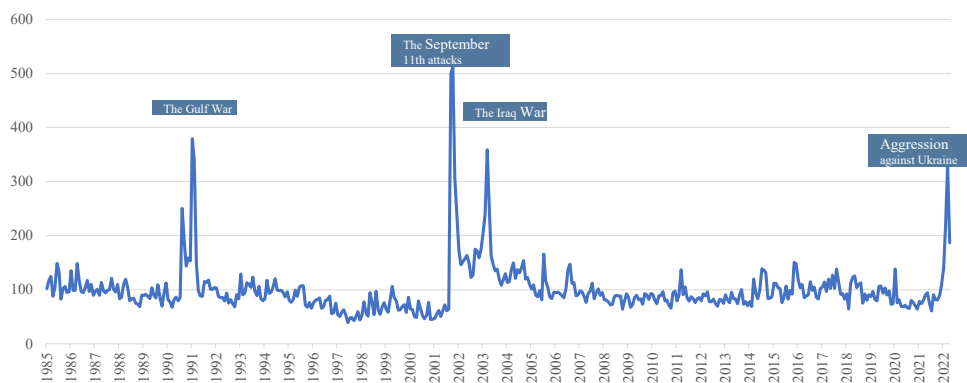


Note: VIX stands for volatility index (also known as the fear index). It is calculated based on expectations of future stock price fluctuations by stock market participants. That is why it can be considered as an index that puts emphasis on uncertainty caused by the financial environment which is felt by investors.

Source: Stock market information from each country.

Furthermore, the geopolitical risk index¹⁸⁴ indicates that geopolitical risk has increased due to Russia's aggression against Ukraine with the index showing a high value that hasn't been seen since 9/11 and The Iraq War (Figure I-3-2-17).

Figure I-3-2-17. Geopolitical risk index



Source: Economic Policy Uncertainty.

(2) Increasing demand for economic security

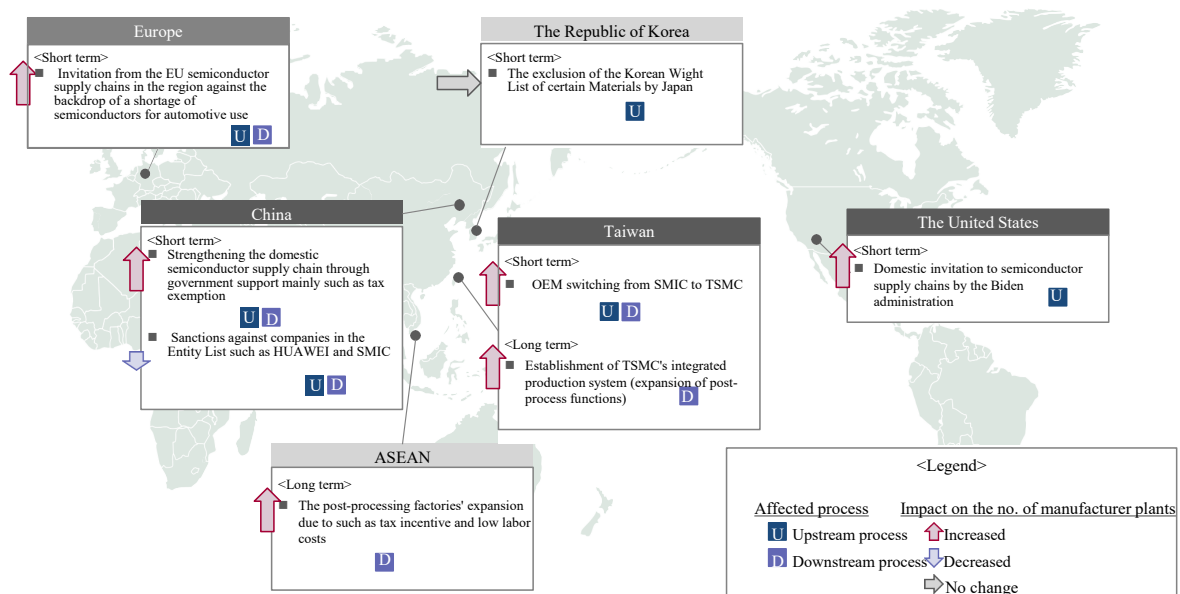
Amid this growing uncertainty, demand for economic security, such as responses to the risk of supply chain disruption materializing due to the spread of COVID-19, is increasing. With the U.S. and China struggling for technological supremacy in emerging technologies such as AI, quantum technology, and the underlying technologies that support them, there is a growing movement in countries to strengthen export control of critical technologies such as those for manufacturing

¹⁸⁴ <https://www.policyuncertainty.com/gpr.html>

advanced semiconductors, and for each country to keep their own technologies away from others. It can be said that the influence of the conflict between the U.S. and China is spreading globally (Figure I-3-2-18). With these movements, countries have been strengthening their economic security efforts by developing strategic industries and reviewing global supply chains, etc. In the U.S., in addition to developing competitive new industries and implementing technology and innovation policies (an "offensive" aspect of economic security), the country is implementing policies to strengthen export control and export control of emerging technologies (policies that emphasize the "defensive" aspect of economic security (Table I-3-2-19). Economic security efforts are being strengthened in Japan as well, as shown by the country making a new Minister take charge of Economic Security and the enactment of the Act on Promotion of Economic Security (the Act on Promotion of Economic Security by Integrated Implementation of Economic Measures).

As for corporate behavior, some parts of the global supply chains are returning to Japan with the slowdown of the global economy and demand for diversifying production bases due to the spread of COVID-19. It is becoming increasingly important for companies to closely monitor trends in geopolitical risks and economic security strategies, and to formulate supply chain strategies to enhance their resilience to quickly and flexibly respond to sudden changing conditions and changes in rules. They also need to, while taking into consideration the size of the risk and how long it will persist, flexibly change and diversify production bases and suppliers, increase inventories, recycle, and stockpile.

Figure I-3-2-18. Impact of the conflict between the U.S. and China on the semiconductor industry



Source: FY2021 Global Economy Survey for Formulating an Integrated Domestic and External Economic Growth Strategy (Survey on Long-term Trends in the World Economy) (Ministry of Economy, Trade and Industry).

Table I-3-2-19. Major regulations by the U.S. in the struggle for technological supremacy between the U.S. and China

| Categories | Content |
|-------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Strengthening export control (the Direct Product rule) | <ul style="list-style-type: none"> · In May 2020, the U.S. directly changed its product regulations and enforced it on the day to prevent Huawei and 114 of its affiliates from acquiring, among other things, dedicated semiconductors made with American technology and software through third countries. · In August 2020, regulations were strengthened to prevent the acquisition of, among other things, general-purpose semiconductor products made with U.S. technology and software. |
| Strengthening export control (The Entity List) | <ul style="list-style-type: none"> · Since June 2020, the U.S. has added 257 Chinese companies and individuals (entities) to the Entity List. · In August 2020, the U.S. further expanded export controls on Huawei and its affiliates. |
| Strengthening investment regulations (Regulations implementing the Foreign Investment Risk Review Modernization Act (FIRRMA)) | <ul style="list-style-type: none"> · In the U.S., the Commission on Foreign Investment in the United States (CFIUS), which reviews, in the perspective of safety, certain transactions involving foreign investment in the U.S., was given further authority (which took effect when FIRRMA was implemented on February 2020) and the definitions and procedures for the matters to be newly regulated in (1) critical technologies, (2) critical infrastructure, (3) non-passive and non-controlling investments related to sensitive personal data and (4) real estate transactions were clarified. |

Source: Information published by the U.S. Department of Commerce and the U.S. Department of the Treasury.

Together with domestic industrial policies, governments are increasing their efforts to support the building of resilient, diverse, and safe supply chains. Governments are promoting investment towards strengthening domestic production capacity and R&D for semiconductors in particular and it is clear that they are trying to work with trusted partners (Table I-3-2-20 and Table I-3-2-21). In addition, cooperation on critical technologies is on the agenda for the cooperation among the like-minded countries of Japan, the U.S., Australia and India (known as the Quad). Aiming to ensure that critical and emerging technologies are managed and operated in accordance with common interests and values, the Quad Critical and Emerging Technology Working Group which was established at the first Quad Summit, has developed the "Principles on Technology Design, Development, Governance, and Use," and has deepened discussions on semiconductors and its important components of four countries to strengthen supply chains for critical technologies. With regard to digital economy and emerging technologies, (A) the deepening of cooperation in technological development and research in the fields of quantum science, life sciences, biotechnology, AI, quantum science and civil space, (B) the importance of reliable operators and the commitment towards the safety and openness of 5G and the (C) cooperation related to sensitive supply chains that include semiconductors while developing and protecting important technologies were confirmed at the Japan-U.S. Summit Meeting (April 2021). Under these circumstances, China has advocated for "self-reliance in science and technology," keeping a major part of its supply chain to itself and promoting the domestic production of core technologies in order to "strengthen a self-developed, controllable supply chain."

Table I-3-2-20. Efforts toward developing core digital technologies

| Country / Region | Major trends in industrial policy support |
|------------------|-------------------------------------------|
|------------------|-------------------------------------------|

| | |
|-------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| U.S. | <ul style="list-style-type: none"> · The National Defense Authorization Act for Fiscal Year 2021 (NDAA 2021) prescribes the maximum amount of 300 billion yen/case of subsidies and the establishment of the "multilateral semiconductor security fund." · The Senate passes the "United States Innovation and Competition Act of 2021" which included funding of approximately 6.2 trillion yen to support semiconductor manufacturing under the CHIPS Act*, which accelerates domestic semiconductor production. The Biden administration also welcomed the Act's passing. <p>(*) Creating helpful Incentives for the Production of Semiconductors (CHIPS) for America Act</p> |
| China | <ul style="list-style-type: none"> · Established the National Integrated Circuit Industry Investment Fund (5 trillion yen) in 2014 and 2019. · In addition, local governments have funds for the semiconductor industry totaling more than 5 trillion yen (a total of more than 10 trillion yen). |
| Europe | <ul style="list-style-type: none"> · Announced the Digital Strategy toward 2030. Invested 134.5 billion euros (about 17.5 trillion yen) in digital transformation (logic semiconductors, high-performance computing, quantum computers, quantum communication infrastructure, etc.). · Announced (September 2021) the enactment of the "Chips Act" aimed at building a chipmaking "ecosystem" to keep the EU competitive and self-sufficient by developing new markets for European breakthrough technologies. |
| Taiwan | <ul style="list-style-type: none"> · Launched incentives such as subsidies to encourage the return of investments back to Taiwan. Accepted investment applications with a cumulative total of 2.7 trillion yen, mainly in hi-tech sectors (January 2019). · Announced a plan to invest a total of 30 billion yen's worth of subsidies into the semiconductor sector by 2021 (July 2020). |
| Republic of Korea | <ul style="list-style-type: none"> · Invested a total of 100 billion yen into developing AI semiconductor technologies (December 2019). · Announced a plan to make concentrated investments worth 500 billion yen to develop technologies in industries for materials, parts, and equipment that include semiconductors by 2022 (July 2020). · The K-Semiconductor Strategy was formulated for the country to become a comprehensive semiconductor powerhouse (May 2021). |

Source: Information published by the governments of each country.

Table I-3-2-21. United States Innovation and Competition Act of 2021

| |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> · Investments grants that include a total of \$52 billion for the next five years for the provisions in the CHIPS Act and \$1.5 billion for the provisions in the Utilizing Strategic Allied Telecommunications Act of 2020. · Plans to maintain and strengthen U.S. leadership in science and technology through R&D investment and the strengthening of regional economies, manufacturing, and supply chains. Granted a total of \$120 billion to the National Science Foundation, the U.S. Department of Commerce, the United States Department of Energy and NASA. · Comprehensive stipulation of the diplomatic strategy against China and the country's commitment to being involved in the Indo-Pacific region. Increased utilization budget for the Department of Space in the Indo-Pacific region. · Stipulation of, among other things, the establishment of a critical response fund to prevent and mitigate cyberattacks by foreign governments and theft of U.S. intellectual property, regulations on drone procurement, etc. and the strengthening of the Buy American Act (prioritizing American supplies and construction materials for the United States government) to maintain competitiveness. · Stipulated strengthening of existing financial sanctions against China, measures for new sanctions, and strengthening of export control. · Stipulated trade measures to ensure supply chains are strengthened for critical goods and to address unfair trade practices. |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

Source: Materials published by the U.S. Congress.

3. Focusing on shared values

Shared values which include; environmental values, i.e., decarbonization to help with climate change, a circular economy to help with resource constraints, biodiversity and environmental conservation and includes social values, i.e., respecting labor and human rights, are not only important for government policies. From the viewpoint of sustainability, solving social issues, and creating social value (CSV), it is also becoming increasingly important in consumer and financial markets.

Companies need to be conscious of their purpose and strive to add value for all stakeholders, i.e., not just for shareholders but also for their customers, employees, local communities, governments, and the natural environment. With many consumers, especially the younger generation, making purchase decisions for goods and services based on consideration for society and the environment, it is becoming increasingly important for companies to go further than the ancillary aspects of corporate social responsibility (CSR) activities and shift consideration of shared values to the added value of their core business and use it as a means of creating new superiority. It is also important for them to build an advantageous competitive environment by actively partaking in the creation of rules related to shared values.

Given also the increasing momentum for ESG investment by investors, it is important for companies to address shared values from the perspective of securing funding in financial markets.

(1) Climate change and environmental protection

(A) Efforts toward carbon neutrality

In recent years, concerns about climate change and environmental problems are growing globally further more than before, and the importance of the transformation that converts responses to climate change themselves to the added value of the core business of companies is growing.

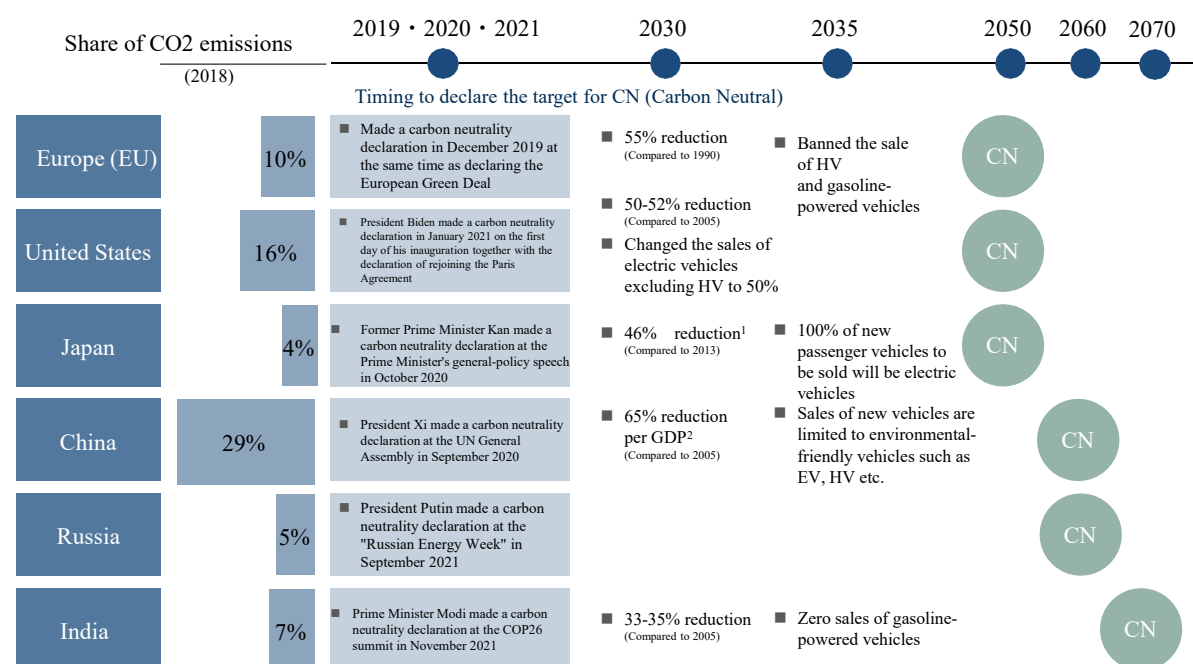
The Paris Agreement was adopted at the COP21 in 2015, and thereby all the parties to the Paris Agreement must adopted the target for reduction of greenhouse gas emissions. Under the Paris Agreement, efforts are being pursued to limit the increase in the global average temperature to 1.5°C while keeping it well below 2°C compared to pre-industrial levels. The goal is to achieve global carbon neutrality in the second half of this century.

More than 140 countries have declared carbon neutrality by 2050, accounting for 42% of global CO₂ emissions^{185 186}. China has pledged carbon neutrality by 2060, and India has pledged carbon neutrality by 2070 at COP26. In addition, major countries such as Europe, China, and India have banned the sale of gasoline-powered vehicles, and in Japan, 100% of new passenger vehicles to be sold will be electric vehicles by 2035. A variety of measures are being implemented to achieve carbon neutrality (Figure I-3-2-22).

¹⁸⁵ Ministry of Economy, Trade and Industry (as of the end of 2021). The count of (a) the countries participating in the Climate Ambition Alliance, (b) the countries expressing carbon neutrality by 2050 by submitting a long-term strategy to the United Nations, and the countries expressing carbon neutrality by 2050 at the Summit on Climate and COP26, etc. in April 2021

¹⁸⁶ CO₂ emissions are counted based on CO₂ Emissions from Fuel Combustion (IEA, 2020), and are limited to CO₂ from energy source (2018).

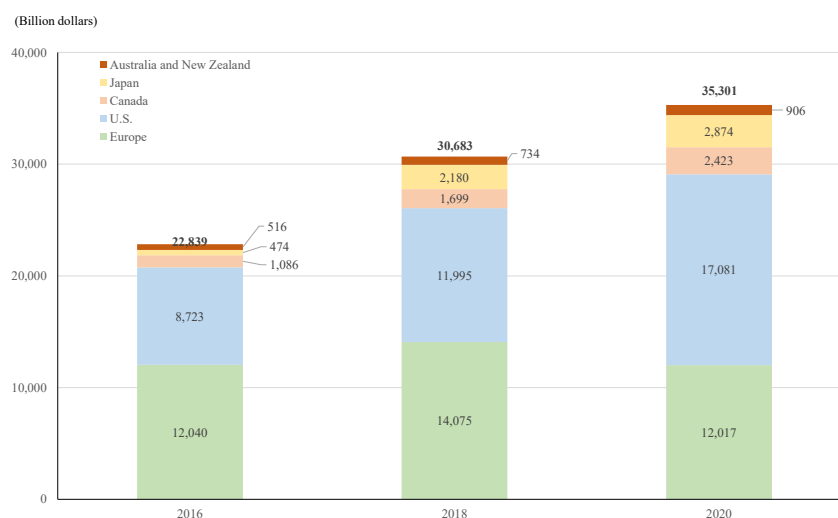
Figure I-3-2-22. Status of carbon neutrality declarations in major countries



Source: Various reports.

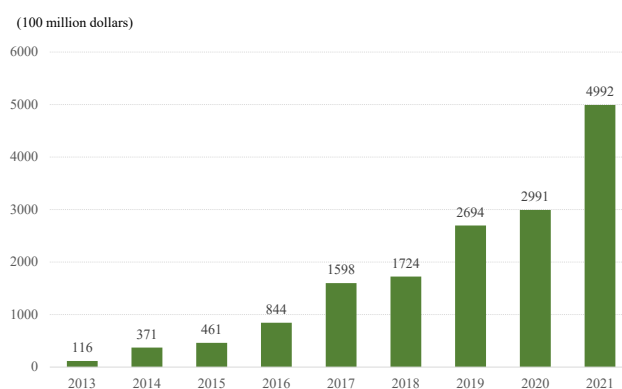
Looking at ways to achieve carbon neutrality, since the adoption of the Paris Agreement in 2015, sustainable finance has been permeating around the world, mainly in the EU. In 2020, the total amount of investment expanded to 35.3 trillion dollars (Figure I-3-2-23) with the very high interest. In 2021, the amount of green bonds issued for projects that are already in a decarbonization level, such as renewable energy, has also expanded to 499.2 billion dollars (Figure I-3-2-24). On the other hand, the percentage hovers around 5% of the total amount of bonds issued (Figure I-3-2-25). It is necessary to look at finance for not only "greening" but also "transition" to achieve steady low carbonization as part of sustainable finance in terms of climate change measures.

Figure I-3-2-23. Trends in the amount of sustainable investment



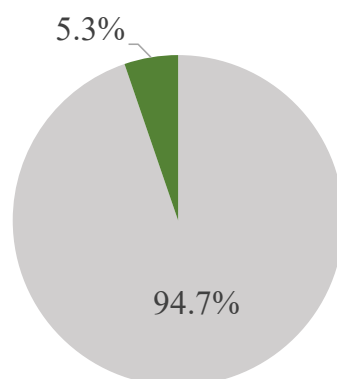
Source: *Global Sustainable Investment Review 2020* (Global Sustainable Investment Alliance).

Figure I-3-2-24. Trends in the amount of green bonds issued around the world



Source: Based on the Ministry of the Environment website.

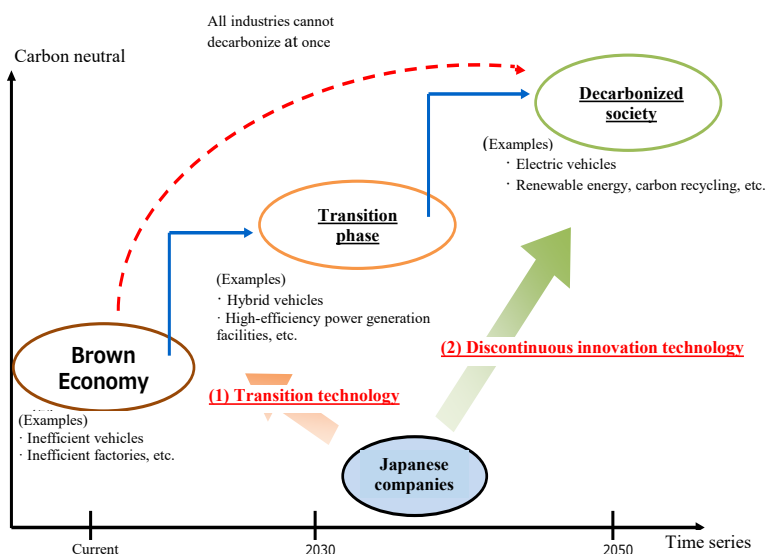
Figure I-3-2-25. Percentage of green bonds to occupy the amount of bonds issued



Source: S&P Global and Ministry of the Environment website.

A large amount of funds will be required for the "transition" toward a decarbonized society. The EU has formulated a "taxonomy" (classification system) for finance, which defines environmentally sustainable economic activities (so-called "greening"), and requires operating companies to disclose their green ratio in sales. Financial institutions are also required to disclose, etc. the green ratio of financial assets such as their finance receivables, etc. However, it is also true that all industries cannot decarbonize at once, and it is not only greening, but also how to proceed with the transition toward decarbonization will become important in the future (Figure I-3-2-26).

Figure I-3-2-26. Transition to decarbonization



Source: *Transition Finance* (the Ministry of Economy, Trade and Industry website).

In addition, the so-called "green swans" are attracting attention because climate change is considered to be a risk that can trigger a new global financial crisis, setting a new financial system challenge for central banks, regulatory authorities, and supervisory authorities. The term "green swan" was first used in a paper¹⁸⁷ compiled by the Bank for International Settlements (BIS) and the Bank of France, and is derived from the term "black swan," meaning an event that is difficult to predict from previous knowledge and experience, and will have a large impact if a risk materializes.

This paper states risks including the following that could materialize: (a) the risk that stranded assets will increase due to rapid changes in the market and social environment associated with climate change measures, causing investors to carry out sacrifice sale and eventually causing a financial crisis, (b) the risk that financial institutions' credit risk and market risk will increase associated with climate change, making it difficult to raise funds in the short term, resulting in increased strains in financial markets, and (c) the operational risk that impacts of disasters caused by climate change will adversely affect the system operation, etc. of financial institutions.

¹⁸⁷ *The green swan: Central banking and financial stability in the age of climate change* (Jan, 2020) (BIS and Bank of France, 2020).

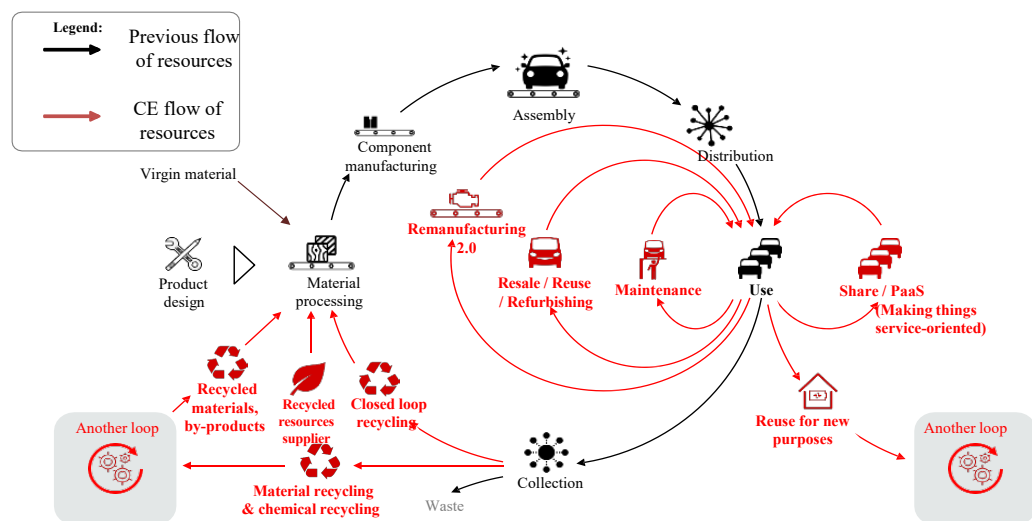
Differences from the "black swan" are (a) it is certain that climate change risks will materialize in the future, (b) disasters due to climate change will be more severe than the systemic financial crisis, and (c) the complexity of climate change is in a higher order, and could lead to a large and complex chain reaction to the environment, society, and economy.

In order to maintain financial stability over the long term under these climate change risks, it has been pointed out that central banks and policy authorities need to (a) explore the essential new policy mix and engage in social discussions, and (b) perform means and reformation of financial systems, considering climate change as a public good.

(B) Transition to a "circular economy"

There is also a growing need to shift to a circular economy. In addition to increasing demand for resources, energy, and food due to global population and economic growth, the volume of waste is increasing, and environmental problems such as ocean plastics are becoming more serious. Against this backdrop, interest in a "circular economy" has increased in recent years in contrast with the conventional "linear economy" (a one-way economy of mass production, mass consumption, and mass disposal), and there is a growing belief that a shift should be made to an economy that maximizes added value while promoting efficient and cyclical use of resources at every stage (Figures I-3-2-27 and I-3-2-28).

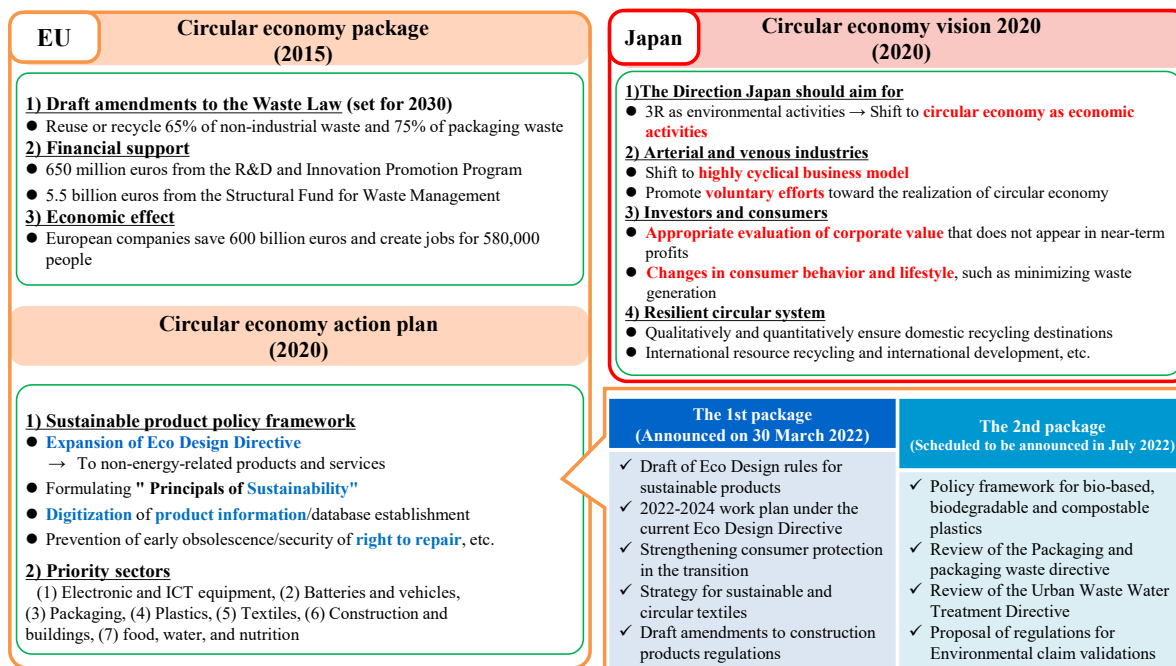
Figure I-3-2-27. Outline of the circular economy



Source: *Circular Economy Vision 2020 (Outline)* (Ministry of Economy, Trade and Industry, May 2020).

Figure I-3-2-28. Policy trends in the circular economy in EU and Japan

I-3-2-28 Policy trends in the circular economy in the EU and Japan



Source: Ministry of Economy, Trade and Industry.

Due to rising global population and economic growth in emerging countries, there is a growing risk of increased consumption and future resource constraints. As a result, global resource mining will more than double in about 40 years (from 88 billion tons in 2015 to 190 billion tons in 2060), and there are concerns that resource prices will rise and it will be difficult to secure a stable supply of rare minerals. In addition, waste problems inside and outside Japan have become apparent, and the volume of waste has increased and inappropriate disposal has been observed in emerging countries. The amount of non-industrial waste in the world is expected to nearly double over 30 years (from 2 billion tons in 2016 to 3.4 billion tons in 2050), and the amount of home appliances disposed of in six ASEAN countries is expected to increase 3.5 times in 15 years (from 10 million units in 2014 to 35 million units in 2030), raising concerns about the Asian countries' waste import regulations, global waste treatment system malfunction, and impacts on the domestic treatment system.

Furthermore, the World Economic Forum in 2016 estimated that the amount of plastic in the ocean will exceed the amount of fish by 2050 due to the worsening of environmental problems such as global warming and ocean plastic waste, etc., and the increasing demand for environmental consideration. Actions accelerated voluntarily mainly by global companies by private initiatives have been observed. Internationally, the resumed fifth session of the UN Environment Assembly (UNEA-5.2) of the United Nations Environment Programme (UNEP) took place from February 28 to March 2, 2022 adopted a resolution to establish an Intergovernmental Negotiating Committee (INC) to discuss legally binding international instruments (treaties) on measures against plastic pollution, including ocean plastic pollution. As the advocate of the Osaka Blue Ocean Vision, which aims to reduce

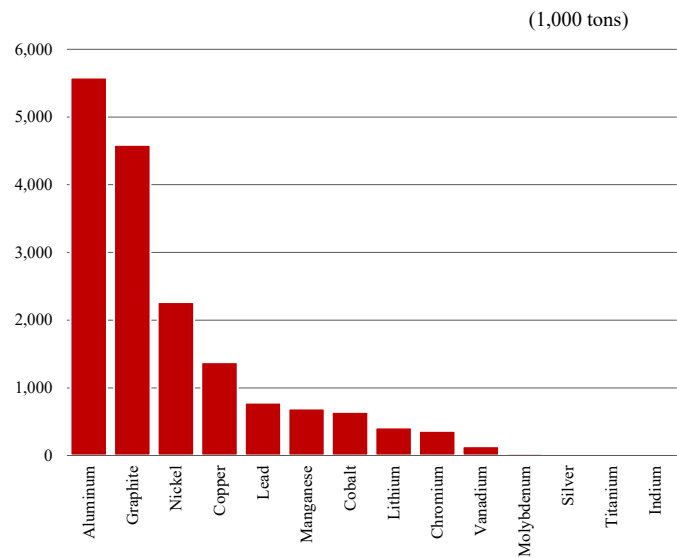
additional pollution caused by ocean plastic waste to zero by 2050, Japan will play an active role in the future international negotiations at the INC. The United Nations also advocates achieving the improvement of resource efficiency and the separation of economic activities from resource consumption and environmental impacts for sustainable development¹⁸⁸.

(C) Importance of securing rare minerals for decarbonization

Due to the progress of digitalization and the global trend toward carbon neutrality in recent years, the stable supply of rare minerals including rare metals, which are indispensable in advanced industries, is becoming even more important. In order to achieve carbon neutrality, large-scale energy conversion, including energy conservation, is required. Therefore, securing a stable supply of rare mineral resources becomes an issue. Some rare metals, which are essential for the manufacture of electric vehicles (EVs) and other electrically-powered vehicles, are unbalanced in reserves and production in specific countries, and there are supply risks arising from country risks and other factors.

According to the "Minerals for Climate Action," etc. published by the World Bank, demand for aluminum, graphite, and nickel will increase by 2050. The demand rate for the production volume in 2020 is large for lithium, cobalt, and graphite with 4 to 5 times higher demand than the volume in 2020 (Figures I-3-2-29, I-3-2-30, and I-3-2-31).

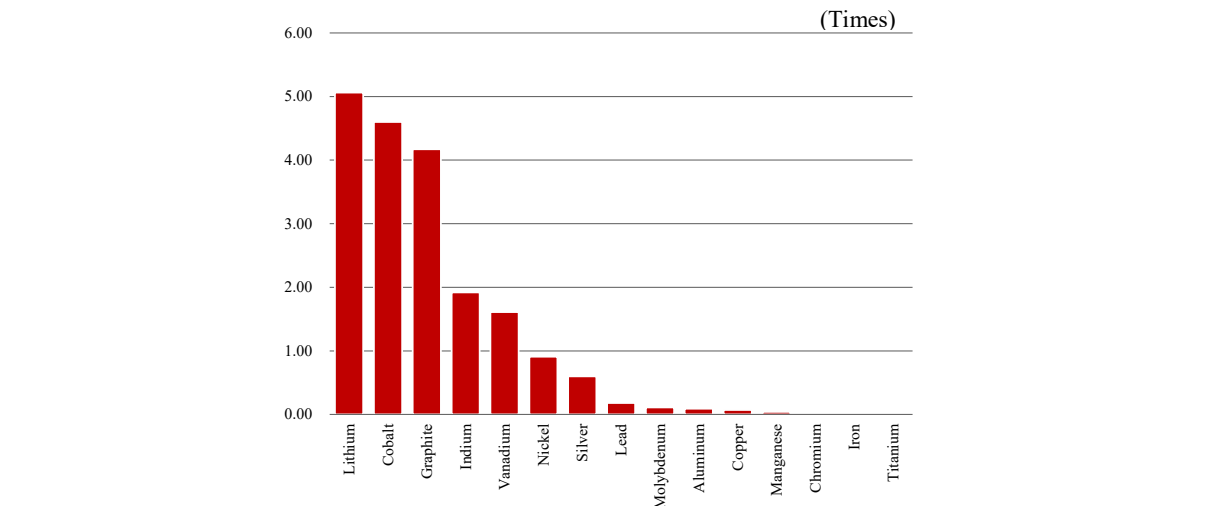
Figure I-3-2-29. Annual demand for important minerals in 2050



Source: World Bank and U.S. Geological Survey (USGS).

¹⁸⁸ *Circular Economy Vision 2020* (Ministry of Economy, Trade and Industry)
<https://www.meti.go.jp/press/2020/05/20200522004/20200522004.html>

Figure I-3-2-30. Demand rate for production volume in 2020



Source: World Bank and U.S. Geological Survey (USGS).

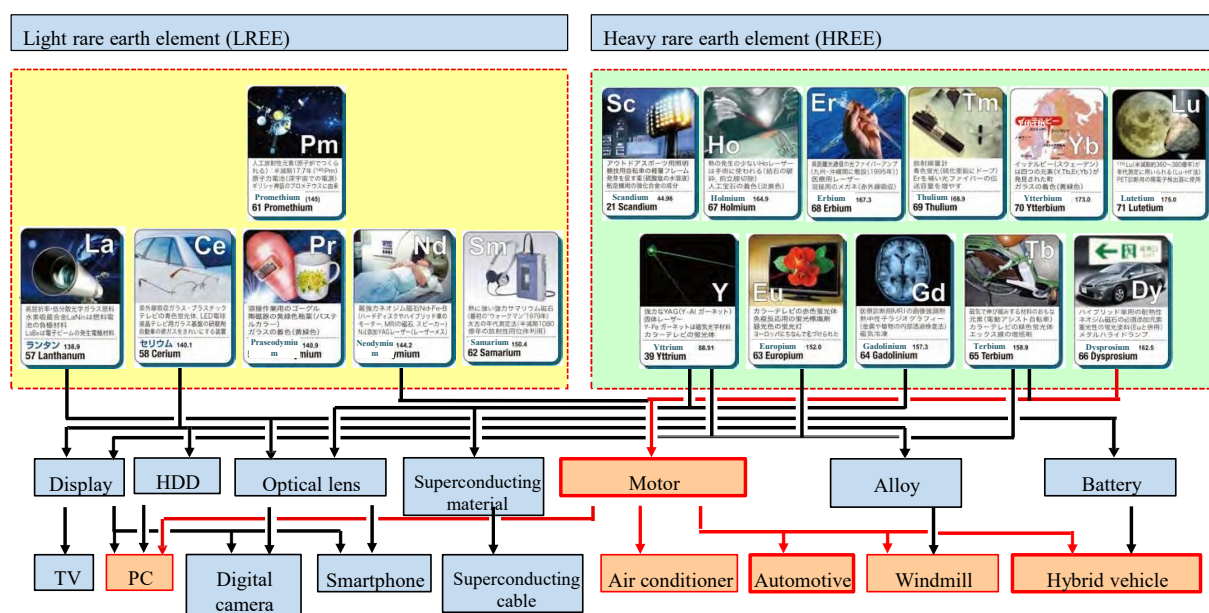
Figure I-3-2-31. Mineral resources where stable procurement becomes important (element symbol table)

| Group | I A | II A | II B | IV B | V B | VI B | VII B | VIII | | | | I B | II B | III A | IV A | V A | VI A | VII A | O |
|------------|--------------------|--------------------|------------------------|-------------------------|---------------------|----------------------|---------------------|---------------------------------------------------------|----------------------|------------------------|-----------------------|-----------------------|-----------------------|---------------------|----------------------|-----------------------|----------------------|---------------------|-----------------|
| | Alkali group | Alkaline group | Rare earth group | Titanium group | Vanadium group | Chromium group | Manganese group | Iron group (4 periods) Platinum group (5, 6 periods) | | | | Copper group | Zinc group | Aluminum group | Carbon group | Nitrogen group | Oxygen group | Halogen group | Inert gas group |
| 1 | 1 H Hydrogen | | | | | | | | | | | | | | | | | 2 He Helium | |
| 2 | 3 Li Lithium | 4 Be Beryllium | | | | | | | | | | | 5 B Boron | 6 C Carbon | 7 N Nitrogen | 8 O Oxygen | 9 F Fluorine | 10 Ne Neon | |
| 3 | 11 Na Sodium | 12 Mg Magnesium | | | | | | | | | | | 13 Al Aluminum | 14 Si Silicon | 15 P Phosphorus | 16 S Sulfur | 17 Cl Chlorine | 18 Ar Argon | |
| 4 | 19 K Potassium | 20 Ca Calcium | 21 Sc Scandium | 22 Ti Titanium | 23 V Vanadium | 24 Cr Chromium | 25 Mn Manganese | 26 Fe Iron | 27 Co Cobalt | 28 Ni Nickel | 29 Cu Copper | 30 Zn Zinc | 31 Ga Gallium | 32 Ge Germanium | 33 As Arsenic | 34 Se Selenium | 35 Br Bromine | 36 Kr Krypton | |
| 5 | 37 Rb Rubidium | 38 Sr Strontium | 39 Y Yttrium | 40 Zr Zirconium | 41 Nb Niobium | 42 Mo Molybdenum | 43 Tc Technetium | 44 Ru Ruthenium | 45 Rh Rhodium | 46 Pd Palladium | 47 Ag Silver | 48 Cd Cadmium | 49 In Indium | 50 Sn Tin | 51 Sb Antimony | 52 Te Tellurium | 53 I Iodine | 54 Xe Xenon | |
| 6 | 55 Cs Cesium | 56 Ba Barium | 57 to 71 Lanthanide | 72 Hf Hafnium | 73 Ta Tantalum | 74 W Tungsten | 75 Re Rhenium | 76 Os Osmium | 77 Ir Iridium | 78 Pt Platinum | 79 Au Gold | 80 Hg Mercury | 81 Tl Thallium | 82 Pb Lead | 83 Bi Bismuth | 84 Po Polonium | 85 At Astatine | 86 Rn Radon | |
| 7 | 87 Fr Francium | 88 Ra Radium | 89 to 103 Actinides | 104 Rf Rutherfordium | 105 Db Dubnium | 106 Sg Seaborgium | 107 Bh Bohrium | 108 Hs Hassium | 109 Mt Meitnerium | 110 Ds Darmstadtium | 111 Rg Roentgenium | 112 Cn Copernicium | 113 Nh Nihonium | 114 Fl Flerovium | 115 Mc Moscovium | 116 Lv Livermorium | 117 Ts Tennessine | 118 Og Oganesson | |
| | | | | | | | | | | | | | | | | | | | |
| Lanthanide | 57 La Lanthanum | 58 Ce Cerium | 59 Pr Praseodymium | 60 Nd Neodymium | 61 Pm Promethium | 62 Sm Samarium | 63 Eu Europium | 64 Gd Gadolinium | 65 Tb Terbium | 66 Dy Dysprosium | 67 Ho Holmium | 68 Er Erbium | 69 Tm Thulium | 70 Yb Ytterbium | 71 Lu Lutetium | | | | |
| Actinides | 89 Ac Actinium | 90 Th Thorium | 91 Pa Protactinium | 92 U Uranium | 93 Np Neptunium | 94 Pu Plutonium | 95 Am Americium | 96 Cm Curium | 97 Bk Berkelium | 98 Cf Californium | 99 Es Einsteinium | 100 Fm Fermium | 101 Md Mendelevium | 102 No Nobelium | 103 Lr Lawrencium | | | | |

Source: Agency for Natural Resources and Energy.

"Rare earths," that are typical rare minerals and used in the production of important parts, making up automobiles and electrical and electronic equipment in Japan have been consumed only tens of thousands of tons a year. However, the functions obtained from them are often indispensable for industries (Figure I-3-2-32).

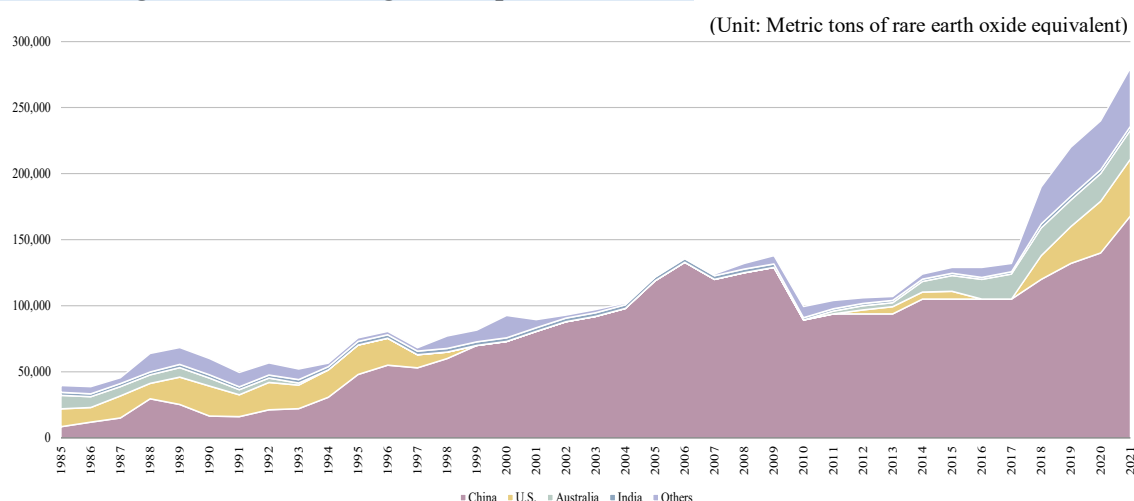
Figure I-3-2-32. Application of rare earths in industries



Source: FY2021 Global Economy Survey for Formulating an Integrated Domestic and External Economic Growth Strategy (Survey on long-Term Trends in the World Economy) (Ministry of Agriculture, Forestry and Fisheries).

Given these circumstances and looking at the change in the production of rare earths in the world, the global share of Chinese ores has exceeded 50% since 1995, so other countries have become heavily dependent on China, and have strengthened their policies to secure important minerals (Figure I-3-2-33).

Figure I-3-2-33. Change in the production of rare earths in the world



Source: National Minerals Information Center of the U. S. Geological Survey (USGS).

Looking at the movements of individual countries in light of such situation, China is strengthening its control over the rare earth industry throughout supply chains. In the United States, during the Trump Administration, an executive order was issued against threats to American supply chains due to

dependence on the hostile foreign country's important minerals, and also in the Biden administration, the President signed a memorandum of understanding in March 2022 that instructs the Secretary of Defense to work to increase domestic production of important minerals such as lithium for use in large-capacity storage batteries, based on the Defense Production Act of 1950. The memorandum of understanding designates important minerals for large-capacity batteries as essential for national defense, and instructs the Secretary of Defense to support feasibility studies to increase the domestic production capacity of important minerals, and to prepare an annual report on the domestic production infrastructure of important minerals. The Biden administration is accelerating activities for important mineral security through the use of the Defense Production Act. In addition, the EU is planning to build recycling-oriented supply chains for important minerals with third countries such as Canada and Africa in addition to those in the region. In promoting decarbonization, the EU plans to promote the establishment of supply chains in the EU region and attract related companies in the region (Table I-3-2-34).

Table I-3-2-34. Trends in policies of individual countries on important minerals

| Country/Region | Major trends in industrial policy support |
|----------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| China | <ul style="list-style-type: none"> · Strengthening management of the domestic rare earth industry. Strengthening control over exports of specific items and distribution outside China. · Requiring, on December 1, 2020, to have a permission of the Chinese Government even outside China by the enforcement of the Export Control Law if re-exporting products containing regulated items made in China. |
| United States | <ul style="list-style-type: none"> · Issuing an executive order to deal with threats to domestic supply chains due to dependence on the hostile country's important minerals during the Trump Administration. The Biden administration has also attached importance to important mineral security. · On January 15, 2021, after the transition to the Biden administration, the Minerals Sustainability Division was established under the U. S. Department of Energy, aiming to build a supply chain of critical minerals. |
| EU | <ul style="list-style-type: none"> · On September 30, 2020, the European Commission released an action plan on important minerals. Based on the idea that "supply chains that are securely diversified, sustainable and socially responsible, cyclical and innovative need to be built for important minerals for the transition to a green and digital economy and the establishment of strategic autonomy in Europe," the following initiatives have been proposed: (A) Building resilient supply chains (within the EU) (B) Recycling of resources; sustainable products and innovation (C) Supply from within the European region (forming an industrial alliance in the important minerals field, and inviting companies in the region). (D) Diversification of resource procurement from third countries (such as Canada and Africa) |

Source: *2050 Mineral Resources Policy towards Achieving a Carbon Neutral Society* (Agency for Natural Resources and Energy).

On the other hand, resource nationalism is also on the rise in countries that possess important minerals. The movements such as the de facto ban on ore exports due to the amendment of the Mining Law in Indonesia and the exclusion of foreign companies in the lithium development in Mexico have been spreading to other resource-rich countries (Table I-3-2-35).

Table I-3-2-35. Upsurge of resource nationalism in countries that possess important minerals

| Country/Region | Major trends in industrial policy support |
|----------------|-------------------------------------------|
|----------------|-------------------------------------------|

| | |
|----------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Democratic Republic of the Congo | <ul style="list-style-type: none"> · In 2018, the amended Mining Law was passed and promulgated, including an increase in royalties for strategic mineral resources and other provisions (10% for cobalt). |
| Zambia | <ul style="list-style-type: none"> · Since 2012, a 10% export tax has been imposed on copper and cobalt as well as zinc and other ores. VAT refunds were abolished in 2012. · In 2016, the Cabinet approved a new royalty system based on copper prices. |
| Madagascar | <ul style="list-style-type: none"> · In 2019, the new president took office and said: "Existing large-scale mining laws have become favorable conditions for companies, so we should have a 30% stake or raise the royalties." |
| South Africa | <ul style="list-style-type: none"> · Released the amended Mining Charter, which includes 30% ownership of mining rights based on the Black Economic Empowerment (BEE) and requirements for local contents. · After the 2018 public comment, the Cabinet approved the bill to amend the Mining Law to include the high value-added (beneficiation) obligation and the obligation to transfer 26% of the capital to the BEE. |
| Philippines | <ul style="list-style-type: none"> · In 2017, the President issued an order to suspend the issuance of new mining licenses. · In 2018, the President issued an order to ban the development of new open-pit mines. · In 2018, the committee of the House of Representatives approved the bill to amend the Mining Act. High tariffs of 20% or more are imposed on ore exports. The contents are close to a substantial export embargo. It is still under discussion. |
| Indonesia | <ul style="list-style-type: none"> · Amended the Mining Law in 2009. Mandatory transfer of 51% of capital to Indonesian companies. · Due to the 2014 obligation to add values, export of ores and other materials is de facto banned. |
| Mexico | <ul style="list-style-type: none"> · Identified lithium as an important mineral resource for the national energy transition, and strengthened the stance of excluding foreign companies in the development of lithium. There seem to be movements toward constitutional amendment along with nationalization of electric power in order to monopolize the development. |
| Chile | <ul style="list-style-type: none"> · The Environmental Commission approved the nationalization of private mining companies, and the nationalization is currently awaiting deliberation at the plenary session of the constitutional assembly. In addition, the senate committee approved amendments to the new mining royalty bill (adopting a hybrid system (limitation and progression, or establishment based of the taxation on and earnings for the annual sales)). · President Boric (elected in March 2022) announced, through his presidential election, his intent to establish a national lithium company that can add values to production in order to develop an industry pertaining to lithium that is a national strategic resource. |

Source: *2050 Mineral Resources Policy towards Achieving a Carbon Neutral Society* (Agency for Natural Resources and Energy).

(2) Efforts to address human rights in corporate management

There is a further growing global interest in addressing human rights, which is a shared value in corporate management. As awareness of human rights accelerates internationally, there is a possibility that if commitments and efforts to respect human rights in a supply chain are deemed insufficient, there is a possibility to face many risks, such as boycotts, disinvestments, and suspension of transactions with existing customers. For companies, it is necessary to take appropriate measures to address human rights issues, including those caused by third parties in the supply chain, from the perspective of eliminating such potential management risks and increasing the added value of companies.

Originally, regarding the relationship between business and human rights, the UN Human Rights Council unanimously endorsed the Guiding Principles on Business and Human Rights in 2011. The Guiding Principles categorize the relationships between business and human rights into three pillars: (A) national obligation to protect human rights, (B) corporate responsibility to respect human rights, and (C) access to remedies, and emphasize the importance of mechanisms for victims to access effective remedies. The Principles serve as a basic international document on how the respect for human rights should be in corporate activities.

In Europe and the United States, efforts to link "human rights protection" with "external economic policies" are accelerating.

The Biden administration of the United States, which emphasizes human rights in its foreign policy, has been working with Europe to implement measures, including sanctions for its involvement in human rights violations in the Xinjiang Uyghur Autonomous Region. In July 2021, the Administration announced that the U.S. government agencies issued the Xinjiang Supply Chain Business Advisory, which urges the industrial world to make sure that any business entities involved in human rights violations are not included in supply chains. In December of the same year, the "Uyghur Forced Labor Prevention Act" was enacted to prohibit imports of all or part of products produced in the Xinjiang Uyghur Autonomous Region of China or produced by business entities listed by the U.S. government to the United States, assuming that they are all produced by forced labor. In order to avoid the import ban, importers must prove that all or part of the imported products are not relied on forced labor and so on. Detailed rules and guidelines for the enforcement of laws ("enforcement strategy") are scheduled to be established and enforced in June 2022.

In Europe, the EU released the "Guidance on Due Diligence for EU Businesses to Address the Risk of Forced Labour in Their Operations and Supply Chains" in July 2021. In February 2022, the European Commission has released a proposal for a Directive on corporate sustainability due diligence that renders due diligence (DD) with regard to human rights and environmental compulsory for certain-scale companies. In addition, a document published in conjunction with the proposal for a Directive on corporate sustainability due diligence states that preparations will be advanced for legislative procedures for prohibiting the market launch of forced labor-related products (Figure I-3-2-36).

Figure I-3-2-36. Outline of the proposal for a Directive on EU corporate sustainability due diligence

| | EU companies | Third country companies |
|---------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Group 1 | <ul style="list-style-type: none"> · With more than 500 employees, and · With an annual net sales exceeding 150 million euros | <ul style="list-style-type: none"> · With an annual net sales exceeding 150 million euros in the EU market |
| Group 2 | <ul style="list-style-type: none"> · With over 250 employees · With an annual net sales exceeding 40 million euros, and · With 50% or more net sales in sensitive sectors (Note 1) | <ul style="list-style-type: none"> · With an annual net sales exceeding 40 million euros in the EU market, and · With 50% or more net sales in sensitive sectors |

Note 1: The "sensitive sectors" refer to the textiles, leather, agriculture, forestry, fisheries, and mining-related sectors.

Note 2: The application of corporate obligations to Group 2 is to be commenced two years after the commencement of application to Group 1.

<Obligatory due diligence required to target companies>

- | |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <ul style="list-style-type: none"> (A) Integration of due diligence into corporate policies (B) Identification of real or potential adverse effects on human rights and the environment (C) Termination or minimization of real adverse effects (D) Establishment and maintenance of complaint receiving procedures (E) Monitoring of the effectiveness of the due diligence policy and its measures (F) Publication of due diligence |
|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

<Response to violations>

- Provide administrative penalties to the EU member states for violations under their national laws, and seek to secure civil liability for companies that violate their obligations and cause damage.

Source: Materials published by the European Commission.

Under these circumstances, Japanese companies are increasingly required to respect human rights in their corporate management and supply chains. In fact, there have been cases where global companies have been criticized by NGOs and other organizations by name, and even in Japanese industry, mainly large companies, are accelerating their efforts in response to recent trends in various countries.

Against this backdrop of international trends, the Japanese government formulated the National Action Plan (NAP) on Business and Human Rights in October 2020. The Action Plan states that Japanese companies are expected to introduce the process of human rights due diligence.

In addition, the Ministry of Economy, Trade and Industry, together with the Ministry of Foreign Affairs, conducted a survey on the status of efforts on business and human rights of Japanese companies ("Questionnaire Survey on the Status of Efforts on Human Rights in the Supply Chains of Japanese Companies"¹⁸⁹) from September to October 2021 as part of the follow-up to the Action Plan as the government for the first time.

According to the survey results, about 70% of the respondents have formulated a human rights policy, and only about 50% of them have implemented human rights due diligence. In addition, the respondents' challenges mostly seen in practicing management that respects human rights are: "Methods for assessing the status of human rights compliance in the supply chain have not been established," and "The supply chain structure is complex and it is difficult to identify the scope of human rights," "It is impossible to secure sufficient personnel and budget."

On the other hand, as a result of practicing management that respects human rights, the achievements and effects mostly obtained in the responses include "reduction of human rights risks within the company," "contribution to the SDGs," "reduction of human rights risks in the supply chain," and "improvement of evaluations received from an ESG evaluation organization."

As the scope of supply chains is expanding and deepening, Japanese companies are also required to conduct corporate management with due consideration to human rights issues.

Based on the results of the survey and other materials, the Ministry of Economy, Trade and Industry has established the Study Group on Guidelines on Respecting Human Rights in Responsible Supply Chains to work on formulating cross-industry guidelines. Together with the development of domestic guidelines to be formulated by summer 2022, the government is planning to work to achieve an environment in which companies can actively engage in respect for human rights under fair conditions of competition, and an environment in which individual countries' measures are more predictable.

¹⁸⁹ <https://www.meti.go.jp/press/2021/11/20211130001/20211130001.html>

4. Strengthening the role of government and shifting industrial policy

Due to increasing geopolitical risks and uncertainty, as well as innovations in cutting-edge technologies such as green technology, the role of proactive industrial policies to strengthen domestic industrial competitiveness is being reexamined mainly in the U.S, Europe and China. With Japan's government creating demand mainly in green industries, the defense and space industry, and the semiconductor industry, based on economic trends and involved government policies, the importance of creating corporate strategies is increasing given the markets brought by government procurement and investment.

(1) Increasing importance of industrial policy

With regard to industrial policy, Japan has had various industrial policies during the post-war reconstruction period, the period of high economic growth, the period of post-bubble adjustments, the stable growth period, and other periods. Since the 1960s, other countries like the emerging countries of Singapore, the Republic of Korea, Taiwan and other Newly Industrializing Countries (NIEs), as well as China and major ASEAN countries have implemented industrial policies for export-driven industrialization, and have changed their industrial policies according to the subsequent stages of growth. In China, the state has played a major role during the Chinese economic reform. The transition from labor-intensive industrialization to capital-intensive industrialization accelerated productivity growth and laid a solid foundation for achieving policy goals¹⁹⁰. The Republic of Korea, Singapore, Hong Kong and Taiwan, referred to as the Four Asian Tigers, have implemented technology and innovation policies for several decades and have achieved high growth in contrast to countries that have failed to break out of the middle-income trap. These countries have also tried creating long-term, high-risk plans for developing industries such as the automotive and electronics industries, and have made their own technologies in these fields. Even in developed countries, the U.S implemented industrial policies focused on the defense and space industry up until the trend toward market-oriented policies increased in the 1980s. While certain technological breakthroughs are attributed to the spread of technologies by the private sector, such as Silicon Valley, active government policy support, such as funding, also plays a major role. In Europe, there were movements to develop industrial policies through cooperation among governments before the 1980s. The Airbus program began in 1965 when the governments of France and Germany initiated discussions about forming a consortium, followed by the participation of Spain and the United Kingdom, the countries have promoted joint industrial policies and strengthened their industrial competitiveness in the EU. On the other hand, since the 1980s, developed countries, such as the U.S. and Europe, have continued to minimize the role of government and have refrained from putting industrial policy at the forefront.

Presently, however, there have been movements to proactively promote industrial policy due to increasing geopolitical risks from the conflict between the U.S. and China, weakness in the supply

¹⁹⁰ Lo, D. and M. Wu (2014), *The State and Industrial Policy in Chinese Economic Development*

chain of critical goods such as semiconductors and rare metals, and developing efforts in countries to achieve carbon neutrality, etc.

For companies, aggressive industrial policies, mainly in the United States, Europe, and China, are becoming stronger and with governments creating demand mainly in green industries, the defense and space industry, and the semiconductor industry, based on economic trends and involved government policies, the importance of creating corporate strategies is increasing given the markets brought by government procurement and investment.

Although the effectiveness of industrial policy has been discussed among economists and policymakers, since the latter half of the 2010s, there have been academic discussions on new industrial policy and industrial policy in the 21st century. Positive industrial policies toward green technologies, for example, can also be justified from an economic point of view with (A) decarbonization being a global public good that leads to underinvestment despite it generating greater social returns than investors' private returns, and, with the support of industrial policy, (B) the development of technology, which is path dependent, being able to bring an end to old production technologies that cause pollution by impacting innovation in the green sector, etc.¹⁹¹ The growing debate on industrial policy can also be seen in the greatly increasing number of English-language publications and academic papers on economics that include "Industrial Policy" in their titles and summaries, increasing from 48 (2000) to 287 (2020)¹⁹². Professor Dani Rodrick at Harvard University, for example, argued that, "As an agenda for the 21st century, we need to revive and revitalize industrial policy. Social goals such as market creation, sustainability and responsible globalization are of paramount importance to industrial policy, and we must move past correcting market failures. Industrial policy is a process of exploration in the unknown." Professor Daron Acemoglu at MIT argued that, "The government can provide decisive support by funding education and research through industrial policy and by becoming a major purchaser of high-tech equipment." Others like Professor Mariana Mazzucato at the University College London mentioned in *The Government as an Entrepreneur* (2014) and *Mission Economy* (2021) that, "The government must carry the risk that the private sector cannot and innovative. When creating innovation systems, the role of the government is fundamentally important. Instead of just "correcting market failures," the government should "create markets" by having a grand mission and mobilizing a wide range of resources." In addition, international organizations such as the IMF, the United Nations Conference on Trade and Development (UNCTAD) and the International Labor Organization (ILO) have moved away from the so-called "Washington Consensus"¹⁹³ and have recently proposed industrial policies as economic development strategies (Table I-3-2-37).

¹⁹¹ Terzi A. A. Singh and M. Sherwood (2022), *Industrial Policy for the 21st Century: Lessons from the Past*

¹⁹² *Dimensions* (Digital Science & Research Solutions Ltd.). Searched by entering "Economics" as the type of journal, "Title and Abstract" as the scope, and "Industrial Policy" as the keyword.

¹⁹³ A set of broadly free market, "neoclassical" economic ideas for developing countries and supported by the IMF, the World Bank, and others. It shares ways to manage economic policy based on market fundamentalism, small government, sound finance, deregulation and trade and investment liberalization to the world.

Table I-3-2-37. Recommendations for promoting industrial policy from international organizations^{194 195 196}

| | |
|-------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| International Monetary Fund | <p>(IMF Working Paper) "The Return of the Policy That Shall Not Be Named: Principles of Industrial Policy"</p> <ul style="list-style-type: none"> · The Four Asian Tigers (Hong Kong, the Republic Korea, Singapore and Taiwan) have seen remarkable economic development after implementing industrial policies centered on technology and innovation. · The Four Asian Tigers are advancing toward the frontier, trying to create long-term, high-risk plans for developing industries such as the automotive and electronics industries, and have made their own technologies. · Development strategies should be formulated with reference to these government-led industrial policies. <p>*The London School of Economics held a symposium based on this IMF working paper in November 2019.</p> |
| United Nations Conference on Trade and Development (UNCTAD) | <p>(UNCTAD publication) "World Investment Report 2018: Investment and New Industrial Policies"</p> <ul style="list-style-type: none"> · At least 101 countries (more than 90% of the world's GDP) have adopted formal industrial development strategies. · Modern industrial policy addresses diverse objectives (integration into and upgrading GVC, knowledge economy, SDGs, new industrial revolution) and it is different from traditional industrial policy in that it promotes investment. |
| International Labour Organization | <p>(ILO publication) "Transforming Economies: Making industrial policy work for growth, jobs and development"</p> <ul style="list-style-type: none"> · Positive industrial policies that provide incentives are necessary for promoting technological innovation and building up production capacity. · Industrial policies need to be designed to not only create more jobs but also to create more productive and better jobs. · The role of industrial policy is to strengthen learning and capabilities and to succeed in catching up to developing countries. |

Source: IMF, UNCTAD, ILO.

Also, in light of the changes in the world situation before and after the Ukraine crisis, experts have expressed views with regard to future industrial policy such as "it is imperative to start bold and coordinated actions toward global market stability, and that it is necessary to eliminate supply bottlenecks and large-scale government funding for renewable energy," and that "economic resilience is also necessary for external strategies to strengthen long-term security" (Table I-3-2-38).

Table I-3-2-38. Expert views on future industrial policies issued before and after the Ukraine crisis

| | |
|-------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Adam Posen President of the Peterson Institute for International Economics | <ul style="list-style-type: none"> · All Western allies should also implement ongoing, multi-year public investment to alleviate national imbalances and increase overall return on investment. · Common examination standards for cross-border private investment from the perspective of national security and human rights are necessary, and a level playing field should be created among allies in order to promote sound competition and reduce the side effects of economic nationalism such as corruption. |
| Nicholas Mulder Assistant Professor at | <ul style="list-style-type: none"> · Sanction have affected the entire global economy as a whole, especially southern countries and addressing this issue is a major |

¹⁹⁴ Cherif R. and F. Hasanov, *The Return of the Policy That Shall Not Be Named: Principles of Industrial Policy*, WP/19/74, 26 March 2019.

¹⁹⁵ *World Investment Report 2018: Investment and New Industrial Policy* (UNCTAD, June 2018).

¹⁹⁶ *Transforming Economies: Making Industrial Policy Work for Growth, Jobs, and Development* (ILO, May 2014).

| | |
|-----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Cornell University | <p>macroeconomic challenge.</p> <ul style="list-style-type: none"> · It is imperative that the G7, the EU, and our partners in Asia begin bold and coordinated actions to stabilize global markets, focusing on targeted investment to address supply bottlenecks. It will require food and energy-related financial assistance to developing countries, as well as large-scale government funding for renewable energy. · To protect the poorest people from the impact of increasing food, energy and commodity prices, grants, rationing and even price control might become necessary. |
| Otaviano Canuto Former Vice President and Executive Director at the World Bank | <ul style="list-style-type: none"> · If domestic fundamentals, such as Macroeconomic stability, certainty of and simplification of regulations, physical infrastructure, education and skills, productivity and innovation, promoting and facilitating export, etc., do not improve, investors interest in industrial policy will be low and short-lived. |
| Michael Spence Professor at Stanford Graduate School of Business | <ul style="list-style-type: none"> · It is clear now that economic security relies on a broad range of relationships with reliable and predictable trade partners. · In order to strengthen long-term security, economic resilience must also be incorporated into external strategies, which can be achieved through diversification. If Europe had diversified its energy sources like Japan, Europe would have had the capacity to impose asymmetric costs on Russia through energy-related sanctions. · In the event of a crisis, the level of diversification required to promote a country's economic security and enhance its negotiating power is unlikely to appear as a pure market outcome. |

Source: Various materials.

(2) Industrial policy in the United States (Strengthening supply chains)

Next, we will look at trends in industrial policy in each country. In the United States, National Security Advisor Jake Sullivan of the Biden administration advocated in his study published in 2020 about changing the "neoliberalism" of the past 40 years and developing a large-scale industrial policy. "Industrial policy, once considered shameful, should now be taken for granted," Sullivan said and continued, "If Washington continues to rely on private companies' R&D for short-term profits rather than long-term and transformative breakthroughs, U.S. companies will continue to lose their competition with Chinese companies." If you look at the industrial history of the United States, industrial policy is being implemented in the early stages of innovation. At the DARPA (Defense Advanced Research Projects Agency), technologies such as the Internet, GPS, and automatic speech recognition were initially developed for military purposes. The use of federal money led to the establishment of private companies, mainly in Silicon Valley, leading to breakthroughs and commercialization.

Although the United States has been distanced from industrial policy since the 1980s, it is currently facing geopolitical risks such as the US-China conflict and challenges such as supply chain maintenance. In order to address these issues, it has been implementing industrial policy to secure a stable supply of important security-related goods and to strengthen domestic industrial competitiveness. For example, regarding semiconductors, it will promote investment in domestic production capacity enhancement and R&D, etc., and support the establishment of resilient, diverse, and safe supply chains in cooperation with reliable partners (Table I-3-2-39).

Table I-3-2-39. Industrial policy for strengthening the resilience of America's supply chains

| Executive Order Strengthening Buy American Provisions (January 2021) |
|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|
| ◆ Establishment of a supervisory department and tightening of exceptional measures for strengthening the procurement of U.S. products in government procurement |

| | |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--|
| Executive Order on America's Supply Chains (February 2021) | |
| ◆ Reporting from the relevant departments and agencies to the President on supply chain vulnerability risks and policy recommendations for (A) four sectors, i.e., semiconductors, storage batteries, important minerals, and pharmaceuticals, and (B) six sectors, i.e., defense, information and communications, energy, and transportation, etc. The report on (A) was published on June 8, 2021, and the report on (B) was published on February 24, 2022. | |
| Semiconductor CHIPS Act | |
| ◆ Promotion of support for the installation of factories and equipment, cooperation, research, and development, etc. through multilateral funds for semiconductors in the United States | |

Source: Materials published by the U.S. government.

In addition, in accordance with the "Executive Order on America's Supply Chains" in February 2021, the White House published a report, "BUILDING RESILIENT SUPPLY CHAINS, REVITALIZING AMERICAN MANUFACTURING, AND FOSTERING BROAD-BASED GROWTH" with its fact sheet, and presented specific measures to strengthen America's supply chain resilience. The report states that as long-term strategies for strengthening America's supply chain resilience, contributions to semiconductor production, research and development, financial support to promote EV purchases, and support and investment in storage battery production, strengthened stockpiling of important minerals and goods, and the formulation of a comprehensive trade strategy to support fair and resilient supply chains (Table I-3-2-40).

Table I-3-2-40. Report on the U.S.' Supply Chains¹⁹⁷ (June 2021)

| |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Near term responses |
| (1) Supporting domestic production of key pharmaceuticals (2) Securing the domestic supply chain for advanced storage batteries (3) Investing in the sustainable production and processing of critical minerals in the U.S. and overseas (4) Cooperating with industry, allies and partners to address the semiconductor shortage |
| Efforts to build an industrial base |
| (1) Innovation and support for American workers (2) Investing in sustainable supply chains in the U.S. and overseas (3) Responding to unfair trade practices |
| Responding to near term supply chain disruptions as the economy reopens |
| (1) Establishing a Supply Chain Disruptions Task Force to focus on mismatches between supply and demand noted in homebuilding and construction, semiconductors, transportation, and agriculture and food |
| Long-term strategy to enhance U.S. supply chain resilience |

¹⁹⁷ BUILDING RESILIENT SUPPLY CHAINS, REVITALIZING AMERICAN MANUFACTURING, AND FOSTERING BROAD-BASED GROWTH, June 2021
<https://www.whitehouse.gov/wp-content/uploads/2021/06/100-day-supply-chain-review-report.pdf>

- (1) Rebuilding the U.S.' production and innovation capabilities
 - Contributing to semiconductor production and R&D
 - Financial support and incentives to promote the purchase of electrical vehicles
 - Financial support for advanced storage battery production and investment in next-generation storage batteries
 - Deploying the Defense Production Act (DPA) to expand production capacity in critical industries
 - Investing in the development of new pharmaceutical manufacturing and processes
 - Cooperating with industry and labor unions to create high-quality jobs in the semiconductor industry
 - Support small, medium and disadvantaged businesses in critical supply chains
- (2) Supporting the development of markets
 - Creating standards for the extraction and processing of critical minerals
 - Identifying potential U.S. production and processing locations for critical minerals
 - Improving transparency throughout the pharmaceuticals supply chain
- (3) Government purchases and investments
 - Strengthening U.S. goods and critical mineral stockpiles
 - Ensuring that new automotive battery production in the United States adheres to high labor standards
- (4) Strengthening international trade rules
 - Establishing a comprehensive trade strategy to support fair and resilient supply chains
 - Incorporating supply chain resilience into the U.S. trade policy approach towards China
- (5) Working with allies and partners to decrease vulnerabilities in the global supply chains

Source: Information published by the U.S. government.

Furthermore, historic industrial base reports were released in February 2012 by seven cabinet agencies; The Department of Defense, the Department of Homeland Security, the Department of Commerce, the Department of Energy, the Department of Agriculture, the Department of Transportation, and the Department of Health and Human Services in February 2022, one year after President Biden signed the executive order. The White House has also issued a report on the actions and achievements over the past year with regard to the "The Biden-Harris Plan to Revitalize American Manufacturing and Secure Critical Supply Chains in 2022 which focuses on investment according to the Bipartisan Infrastructure Law (enacted in November 2021, totaling approximately \$1 trillion over eight years).

(3) Industrial policy in Europe

In emerging technologies such as ICT, semiconductors and electric vehicle batteries, Europe lags behind the United States and China, and is unable to take a significant position in the supply chain. In addition, while being aware that it is facing severe competition with the lacking number of unicorns in Europe as well, etc., major EU countries such as Germany and France are leading the way in promoting industrial policy through cooperation among EU member states.

While Europe seeks to achieve economic recovery and growth based on the green and digital transition, it faces intensifying economic and technological competition with the U.S. and China. Amid heightened geopolitical tensions, Europe aims to reduce dependence on China and other countries outside the region by aiming to secure its autonomy in strategic areas (raw materials, batteries, pharmaceutical raw materials, hydrogen, semiconductors, and cloud edge technologies), and calls for efforts to realize shared values such as green solutions and human rights including for those outside the region. As a tool for achieving such strategic autonomy and shared values, the EU is working together on industrial policy.

In the face of increasing geopolitical tensions, it is important for Europe to make a green and digital transition to ensure economic and technological autonomy, and a necessary tool to do so is industrial policy. Focusing on the transition to green and digital, Europe aims to achieve economic recovery and

growth, emphasizing "strategic autonomy" in strategic areas with the aim of reducing dependence on China and other countries outside the region. It also calls for efforts outside the region to realize "shared values" such as green solutions and human rights.

In May 2021, the European Commission published its update of the "Updating the 2020 New Industrial Strategy, "adding learning lessons from the COVID-19 crisis in the new industrial strategy against the backdrop of the environmental changes caused by COVID-19 (Table I-3-2-41). Focusing primarily on the impact and lessons learned from the COVID-19 crisis and the analysis of strategic dependencies, it emphasizes the importance of (A) strengthening single market reliance, (B) dealing with dependencies in strategic areas, and (C) accelerating the green and digital transition. Learning from the disruptions in the international value chain caused by the COVID-19-crisis and other factors, the update states that it is necessary to respond to strategic concern of EU's dependence on countries outside it.

Table I-3-2-41. EU's efforts toward supply chain resilience and autonomy

| "Updating the 2020 New Industrial Strategy" (May 2021) |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 1. Strengthening single market reliance <ul style="list-style-type: none"> ◆ <u>Ensuring the availability and free movement of persons, goods and services</u>, including standard setting and sharing, and fast-track conformity assessment among member states. 2. Dealing with dependencies on specific countries in strategic areas <ul style="list-style-type: none"> ◆ Autonomy in six strategic areas (Raw materials, batteries, active pharmaceutical ingredients, hydrogen, semiconductors, and cloud edge technology). ◆ Support for industrial alliances in, other than for existing industries in the strategic areas of (1) raw materials, (2) batteries, and (3) hydrogen, new strategic areas such as (4) processors and semiconductors, (5) industrial data, edge and cloud, (6) space rockets and (7) zero-emission aviation. ◆ Flexibility in qualifying important projects exempted from the EU subsidies (next-generation cloud, hydrogen, low-carbon industries, pharmaceuticals, state-of-the-art semiconductors). ◆ Supporting industries by formulating standardized strategies and utilizing government procurement. 3. Accelerating the green and digital transition <ul style="list-style-type: none"> ◆ Reviewing competition rules to make sure that they are fit to support the green and digital transition ◆ Realization of a Carbon Border Adjustment Mechanism for selected sectors, fully compliant with WTO rules ◆ Considering proposing a European approach to carbon contracts for difference, using ETS revenues |
| Chokepoint analysis |
| <ul style="list-style-type: none"> ◆ Identifies 137 products (representing 6% of the EU's total import value of goods) in sensitive ecosystems for which the EU is highly dependent. ◆ Mostly products relevant to supporting the green and digital transition such as in energy and health ecosystems. China accounts for about half of the imports, followed by Vietnam and Brazil. ◆ However, 34 products (energy-related raw materials, chemicals, active pharmaceutical ingredients, etc.) are potentially more vulnerable because of they are difficult to substitute. |

Source: Materials published by the European Commission.

The EU launched industrial alliances such as the European Battery Alliance (EBA), the European Clean Hydrogen Alliance, and the European Raw Materials Alliance (ERMA) to provide comprehensive support to key industries and to increase the regional procurement ratio of batteries, hydrogen and important raw materials (Table I-3-2-42). In July 2021, the European Commission announced the European Alliance on Processors and Semiconductor technologies and the European Alliance for Industrial Data, Edge and Cloud with the aim of advancing the next generation of

microchips and industrial cloud/edge computing technologies, as well as enhancing digital infrastructure, products and services. With President von der Leyen mentioning the need to strengthen the production capacity of the semiconductors, which the EU overly depends on Asia for, in the 2021 State of the Union Address, the European Chips Act was presented with the aim of creating a state-of-the-art European chip ecosystem, including production that ensures the EU's security of supply and for developing new markets for ground-breaking European tech.

Table I-3-2-42. Industrial alliances in Europe

| | |
|-----------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| The European Battery Alliance (October 2017) | <ul style="list-style-type: none"> ◆ Launched by concerning industries and with the support of the European Commission and member states. ◆ Aims to reduce dependence on Asia and other countries and to create a competitive battery industry throughout the battery value chain. ◆ Exchange of regulatory information, provision of information on battery-related projects, provision of business development opportunities, and funding support. |
| The European Clean Hydrogen Alliance (July 2020) | <ul style="list-style-type: none"> ◆ Focusing on the strategic value chain and aims to create the hydrogen based Airbus. ◆ Creating industrial alliances by bringing academic and research institutes, suppliers, small and medium-sized enterprises, and large companies together. |
| The European Raw Materials Alliance (ERMA) (September 2020) | <ul style="list-style-type: none"> ◆ Although Asian companies are not participating, it seems that a wide range of supply chain-related companies can participate. ◆ Participated by more than 150 stakeholders with a common objective to ensure the supply of sustainable and advanced raw materials for the industrial ecosystem to build Europe's resilience and competitiveness. ◆ Firstly focuses on the value chain for rare earth and permanent magnets. Then plans to expand to support for other important strategic raw materials and base metal needs. |
| The Industrial Alliance on Processors and Semiconductor Technologies (July 2021) | <ul style="list-style-type: none"> ◆ Identifies and addresses bottlenecks, needs and dependencies across the industry. ◆ By having 20% of the global market share for semiconductor production by 2030, the EU defined a technological roadmap to ensure it has the ability to design and produce state-of-the-art microchips while reducing its strategic dependence on microchips. ◆ For the purpose of increasing semiconductor production, it aims to establish the necessary design and manufacturing capabilities for next-generation, reliable processors and electronic component manufacturing. |
| The European Alliance for Industrial Data, Edge and Cloud | <ul style="list-style-type: none"> ◆ The European Alliance for Industrial Data, Edge and Cloud promotes the trust among cloud users across all sectors by promoting the emergence of innovative cloud edge technologies that are secure, energy resource efficient and fully interoperable. The Alliance addresses the specific needs of EU citizens, businesses and the public sector (including military and security purposes) to process sensitive data, while increasing the competitiveness of EU industry in cloud edge technology. |

Source: Materials published by the European Commission.

(4) Industrial policy in China

China is also developing a state-led industrial policy and while the country's industrial structure was highly dependent on overseas markets for core technologies such as semiconductor manufacturing equipment, and advanced parts and materials, in May 2015, China announced its strategic plan "Made in China 2025," which aims to have domestic production covering 70% of 10 priority sectors, such as new generation information technology, energy-saving and new energy vehicles, by 2025. It has promoted the elimination of chokepoints in the supply chains through science and technology and by

strengthening supply chains as well as domestically producing core technologies (Table I-3-2-43, Table I-3-2-44, and Table I-3-2-45).

Table I-3-2-43. The ten priority sectors of "Made in China 2025"

| |
|------------------------------------------------------------------------------------------------------------------|
| · New generation information technology (semiconductors, "5G," a new 5th generation telecommunications standard) |
| · Advanced numerical control machine tools and robotics |
| · Aerospace technology, including aircraft engines and airborne equipment |
| · Ocean engineering and high-tech ships |
| · Advanced railway equipment |
| · Energy-saving and new energy vehicles |
| · Electrical equipment (large-scale hydroelectric and nuclear power generation) |
| · Farming machines |
| · New materials (superconducting materials, nanomaterials) |
| · Biopharmaceuticals and high-performance medical equipment |

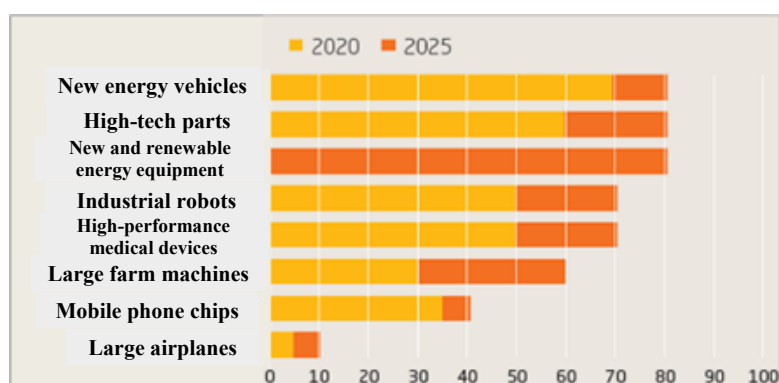
Source: Information published by the State Council of the People's Republic of China.

Table I-3-2-44. Non-binding targets set in three phases for "Made in China 2025"

| |
|----------------------------------------------------------------------------------------------|
| Phase I (2025): China shall become one of the world's strongest manufacturers |
| ↓ |
| Phase II (2035): China shall raise to the intermediate level among the world's manufacturers |
| ↓ |
| Phase III (2049): China shall become the world's leading manufacturer |

Source: Information published by the State Council of the People's Republic of China

Figure I-3-2-45. Domestic procurement targets for major technologies



Source: Report by the European Union Chamber of Commerce in China.

China has set priority sectors for developing industries through emerging technologies and has, among other things, provided tax incentives to domestic and foreign investment companies that have R&D functions in these fields in China, actively supporting the development of Chinese technologies.

In 2014 and 2019, the National Integrated Circuit Industry Investment Fund totaled approximately 5 trillion yen. In addition, local governments also have funds for the semiconductor industry totaling more than 5 trillion yen, and a total of more than 10 trillion yen seems to be invested in semiconductor-related technologies.

As we saw in Part I, Chapter 2, Section 4, looking at the trend of government subsidies in China, they are given to not only state-owned enterprises, but also widely given to state-owned enterprises. In fact, since the mid-2010s, the total amount of subsidies for private enterprises has exceeded that of state-owned enterprises under the jurisdiction of the central and local governments. This shows that flexible support is being provided to a wide range of companies, including private companies for enhancing industries. Next, as for target industries, since the announcement of "Made In China 2025" in 2015, the share of subsidies for related sectors has increased, and the subsidies for the same sectors have increased. Among the 10 priority sectors, the total amount of subsidies for private enterprises has exceeded that of state-owned enterprises significantly, and private companies have led the way in new sectors close to consumer markets. Looking at the differences in financial conditions, etc. and the ratio of subsidies to sales between the upper and lower groups of subsidies suggests the possibility that subsidies are effectively given to compensate for deficits and for promoting R&D and capital investment, however a conclusion cannot be made due to there being considerable factors such as the characteristics of the industry.