# The transactions for carbon pricing in Japan

Abstract

Although the climate change problem is a planet wide problem, we don't have the right type institution. Therefore, we have much difficulty to find a solution for the problem through political process, such as the negotiations among governments or the initiatives of international organizations. In Japan, there is further difficulty on the governments, where the chargeable organizations are not good integrated. First, the central government has two control towers, which are the Ministry of Environment and the Ministry of Economy, Trade, and Industry. Besides, from the perspectives of individual local governments, which have responsibilities to implement the environment administration, they don't have enough physical and personal resources and abilities.

In contrast, we can obtain the most efficient solution when we rely on the price mechanism by carbon pricing. However, we need arrangement of institutional frameworks by governments following the Law and Economics theorem to find the market-based solution. As for carbon pricing, the ideas of carbon tax or emission trade system were proposed as the framework.

We found fundamental challenge there, namely, the legal and accounting formalization of the transaction. In the case of emission trade system, we have additional challenges, such as the pattern of intermediary service for the transactions and how to keep the integrity of the market. EU-ETS has cleared the challenges with the core concept of 'the regulatory auction'. In addition, we can see the movement of the private initiatives to establish voluntary carbon markets, such as Task Force for Scaling Voluntary Carbon Market or London Stock Exchange, which also want to clear the challenges. In Japan, the situation is worse. It has a structural problem that liquidities are generally quite short, as we can see the poor metabolism of the enterprises and employments. Besides, people want to have the formal incorporation in legal and accounting institutes for de novo assets such as carbon credits. Under these circumstances, Japan has had mal tradition to depend too much on governments in establishing a new way of business.

There are other challenges for the market regulation. Generally, it is a premise for the price discovery function of a market that incentives of various participants, such as issuers, investors, intermediary firms, gate keepers and so on, are coordinated in an order. The global standard in overseas markets basically leave the coordination of incentives on economic rationalities of market participants, and would take an exceptional measure only after the real harmful effects had occurred. It should be in similar fashion for carbon pricing. However, in Japan, there is a strong opinion that the competent authority must prepare regulation to prevent the expected harm effects. The related authorities fear very much to be criticized. Therefore, the compartmentalized regulations become a hazard for the transaction of de novo assets like carbon credits. In addition, carbon pricing in Japan cannot escape from the critics such as 'The transactions of carbon credits are just money game.', 'The carbon offset statements based on the carbon credits purchased with money are just escapes from the obligation of public institutions of society.'

As the Japan's central government must demonstrate the leadership to achieve its own NDC, particularly antidoting the risks for private enterprises, it implemented the carbon market experiment, based on the supplementary budget for fiscal year 2022. However, this experiment did not achieve enough results to establish the marketplace for carbon pricing. The basic reason for the poor performances is the framework as a governmental budget project itself. Meanwhile, Tokyo Metropolitan Government and Saitama Prefecture are implementing their own carbon market experiments, but the transaction volumes do not have been enough to discover the fair carbon prices.

In the next stage, at the very beginning, we must improve the market structure reflecting the poor performances of the experiment in 2023, but it might be difficult for the governmental budget project. Therefore, private initiatives have keys to get successful carbon pricing in Japan. In the second place, we might utilize DLT (Distributed Ledger Technology). Utilization of security tokens for carbon credits bring us many economic advantages, and it might give us a breakthrough to reform the current rigid regulation system.

## 1 The character of climate change problem and the role of international public sectors

### (1) The character of climate change problem and the role of individual government

#### ① Roles of governments in the climate change problem

The climate change problem is the largest challenge for the current mankind. Although this is a planet wide problem, we mankind don't have the right type institution. We must find a solution for the problem through the international political process.

In this process, NDC (Nationally Determined Commitment) under the framework of joint communiqué such as Paris Agreement has been the clue. Japanese government has also made its own NDC, which is 'carbon neutral by 2050'. However, we must find common rules to solve the climate change problem via negotiations among individual governments, such as COP27 (United Nations Framework Convention on Climate Change). Things there does not have gone well, as we can see every year.

#### ② Difficulty in the negotiations among governments

It is not easy for the negotiations among governments to adjust the differences in recognitions and measures regarding the global climate change problem.

First, there are obdurate opinions to deny the causal relationship of the GHG (Greenhouse effect Gas) emission such as CO2 (Carbon Dioxide) by mankind with the planet wide climate change problem. Although it is a scientific theme if the GHG emission by mankind brings the problem, the industries which are currently emitting much GHG might not substantially change their negative viewpoints.

Second, there is no concrete consensus who must bear the burden to reduce GHG emissions. There are various opinions among individual countries including the one to claim that industrial countries must reduce their emissions to a larger extent, while developing countries which want to raise their people's life standards can commit the milder targets. Besides, in domestic opinions within an individual country, there is an assertion that rich people who already emitted much GHG must reduce their emissions with severity, while poor people would be damaged harder by the climate change problem. Regarding these differences of opinions, some insisted that solution must be based on the social fairness. However, it is quite difficult to find the objective and decisive answer to this kind of value judgement questions. [1]

Moreover, there is no standard concerning how to reduce the CO2 emission. For example, forestry offset project types are preferred because they contribute to both of CO2 reductions and development aids. We have another example of building nuclear power plants. They are encouraged by industry people because they do not emit CO2 and relatively less expensive if we do not count the future social cost to decommit the reactors. However, both methodologies are criticized by many people including the academia from various reasons, such as ineffectiveness of CO2 absorption, higher risk and so forth. There is also a country such as Germany denied the use of nuclear energy at all. It is not easy to adjust the difference regarding the methodologies to reduce CO2 emission.

In addition, individual government has a dilemma concerning carbon leakage. This is a problem caused by the competitive disadvantage of the industry whose products are under heavier regulations on emission reduction than foreign potential competitors. The individual government wants to set its own measure to offset the problem. For example, European Union, which has a large market with many member countries, has established the rule to distinguish the green projects from brown ones, at the same time, has published the attitude to employ the CBAM (Carbon Border Adjustment Measure). [2]On the other hand, Japanese government, for example, committed its own NDC but has shown passive and ad hoc responses to the global carbon leakage problem.

Moreover, even if the negotiations went well, it would not be clear if the agreement would improve the welfare level of mankind.

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[1] See [1]

[2] See [25]

③ Initiatives of international organizations

Under these circumstances, an international organization sometime takes an initiative to accelerate the coordination between an industry country and a developing country. CDM（Clean Development Mechanism）is an example where an emission reduction project was made through a cooperation between an industry country and a developing country can be permitted to issue a carbon credit. This scheme is based on the article 6 of the Paris Agreement. It can be recognized as an offset within their own NDCs, and allowed to be transacted among the related entities. However, they are not popular because of bureaucratic works of the international organization. For example, it takes around 2 years before the permission to issue a carbon credit. Although it is an understandable examination process to avoid slanders as green washing, it is criticized by industry people for lacking necessary flexibly as a private economic activity.

(2) Situation in Japan

① Central government

In Japan, there are further difficulty on the governments, where the chargeable organizations are not good integrated.

First, the central government has two control towers, which are the Ministry of Environment and the Ministry of Economy, Trade, and Industry. They have had quite different stances to the climate change problem. The Ministry of Environment has had the responsibility for the negotiations with other countries, and has been the competent authority for local governments to implement the environmental administration practically. On the other hand, the Ministry of Economy, Trade, and Industry has responsibility for overall industry policy of Japan, and in charge of an individual industry supervision just like the Ministry of Agriculture and Fishing, the Ministry of Land and Transport and so on. The ministries have many traditional wisdoms. For example, as for a public certificate organization for carbon credits, the management of organization is decided following the negotiation between the Ministry of Environment and the Ministry of Economy, Trade, and Industry, but the individual certification of a carbon credit should be approved by the competent ministry for the industry. This is a well-organized system in the government but quite sticky. Agile improvements of the certification system of carbon credits are very difficult in Japan.

The cabinet, partly aiming to remove the harmful effects of compartmentalized administration, established ‘GX (Green Transformation) Implementation Conference’ chaired by the Prime Minister supported by the Minister for Economy, Trade, and Industry and the Chief Secretary of Cabinet Office. However, the headquarter for this conference is not a permanently installed organization to integrate the whole central government, but just a secretariate for temporal conferences to examine the necessary measures to implement GX. Accordingly, ‘The fundamental attitude for the promotion of GX’ place the concept of ‘Economic growth-oriented carbon pricing’ as the mean to raise huge money necessary for the emission reduction investments under the cooperation of public and private sectors, and encourages the usage of nuclear power. Following the concept of ‘Economic growth-oriented carbon pricing’, the attitude decides to take measures towards three targets such as bold assistances to the investments with GX economy transition bond, initiatives for the early investment for GX by carbon pricing and the usage of new financial methods. However, the attitude will introduce ‘the regulatory auction’ only for the electricity industry from as late as 2033. Honestly speaking, this attitude is falling behind the global trend and inward facing.

② Local governments

Local governments implement the environmental administration guided by the Ministry of Environment. From the perspectives of local governments, they don’t have enough physical and personal resources to carry the responsibilities to implement the whole environment administrations practically. For example, according to the ‘Environment White Paper’, ’Prefectures and oordinance designated cities have 6,441 persons for the public pollution matters (excluding industrial wastes and sewers) and 2,105 persons for the protection of ecosystems. 223 out of about 3ooo municipalities

have their own divisions specialized for the environment administrations.'[3]

In addition, most of chargeable employees in local governments are interested in the local ecosystems or prevention of public pollution, not in the planet wide problem. Besides, there is a natural limit for those who are interested in the climate change problem to plan the marketplace for carbon pricing which might be beyond their chargeable borders.

[3] See [4]

## 2 The climate change problem and price mechanism

### (1) Carbon pricing

#### ① The function of price mechanism

As written above, the climate change problem is very difficult for the public sectors to find a solution through the political process. In contrast, carbon pricing, which relies on the price mechanism, can provide the more efficient solutions because the price information work as a common signal for all entities in the economic society.

First, we can obtain the decisive answer based on market voting regarding the causal relationship of GHG emissions by mankind with the climate change problem. Besides, we can find the right combination of burdens and methods to reduce GHG emission. Moreover, according to the 'Coase Theorem', which is the orthodox of the Law and Economics, externality caused by a public pollution, such as the climate change problem caused by GHG emission, could be solved optimally through internalization of the external cost into the market mechanism among the related entities.

However, the Law and Economics also requires the government to develop the institutional framework of the market.

As for carbon pricing, the idea of carbon tax or emission trade system were proposed as such institutional developments. There are many challenges in the proposals.

First, enterprises might regard carbon pricing just as the increase of cost, which bring about the additional credit risk of their businesses.[4] Therefore, the industry enterprises, particularly those who emit much CO2 currently, might outwardly make advertisements of their efforts to reduce CO2 emissions but inwardly do not want to develop the institutional framework for carbon pricing. The governments are under the political pressure by those enterprises, so that they do not have much incentives to develop the framework proactively.[5]

Second, the chargeable authority must decide the elements of the framework proposals such as carbon tax rate or the penalties to emission regulation as the premise of carbon pricing. In the past system plannings such as the land holding tax or regulation on the industrial wastes, the government relied on the existing similar systems such as the financial products taxation or the penalties for the other violations of the industrial regulation. The relationship between system planning and transactions are just like 'egg and chicken'. We have similar challenges concerning the subjects of carbon taxations or emission regulations.[6]

To prevent the political pressure and obtain the fundamental information to design the institutional frameworks, we should depend on the transactions of the assets underpinned with carbon pricing.

#### ② Fundamental challenges to carbon pricing

In the current institution, we found fundamental challenge. It is the legal and accounting formalization of the transactions of de novo asset.

In the case of emission trade system[7], we have additional challenges such as the pattern of intermediary service for the transactions of assets and how to keep the integrity of the market.[8]

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[4] See [19]

[5] According to [29], many of carbon taxes or emission trade systems were introduced as the financial resources for subsidies to emission reduction investments. Besides, the beginning of EU-ETS was started with gratis allocations to the heavy industries in Europe.

[6] The policy planner needs such substantial information. However, in financial markets, carbon prices were not reflected in the price of the existing financial instruments such as stocks and bonds. See [12]

[7] The proposal of carbon tax has its own additional challenges starting from the implement cost of taxation bureaus.

[8] The definition of 'carbon pricing' is the exchange rate between assets underpinned with carbon emission and currency. This theme has fundamental questions to be resolved, such as how to consider the relationships with standard financial instruments like deposits, stocks, bonds and so on, or the relationships with metabolisms of issuers, most of them are enterprises. However, in this article, I leave from these fundamental questions, and employ the definitions of carbon credit prices, following the usual definitions by private initiatives. See [12]

EU-ETS has cleared these fundamental challenges by the core concept of 'the regulatory auction'. It employed the structure of a cap & trade market backed by the coercive regulations of member countries, the transactions were bit and ordered over the counter trade of member banks at the beginning (the introduction of the regulated exchange such as European Energy Exchange to list carbon credits was made only recently), and EU commission by itself has issued the emission allowances of the regulations by member countries as the subjects of the transactions. Based on the premises, both of spots of European emission allowances and their futures are dealt in EU-ETS which become a part of global activities of European commercial banks. [9]

In addition, some of international organizations are claiming that the floor of the carbon price only for major countries such as China. This proposal aims more reduction of CO2 emission based on the existing carbon pricing, but be supposed to put emphasis on the international political process. We can see the considerations on the equity among countries in the assertion. [10]

On the other hand, there are private initiatives to establish the voluntary carbon markets.[11] For example, Task Force for Scaling Voluntary Carbon Market is a private initiative represented by Mark Caney, the former governor of the Bank of England, supported by Mackinsey & Company. It has published the first report in 2021, which describes the elements and future growth of the voluntary carbon market, and published the second report in 2022, which sketched the governance structure to clear the fundamental challenges to the market.[12]Besides, London Stock Exchange has proposed in 2022, to establish the voluntary carbon market where the equities of a fund which consist of the various emission reduction projects of enterprises are transacted.[13]

### （2）The function of price mechanism in Japan

In Japan, there is a structural problem that liquidities are generally quite short, as we can see the lack of metabolism in the enterprises and employments. We have an example for this in the financial market., deposit taking institutions like commercial banks have larger weight in the monetary intermediation compared to other western countries. According to the statistics by Bank of Japan, where the share of deposits in total financial intermediation between households and enterprises are more than 200% in Japan, in contrast to 50% of the USA, 90% of Europe. In contrast, the weight of market in the monetary intermediation is quite small.

Besides, we also find the overall tendency in the background to reject the economic activities signalized by prices. For example, the concept 'regulatory auction' is totally denied in Japan's institutions, as we can see in the allocation system of electric waves to telephone companies or boarding gates of an airport to airlines.

Moreover, de novo assets such as carbon credits need the incorporation in the legal and accounting institutes.[14] This

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[9] See [33],[37],[38]

[10] See [39]

[11] See [27]

[12] See [41]

[13] See [31]

[14] According to my idea, the relationship between real transactions and the authorization concerning de novo assets is just like in 'chicken and egg' situation. Indeed, for example of cash, we use them to settle our transactions every day, without any decisive legal and accounting formalizations. In the similar manner, we need not the decisive formalizations for de novo assets. On the contrary, the demand for the formalizations might be harmful. For example, the establishing law has the formalization only for tangible goods not for intangible services. It might be a hazard for the growth of service industry in Japan. But reality in Japan.is exactly opposite. People want to have the formal incorporation in legal and accounting institutes for de novo assets. As for carbon credits, they do not have legal framework as an asset. It is not a formal asset without the public certification based on Paris agreement, in contrast to the tangible assets like office equipment, so that the purchase of carbon credits is not recorded as investment but as donation. That means the investor must pay corporate tax before the purchase of carbon credits, in contrast to other tangible assets.

is common challenge in the world, but especially in Japan people want to have such an authorization in the formal institutes surely. Accordingly, as for the transaction of them, people prefer bit and offer orders via regulated exchanges to OTC (Over the counter trade) because it is formalized in the written act.

Under these circumstances, Japan has had mal tradition to depend too much on governments, which is not so proactive nowadays as earlier, in establishing a new way of business. I am afraid that Japan's economic society would follow what became a standard in oversees market in the transactions of de novo assets such as carbon credits.

3 Market regulation

(1) Price discovery based on the transactions of assets

① Incentives of interested parties

There is another challenge for the establishment of marketplace.[15]

Generally, it is a premise for the price discovery function of a market that incentives of various participants who 乜 deal assets are coordinated in an order. Those participants in contention are issuers, investors, intermediary firms (exchanges, security houses and so on), gatekeepers (standard setters, validators, accountants and so on). The combination of the incentives should be transformed spontaneously based on economic rationalities of participants, just like the business model for the market of asset backed securities.

It should be in similar fashion for carbon pricing. Assumed participants are similar too, namely, issuers, investors, intermediary firms, gate keepers and so on.

First, issuers are interested in profitability of their investments for emission reduction, and fundraising for their investments. The former depends on the future carbon price, and the relationship of profitability and future price is just like the 'chicken and egg' situation. However, this kind of uncertainty has been always accompanied with issuance of stocks, the analysis based on the existing prices is normal procedure for potential issuers as we see in internal carbon prices of many enterprises. The latter has a timing difference between requirement of the future achievement of emission reduction and the current fund raising for the investment. However, this difference is also usual for the issuance of stocks, can be mitigated by the ingenuity of financial intermediation firms, such as structured finance or insurance on the ex-post achievement of the investments.

Second, broad range of investors should be involved for the transactions. It would be effective for this purpose to remove the range limitation of the investors and to strengthen the incentives to invest in carbon credits by the establishment of the disclosure duties about carbon emission of the investors. The international efforts are made nowadays, particularly Stage3 of GHG protocol is expected to have much effect to incentivize the broad investors.

Besides, the ingenuity of financial intermediary firms is indispensable, such as the set-up of the financial instruments for investments or providing reliable information regarding their future prices. [16]

Moreover, standard setters and the validators should obtain the trust of investors on meeting the requirements for carbon credits, such as additionality, effectiveness, carbon leakage, harmlessness, base-line, and monitoring. As most of standard setters are based on the strictness of their standards, they are supposed to have enough incentives to satisfy the condition as the part of the transaction system. [17]The validators are still not independent from the other entities, but to be expanded from now on.

② Market regulations by overseas authorities

Public sectors in overseas markets basically leave the coordination of incentives on economic rationalities of market participants, and would take exceptional measures to prevent the real harmful effects only when they had occurred.

For example, in the case of the global financial crisis caused by 'Rehman Shock', the measures to strengthen the credibility of central counter parties such as regulated exchanges to shut down the contagions of systemic risk. This measure was presented in the governmental conference such as Philadelphia Summit, and come to the detailed agreement by BIS (Bank for International Settlement) and IOSCO (International Organization of Securities Commissions).[18] In the case of domestic financial crisis such as Great Depression in the USA, American congress has

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[15] The discussion in this chapter matters only for the emission trade market, but does not relate with carbon tax.

[16] The overseas carbon markets had already developed this kind of financial services. Many analyses were made regarding the profitability of the services concerning carbon credits transactions. See [18]

[17] In Indonesia or Vietnam there are the movements to establish their own certificate organizations. See [42]

[18] See [10]

decided the measures such as the establishment of SEC (Securities Exchange Commission). In both cases, they did not have denied the incentives combination of market participants.[19]

As for carbon pricing, the regulation on transaction subjects or price information are not the topic for the regulators, but the institutional arrangements on information disclosure to construct the market mechanism or the institutional adjustments for security token are important topics for global system development.[20]

(2) Situation in Japan

① The compartmentalized regulations

On the other hand, in Japan, there is a strong public opinion that the effective regulation should be prepared for the expected harm effects. [21]It is because the competent authority would be severely criticized by mass media when they were not enough prepared the preventions for the harmful effects. The concerned ministries might buck the bug onto each other, when the harm effects really occurred. In this situation, it could happen that the potential competent authority suppresses the transactions of de novo assets. This problem could be same in financial instruments and let the Japanese market fall behind the innovative markets where the technical progress always intensifies the competition among the markets.

As for the regulation on the asset transactions in Japan, the financial assets and other assets are strictly divided. Financial assets are regulated by Financial Service Agency, which is the competent authority of FIEA (Financial Instruments and Exchange Act). Other assets are regulated by other ministries starting from the Ministry of Economics, Trade, and Industry, which oversee CIEA (Commodity Instruments and Exchange Act).

The compartmentalized regulation system is based on the histories of the concerned institutions, such as FIEA comes from the history of the security scandals 100years ago in the USA and CIEA comes from the history of the operator scandals 50years ago in this country. As carbon credits are de novo assets, they have no history.

This way, compartmentalized regulations on existing assets, with a strong public opinion that the effective regulation should be prepared for the expected harm effects, might disturb the transactions of de novo assets like carbon credits.

As the Ministry of Environment has been weak in Japan's central government, it has no power to overcome the hazard by compartmentalized regulations. It was established in 2001, has had the mission for Japan's response to planet wide problems like climate change, so that is has made severe compromises on various issues such as the certification system for carbon credits or guidance to the local governments regarding their implementation of environment administration. Although the Japanese government has published the NDC 'carbon Neutral by 2050' nowadays, it does not have reformed the execution system. Japan's government, for the purpose of relaxation of rigid regulations, established 'Regulatory Sand-Box' system. However, it does not have worked good for the marketplace, where participants freeze before they make necessary investments to introduce the new transaction systems.

② The critics on the transaction

Besides, carbon pricing in Japan cannot escape from the critics such as 'The transactions of carbon credits are just a money game.', 'The carbon offset statements based on the carbon credits purchased with money are just escape from the obligation of public institutions of society.'[22]

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[19] See [34]

[20] It was similar in Japan during the Edo period, so that the market mechanism like 'Dojima Komeichiba' has developed as the top runner in the world. See [2]

[21] See [26]

[22] Japan's FIEA enumerate financial assets to be regulated by the Act from title securities listed in general institutions such as commercial law, and gives them special legal effects and regulations. Under this act, the market infrastructures are regulated quite strictly. For example, the range of business of financial instruments exchanges are limited to the financial assets and the businesses of them are controlled in every detail. Besides, the transactions of legally designated securities are protected by several legal means such as the surveillance by the SESC (Security Exchange Surveillance

## 4 Evaluation of governmental market experiments and the future improvement direction in Japan

### (1) Evaluation of governmental market experiments in Japan

As Japan's government has made an international commitment, NDC of 'carbon neutral by 2050), it must do something. It wanted to demonstrate the leadership of the public sector, so that it antidotes the risks for private enterprises, and encourages the private entities by showing concrete proposals. The carbon market experiment by the central government was the measure to achieve this purpose, based on the supplementary budget for fiscal year 2022.

However, this experiment did not achieve enough results to contribute to the establishment of marketplace for carbon pricing. First, the price information discovered in the market diversified very much depending the methodologies employed. For example, the price of carbon credits by energy saving is 1600~ 800 yen per reduction of CO2 tons, in contrast to the prices of credits by forestry, which were 10,000~16,000 yen per reduction of CO2 tons. No one would invest in carbon credits with such diversified prices. Market liquidity in the experiment was short, too. This experiment was implemented for 85 business days, but the number of transactions made in the market was only 163. As in other markets, the number of market transactions are normally tens of thousands, the market experiment hardly provided the transactions of carbon credits. Besides, most of the transactions, namely 88%, were made by public entities, which already had issued carbon credits by themselves. [23]

There are many factors for the poor performances of the market experiment. First, the transaction subjects in this experiment were limited to public carbon credits certified by the governmental organization such as J-Credit managed by Mizuho Research & Technology. It did not include the voluntary carbon credits or futures of spot carbon credits. Second, the ways of bit and orders were limited to the regulated exchange, namely Tokyo Stock Exchange, which won the bid of the experiment by the government. It showed a sharp contrast to the EU-ETS, which started the transactions via OTC (Over the counter) orders. In Japan also, financial products except spots of common stocks are traded mainly via OTC orders. They have dominance in the real markets normally, as we can see the broad financial instruments except

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Committee), assurance on the correctness of disclosed information of issuers by the audit farms, secured transformations of rights by the Japan Securities Deposit Center. On the other hand, FIEA does not limit the range of business of financial instruments operators (security houses), in contrast to Banking Act, but regulates the detailed transactions that they supplied based on criminal penalties.

In contrast, the CIEA does not provide such a closed system, but prohibits the operators of asset transactions to solicitate without invitation from their clients as the means to hold the integrity of the market.

Originally, FIEA was the compound of the Japan's Security Exchange Act and the Fund Exchange Act. The later imitated the former at that time, which was transplanted from the American federal law. The Japan's Security Exchange Act was based on a fundamentally different legal institutions to American. For example, in USA, company laws were set by the states, implementation of the regulations does not depend on criminal penalties. Therefore, FIEA brings many obstacles to the Japan's financial market. For example, it excessively strengthens the compliance of the market participants, and it makes the legal change and the implementation of the regulation excessively rigid.

Besides, the original Security Exchange Act was based on out of dated financial technology in the USA, so that it is deviated from the current financial transactions. For example, the current FIEA charged the detailed and strict regulations on regulated exchanges, such as the regulation on the margin for transactions or financial structures of regulated exchanges, because authorities wanted to shut down the contagion of the market systemic risk among the participants. However, it was assumed that regulated exchanges had the advantages related with the lower technical standard. At that time, hub &spoke transaction systems provided by regulated exchanges had more economical rational than OTC trade. Recently in most transactions of new financial assets, OTC trade has overwhelmingly large share in the market. On the other hand, current regulated exchanges are private enterprises. They depend on non-financial elements of member issuers such as the reputations to recruit the employees, or 'freeze' of market participants to innovate the financial system. Therefore, the same implementation of FIEA as before would bring about the harm effect on the new business of regulated exchanges. Regarding this point, we should also note the basis law to supervise regulated exchange in Europe is Banking Act, in contrast to Japan's FIEA.

[23] See [13]

spots of stocks. Third, devises for the transactions were limited to the choice of Tokyo Stock Exchange as the implementer of the experiment, while there are various methodologies to reduce CO2 emission. Structured finance instruments by the primary market operators, such as the one proposed by London Stock Exchange half year before the experiment, was excluded from the beginning. From the perspectives of investors, those creativities by financial service operators were absolutely needed. [24]

In the background, the framework of the market experiment as a governmental budget project itself had the problem. As this project is a formal governmental business, the Ministry of Economy, Trade, and Industry as a competent authority must ask Tokyo Stock Exchange as a major regulated exchange that was proven to have managed secondary market business. All new attempts like voluntary carbon credits or futures of spot carbon credits, OTC orders, structured finance instruments were excluded from the beginning. They had to follow the ancient regime since 2001.We could not expect the good performances of the market experiment by the central government with the governmental budget.

Meanwhile, Tokyo Metropolitan Government and Saitama Prefecture are implementing their own carbon market experiments. However, the transaction volumes do not have been enough to discover carbon price. This is because that they have originally limitations as written in 1 (2) ② and that Tokyo has its own additional difficulty to have few fabrics to emit large volume of CO2 which were regulated by the Ministry of Environment.[25]

### (2) The future improvement direction in Japan

At the very beginning of next stage, we must improve the market structure reflecting the poor performances of the last experiment in 2023. Japan's market has little time to compete with overseas markets in the era of innovating information technology and provide effective solution to the planet wide problem. From the viewpoints of financial instrument industry, the future market should have positive participation of primary market operators by providing the structured finance instruments based on the pool of various new technologies for emission reductions. Besides, from the viewpoints of investors, their incentives should be strengthened by deregulation of market participation and broader disclosure standard like scope3 of GHG protocol. Moreover, not only transactions in the regulated exchange but also OTC orders should be introduced. These amendments might be difficult to include in the governmental budget business. [26]Therefore, private initiatives have keys to get successful carbon pricing in Japan. [27]

In the second place, we might consider to utilize DLT (Distributed Ledger Technology) and to make security tokens of carbon credits. Utilization of security tokens for carbon credits bring us many economic advantages, such as round the clock transactions, practically instantaneous settlements, transparency for emission reductions and market prices, cost economics, interoperability and so on. [28]The problems pointed out like becoming triggers to involve green washing are not unique for tokenization but already dealt by standard setters. [29]

Besides, tokenization might give us a breakthrough to reform the current institution. As for carbon credits, which do not have legal categorization yet, the utilization of new technology such as DLT might bring the first step for the

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[24] As for the evaluation of carbon credits, there an influential opinion that an all-in-one information of issuing firm might be preferred to every information of an individual project. See [30]

[25] See [2] and [14]

[26] The constraints written in (1) of this chapter might be unavoidable to prevent the political risk concerning the budget project under the ancient regime.

[27] See [32]

[28] These advantages are not limited to the transactions to utilize information technology of distributed lagers, but also appliable for all electronic transactions and payments using open network as general. DLT would promote the pros of economic commerce on open network to the extreme, such as the best price competition among suppliers who can rely on crowd computing thoroughly, the best possibility for the selection by demander who can compare the cost price without care about the information transparencies, and the best competition beyond the industries and borders among countries.

[29] In overseas markets, we already found the concrete proposals by financial industry to use DLT for carbon credits and the countermeasures by standard setters. See [28], [34] and [42].

formalization, and the relaxation of compartmentalized regulation.[30]

But at the same time, it is noteworthy for the government to play their roles flexibly realization of the advantages. For example, in Japan, deposits have an overwhelmingly large share in financial instruments, which were strictly distinguished from capital market instruments such as stocks and bonds, and from other general title documents. On the other hand, we should provide cross-sectional incentives to broad range of investors to invest in carbon credits. Regarding this situation in Japan, the government might consider to involve the scope3 of GHG protocol in the regulation for deposit taking institutions. Most of commercial banks are listed companies, so that they are already obliged to disclose the total emission following the scope3. The regulation would not charge additional costs to them. However, if the emission disclosure would be involved in the regulation of all deposit taking institutions, it would give strong incentives to the client companies. Most of those companies are unlisted, so that they don't have any interest to disclose their CO2 emission volume.[31]

Except this, the government should leave the emission reduction to the market, and other regulations such as Act on Promotion of Global Warming Countermeasures should not be strengthened. In this country, where enterprises cannot do anything what is not written in the law, the government should make this attitude clear in advance.

[30] Japan's FIEA is very liberal in the principle, but in the practice, the intervenes by the government is quite dense. For example, in the secondary market, every detail of the business of regulated exchanges was written in their business method manuals, and all changes of their manuals must be permitted by the chargeable officer in advance. The balance of pros and cons to be market infrastructures were maintained so far by the exceptional legal effects for the infrastructure services by those entities. The utilization of DLT might resolve all linkages between exceptional legal effects and dense supervisions.

[31] As most of commercial banks are listed companies, the scope 3 of GHG protocol should be applied to the banks and their clients. However, it might lead to the shift of client borrowers to financial cooperations, which are not listed companies. Therefore, it would be desirable to include the obligations by Banking Act to disclose the information following the scope 3 of GHG protocol.

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