

On the Ownership of Carbon Emission Rights in Emission Trading Scheme*

YOU Mo

Global climate change is one of the most serious challenges facing humanity today. Most countries agreed that the global average temperature rising has to be controlled into 2° C compared to pre-industrial world. Emission Trading Scheme is considered an effective means to achieve this goal. The essence of the scheme is the circulation of carbon emission rights. Who owns carbon emission rights? What types of carbon emission rights do countries own? How to allocate carbon emission rights? The answers of these questions form the basis of the regulation and protection of Emission Trading Scheme. From legal theory and new institutional economics, the paper discusses ownership issues of carbon emission rights. It contains not only theoretical analysis on relevant international laws and environmental laws, but also case analysis on the effect of rights allocation on transaction cost. It shows that individuals and the country share carbon emission rights. It also shows that the transaction costs may increase if the rights are allocated depends on civil law theory or emission amount. And legal institutions should endow the rights to parties with more members, looser organisation and less information, to ensure transactions go more smoothly.

Keywords: Carbon emission rights; Right to use environmental capacity; Right to development; Transaction cost; Air pollution tort lawsuit

I. Introduction

Emission Trading Scheme includes compulsory carbon trading market and voluntary emission reduction programs. Generally, in a compulsory carbon trading market, carbon emissions regulation can be divided into two parts: ‘cap’ and ‘trade’. ‘Cap’ primarily represents administrative behaviour, which involves the allocation of carbon emission amounts within jurisdictions, the range of enterprises included in the market and their initial government quotas. ‘Trade’ primarily represents market behaviour—spontaneous transaction behaviour—by enterprises or individuals for benefit maximisation, which is based on the aforementioned allocation according to their supply and demand. Some Japanese researchers suggested to see carbon emission allowance as an obligation which is given to organizations meeting certain

conditions rather than a right¹⁾, based on Japanese administrative laws, for example, the periodic report obligation which is given to the plants appointed by Minister of Economy, Trade and Industry based on energy usage amount²⁾. Apparently, this opinion is not suitable for carbon trading markets, because it cannot explain the positive value of carbon emission allowance in the markets and is incompatible with reductions from voluntary emission reduction programs. In fact, the object of transactions is carbon emission rights, and the format contains the quota of compulsory carbon trading markets, Certified Emission Reductions (CERs) derived from the Clean Development Mechanism (CDM), Verified Emission Reductions (VERs) and reductions from other voluntary emission reduction programs.

The essence of market behaviour is the circula-

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tion of rights, the premise of which is the clear definition of rights, which depends on the analysis of its legal basis and institutional objects. Who owns carbon emission rights? What types of carbon emission rights do countries own? How to allocate carbon emission rights? The answers of these questions form the basis of the regulation and protection of Emission Trading Scheme.

This paper contains two sections. The first section provides a theoretical analysis of environmental law and international law, tries to answer the first two questions by discussing the fragmentation and integration of the right to development and the right to use environmental capacity and concludes that carbon emission rights should be divided into two parts with different structures: the rights of natural persons and those of countries. The second section tries to answer the third question by discussing the role of rights distribution in economising transaction costs through a case analysis of Japan's air pollution tort lawsuits and concludes that legal institutions should endow rights to parties with more members, looser organisation and less information. Whether legal persons should receive rights depends on their industry and organisational characteristics.

II. Carbon emission rights in legal theory

What kind of rights are carbon emission rights? The answer to this question remains under discussion in academia because a variety of explanations exist for this problem given the differences in legal systems, research purposes and study fields.

Civil law systems pay more attention to the theoretic study of this problem. Pei etc. considered carbon emission rights as real rights through research on the CDM mechanism³⁾; the research report of the Kyoto Protocol and Japanese domestic law, which is issued by Japan's Ministry of Environment, claimed that

carbon credit is a type of movable property whose relative right is a real right—an intangible property right⁴⁾. Deng believes that a carbon emission right is a quasi-real right, similar to a pollution emission right because the object of the right is environmental capacity⁵⁾. Yang points out that a carbon emission right belongs to the right to development according to international law⁶⁾; Wang believes that a carbon emission right has the attributes of both a quasi-real right and the right to development, with dialectical unity⁷⁾.

Common law systems focus more on practice issues. Hepburn considers that a carbon right is a novel property in light of the relative techniques and law in Australian Carbon Capture and Storage. Specifically, it is a unique land interest attached to forestland⁸⁾. Regarding how the US government deals with the negotiation of international carbon emissions reduction, Posner opposed the inclusion of carbon emission rights in the right to development after analysing distributive and corrective justice but without clarifying definitively the views on its property⁹⁾.

To summarise, the views involve four theories: intangible property rights, land interest as a property right, the right to use environmental capacity as a quasi-real right and the right to development. Among these rights, the view of intangible property rights has not been widely approved. Japan's Ministry of Environment expressed in its report that even if carbon credits are defined as movable property, a considerable gap exists in Japanese law regarding the concept of movable property¹⁰⁾ at 2006. Later a report for carbon trading system on Japanese civil law suggested a surprising and incomprehensible opinion that the carbon emission rights is a 'special property rights', which is different from the real rights in Japan's *Civil Code*. All the owners of this 'special rights' only have the right to transfer or withdraw, but not the right to utilise and benefit¹¹⁾. If no one can use or benefit from the rights, why is

there any price and transaction? The view on land interest only exists in Australia, where the Carbon Capture and Storage system is relatively developed. Therefore, this section focuses primarily on two views: the right to use environmental capacity as a quasi-real right and the right to development.

1. Right to use environmental capacity as a quasi-real right

(1) Real right and quasi-real right

The right object of a real right is a certain thing, traditionally it limits to *res corporales*. Given productivity development and changes in the production relation, various novel rights arise whose objects are intangible. For example, intellectual property rights are difficult to include in the aforementioned system. Countries with a civil law system usually normalise these novel rights through individual legislation. Wang insists that creating confusion over the concept is possible if intangibles are involved as objects of real rights. As a result, intangible property should be legislated separately¹²⁾. Later, Wang added that listing all intangibles in a real rights law is unnecessary because too many exist to be enumerated. Instead, defining the essential attributes and basic features of the object or unsteadily broadening the concept of a civil rights object is suggested¹³⁾.

For this problem, the concept of a quasi-real right is a powerful complement to traditional real rights. The proper range and standard of judgment is still controversial in the field of law; however, as its name implies, a quasi-real right is a civil right that is not completely a traditional real right (a mining right, a water gavel or a hunting right, among others). Some researchers believe that the difference arises from the object of a quasi-real right being intangible or uncertain; others believe that a quasi-real right must be generated through administrative action; and some distinguish a quasi-real right from the domination, exclusiveness and priority of a right. In conclusion,

a quasi-real right is a collective name for a series of rights rather than a certain right with a single property.

(2) Right to use environmental capacity

The concept of 'environmental capacity' is derived from *enviromtology*, which refers to 'the maximum pollution amount afforded by a certain environmental unit', limited to the self-clearance ability of the natural environment. The legal limitation of the maximum amount should be analysed according to the definition of pollution matter. Hence, a judgment should be made based on human health, safety and benefit, which may be directly or indirectly affected by a change in environmental characteristics within reasonable expectations, or based on the harmful effect caused by the human utilisation of the ecological environment.

On the basis of the dual character of socialisation and ecologicalisation of the real right, Lv brings out the concept of the 'environment real right' and creatively complements the standards of judgment of the object value, which is 'whether it generates economic benefit to the subject'. Furthermore, Lv points out that the right to use environmental capacity is to develop and utilise the ecological value of an environmental resource, which is the right of ownership, utilisation and benefit from environment capacity by the legal environment user¹⁴⁾. Deng summarises the features of environmental capacity: 1) integrity and relative independence, 2) scarcity, 3) stability and 4) regional variations. Furthermore, he develops the theoretic base of Lv, which views environmental capacity as the object of pollution emission rights given its perceptibility, relative domination and determinability, and to a certain extent, is able to satisfy the relative characteristics of a real right object, but that differs from a traditional real right object and therefore, should be included as quasi-real right¹⁵⁾.

At the same time, Lv notices that 'for a

natural person, certain environmental capacity is required for the survival of biological human beings, so that the right of a natural person to obtain or occupy a certain capacity that is necessary for self survival should be distributed automatically, without any legal procedure or approval'. In addition, 'it is necessary to limit the right to obtain or occupy a certain environmental capacity of a legal person or civil subject engaged in production and business activities, which should be authorized by legal procedure'¹⁶⁾.

Total volume control is an application for this theory. China exercises total volume control over the discharge of key air pollutants¹⁷⁾. Japan also uses it in many environmental fields, like for chemical oxygen demand in Seto Inland Sea¹⁸⁾, for air pollutants in the area where plants concentrate¹⁹⁾, and for water pollutants in public waters²⁰⁾.

From this definition and analysis, given the background of global warming being partially caused by the over-accumulation and emission of carbon dioxide, carbon emission rights can be included as a right to use environmental capacity with quasi-real right attributes, similar to pollution emission rights. The main difference between carbon emission rights and types of traditional pollution emission rights is the insignificant regional variation because carbon emissions from anywhere in the world influence global warming. This feature of carbon emissions forms part of the theoretical base for the global carbon trading market. As a result, the right object is the global air capacity of carbon dioxide. This object's ownership and relative bundle of rights is distributed to countries through international agreements, and the whole or part of the rights (for example, obtain, utilize, benefit, dispose) are distributed to civil subjects by countries.

In this theory, carbon emission rights, which are distributed through international agreements, should belong to the country, as do other natural resources. However, because

natural living persons inevitably contribute to carbon dioxide emissions, a certain amount of carbon emission rights is necessary for the survival of natural persons, meaning that a certain amount of relative rights should be guaranteed as being automatically obtained by them. Therefore, what is the difference between this part of carbon emission rights and the rights that must be obtained through a legal procedure? For this part of the rights, should natural persons automatically obtain complete ownership? For example, can they abandon the rights voluntarily or sell them? These questions are yet to be answered.

2. Right to development

The right to development was termed 'the third generation of human rights'. In 1979, the UN Economic and Social Council and its subordinated Commission on Human Rights claimed that the right to development is a type of human right, and the equal opportunity to development is the right of countries and individuals²¹⁾, which was emphasized in the 34th General Assembly through resolutions during the same year²²⁾. In 1981, the Organization of African Unity adopted the *African Charter on Human and People's Rights*, which mentioned that 'all peoples shall have the right to their economic, social and cultural development with due regard to their freedom and identity and in the equal enjoyment of the common heritage of mankind'²³⁾. In 1986, the 41st General Assembly claimed in the *Declaration on the Right to Development* that 'the right to development is an inalienable human right by virtue of which every human person and all peoples are entitled to participate in, contribute to, and enjoy economic, social, cultural and political development, in which all human rights and fundamental freedoms can be fully realized'²⁴⁾. Further, at the World Conference on Human Rights held in Vienna in 1993, representatives of more than 180 countries discussed and adopted the *Vienna Declaration and Programme*

of Action, which reaffirmed the right to development, as established in the *Declaration on the Right to Development*, as a ‘universal and inalienable right and an integral part of fundamental human rights’²⁵⁾.

Carbon dioxide is primarily produced from the utilisation of fossil fuels; therefore, carbon emission rights are closely related to human development. China’s National Development and Reform Commission and concerned departments formulated *China’s Policies and Actions for Addressing Climate Change*²⁶⁾ as issued by the State Council. The policies declared that ‘climate change is not only an environment problem but also a development problem, ultimately affecting development’. Many Chinese researchers agree with the view that carbon emission rights are a type of right to development because these rights are a type of human right according to this theory. Thus, China, with the largest population in the world, deserves more carbon emission rights.

However, one significant drawback to this theory is the non-transferability of human rights, which leads to the collapse of the foundation of the legal principle in the carbon trading market. John Locke claimed in his famous *Two Treatises of Government*, published in 1690, ‘For man, not having such²⁷⁾ an arbitrary power over his own life, cannot give another man such a power over it²⁸⁾’, which laid the foundation for the ‘first generation of human rights’, as promoted in the bourgeois revolution. In 1776, the *Declaration of Independence* noted the ‘unalienable rights’ of life, liberty and the pursuit of happiness, which are created equal²⁹⁾. The *Universal Declaration of Human Rights*, adopted by the United Nations General Assembly in 1948, in addition to reaffirming ‘the first generation of human rights’, created ‘the second generation of human rights’, including work and education and others requiring the active participation of countries and, in particular, still used the term ‘inalienable’³⁰⁾. A similar description of the right to development

has been previously explained. ‘Inalienable’ means indivisible, undeprivable, irreplaceable and undestroyable. In relation to legal theory, right owners do not have complete ownership but only have the right to occupy, utilise and benefit, rather than transfer or destroy.

3. Analysis of legal attributes and ownership of carbon emission rights

Developing theoretical defences to the concept of carbon emission rights as a quasi-real right or a right to development is not difficult. However, in practice, carbon emission reductions, particularly in the carbon trading market, face serious problems. These problems include the right to development leading to the non-transferability of carbon emission rights, and the theory of quasi-real rights resulting in insufficiently ensuring human rights³¹⁾. To resolve these two problems, we must consider and analyse both separately and integrally.

(1) Fragmentation of the quasi-real right and the right to development

It is impossible to absolutely unify the two theories given the significant difference in the way that rights are obtained and circulated. Because any right has an origin and direction, it is necessary to further analyse and find its source rather than simply classifying its ownership. Among rights, human rights are the only exception.

The source of human rights differs from the influence of nations, peoples and religions. Most western jurists influenced by the bourgeois revolution and Christianity agree with the theory of natural rights. For example, John Locke’s analysis is based on Christian theology, and the *Declaration of Independence* considers that human rights are endowed by the ‘creator’³²⁾, which people in different religions describe as God or nature or others. However, westerners guided by these theories still commit numerous crimes on other nations, religions or peoples. Richard Rorty points out

that human rights come from ‘rationality’, which labels dissidents as non-rational who need to be deprived of their human rights. As a result, he raises the concept that human rights should be directed from ‘sentimentality’³³⁾. Karl Marx believes that human rights are generated historically rather than being natural born. Many modern jurists also raise the view of ‘human rights endowed by law’. Finally, the United Nations General Assembly agreed to avoid the question of ‘endowed by who’ in the *Universal Declaration of Human Rights* and only express that ‘(everyone) has reason and conscience’³⁴⁾, thus describing human rights through both rationality and sentimentality. However, a quasi-real right is different, with the relative bundle of rights requiring a definite route regarding its source and direction to enable it to be ruled and protected in various aspects. If carbon emission rights, which are required for natural persons’ survival, are considered as a type of right to use environmental capacity, the right object—the environmental capacity owned by a country—in that condition, even if ‘being obtained automatically’, makes it impossible to skip the procedure of being ‘obtained automatically’ from the country. As a result, the country’s ownership of this part of environmental capacity should be reflected (perhaps by imposing or reclaiming the right) through administrative behaviour in certain conditions.

In conclusion, this paper states that we must confront and admit the fragmentation of carbon emission rights, which are required for natural persons’ survival. That is, viewing this part of carbon emission rights as a right to use environmental capacity is inappropriate. This right should only be viewed as a right to development, the legal ownership of which should be absolutely consistent with other basic human rights; individuals have the right to obtain, utilise and benefit rather than transfer or withdraw. The country plays no important role in this part of carbon emission rights.

(2) Integration of the quasi-real rights and the right to development

The fragmentation of quasi-real rights and the right to development resolves the issue of human rights being ensured in carbon emission rights, and the remaining ‘non-transferability’ should be considered from the integration viewpoint. We focus on investigating the real characteristics of the right to development through an analysis of its relationship with other human rights.

‘The third generation of human rights’ theory raised by Karel Vasak is still controversial, and many other researchers bring out various methods of categorisation. However, such categorisation does not mean that these human rights are separated, and this study does not discuss this concept in detail. Instead, this study highlights several representative and important human rights and discusses their relationships.

The three famous factors in the first generation of human rights—life, liberty and the pursuit of happiness—are declared in the *Declaration of Independence*. Obviously, the former two factors stress condition, whereas the latter focuses on behaviour. Pursuit of happiness has the same meaning as pursuing the maximisation of benefits, among which the use of force is excluded for the purpose of protecting life and liberty. That is to say, to pursue benefit maximisation should not betray another person’s will, but it provides the economic foundation for life and liberty, thus ensuring human rights. Economically, the bourgeois revolution ensured the existence and maintenance of a free market by protecting these three factors.

Different from the ‘passive’ first generation of human rights, the second generation of human rights require the country and government to ‘actively’ ensure certain rights, such as the right to work and education as raised in the *Universal Declaration of Human Rights*³⁵⁾. The protection of these rights would ensure social

benefit maximisation, which is to increase labour input and labour productivity (through education). At the same time, individuals can also realise the pursuit of self-benefit maximisation by performing these rights. Therefore, these parts of human rights are not only the foundation of the first generation of human rights, but also are extensions of society. Explanations of China's current constitution contain the dual character of right and obligation³⁶⁾, which is the emphasis of individuality and sociality.

The third generation of human rights, represented as the right to development, have gone further and are sometimes termed 'collective human rights'. Zhang believes that the right object must only be the individual³⁷⁾; meanwhile, Li considers that collective human rights exist relatively; individual human rights are the basis of collective human rights and collective human rights are to ensure individual rights³⁸⁾. Some researchers believe that previous human rights also contain collectivity. This study states that the feature of this type of human right is that it should be realised collectively even though the object is individual. The relationship of this type of human right to other human rights is characterised as interconnected and interdependent, and they form the basis for insurance for each other, as did the previous two generations of human rights. On the one hand, as noted in the *Declaration on the Right to Development*, the purpose of the right to development is to completely realise all human rights and basic liberties. On the other hand, development itself is one of the purposes of the individual pursuit of happiness.

Because the right to development contains the dual characters of method and purpose, the integration between the right to development and a quasi-real right is abundantly clear. This study believes that it is wrong to equate carbon emission rights to the right to development. The efficient utilisation of a relative

bundle of carbon emission rights is the essence of the right to development, which involves the legal and economic utilisation of partial carbon emission rights as a quasi-real right. Carbon emission is an important method of realising development, but it is not the only method. Countries or enterprises with high carbon intensity have different requirements for the resources needed for self-development compared with low carbon intensity countries or enterprises, and they must redistribute resources through the carbon trading market to achieve co-development. This right to administer freely is also an essential reflection of the right to development and other basic human rights emphasised by international society. Additionally, the right to transfer this part of carbon emission rights is part of the right to development.

Regarding the problem of legal attributes and ownership of carbon emission rights, through analysis of the two theories of quasi-real rights and the right to development, this paper concludes that carbon emission rights should be divided into two parts. First, it is required for the survival of natural persons, which is not the right to use environmental capacity as a quasi-real right, but it is the right to development, a basic human right reflecting the purpose of the right to development and ensuring the efficient maintenance of other basic human rights. Natural persons have the right to obtain, utilise and benefit, rather than transfer or withdraw. Second, carbon emission rights, which are rights to use environmental capacity with the object as the air environmental capability owned by countries, similar to quasi-real rights for wireless spectrum, fishing and mining. Natural persons and legal persons can utilise, benefit, transfer and withdraw these rights through certain administrative procedures or civil contracts, which reflect the right to development as a method.

Ⅲ. A new perspective on new institutional economics

The transaction cost, which hinders the effective transfer of rights through market behaviour, is the result of many factors. In the air pollution tort disputes that emerged significantly in the 20th century, the main reasons for increasing transaction costs are numerous participants and information asymmetry. The carbon emission issue goes further on these two factors, making it more difficult for participants to measure the benefits or communicate with others. Because law is a scale-constant institution, the designer should consider the ownership of carbon emission rights based on institutional economics and the objective of institutions.

1. The influences of transaction costs on rights allocation based on civil law theory

In civil law theory, allocation of rights and liability in a tort dispute depends on three elements: harm, causation and negligence. In other words, the actor is liable if his behaviour is negligent and has caused harm to the victims. The judgment of these three elements has a logical sequence, and all three steps could be influenced by transaction costs.

Step 1. Harm

Harm is the easiest element to judge accurately, except in certain special cases. The harm caused is obvious if someone is stabbed; however, estimating harm when a person is poked by a needle with HIV-tainted blood is difficult. AIDS has an incubation period and is infectious; therefore, numerous unforeseeable issues may influence the actual degree of harm in this case. Before an AIDS attack, the victim may die of other reasons, may be cured through specific medications or may even infect more people. In most cases, the transaction cost, which hinders the judgment of harm, is reduced as society and technology develop.

Step 2. Causation

After the confirmation of harm, the judge should ascertain whether causation exists between the behaviour of the actor and the harm caused. Given low transaction costs, this step is easy to perform through natural science and the logical extrapolation of experience.

Step 3. Negligence

The last step is to ascertain whether the actor was negligent when causation existed between the behaviour and the harm. In traditional tort disputes with low transaction costs, this step is the most difficult to execute. In the 1947 case of *United States v. Carroll Towing Co.*³⁹⁾, Judge Learned Hand coined the famous Hand formula, 'PL>B', to determine the degree of 'reasonable care' and the extent of 'negligence' of the actor. The Hand formula uses cost-benefit analysis from economics, comparing the prevention cost of the actor with the weighted average benefit, to replace the relatively vague concept of 'negligence' from legal theory. Richard A. Posner extolled this formula and the concepts behind it⁴⁰⁾.

In the next section, this paper studies Japan's nine air pollution tort lawsuits, their judgments and after-effects, to prove that the traditional analytical method of the three elements is unsuitable for issues with high transaction costs. The judgments by courts do not act as final decisions; instead, they transmit signals, reduce transaction costs between participants and prompt them to come to agreements by themselves.

2. Case analysis of Japan's air pollution tort cases

This paper chooses Japan's air pollution tort lawsuits as research objects because the reversion of the burden of proof principle is not adopted in Japan, and the disputes over causation are more obvious. More than thirty air pollution lawsuits exist in the LEX/DB database⁴¹⁾; a majority of them were not chosen for the following reasons. First, they are not exclusively air pollution cases. For example,

Table 1. Japan's Air Pollution Tort Lawsuits

Number/Name	Judgment Date	Causation	Claim for Cessation of the Infringement	Follow-up
#1/Chiba Kawazasaki Steel Co. pollution	1988.11.17	Affirm	Ignore	Compromise after appeal
#2/Osaka Nishiyodogawa pollution 1 st lawsuit	1991.3.29	Partial affirm; Partial negate	Ignore	Compromise with the factory parties after appeal
#3/Kawasaki pollution 1 st lawsuit	1994.1.25	Partial affirm; Partial negate	Ignore	Compromise with the factory parties after appeal
#4/Kurashiki pollution	1994.3.23	Affirm	Ignore	Compromise after appeal
#5/Osaka Nishiyodogawa pollution 2 nd ~4 th lawsuit	1995.7.5	Affirm	Dismiss	Compromise with the road parties after appeal
#6/Kawasaki pollution 2 nd ~4 th lawsuit	1998.8.5	Affirm	Dismiss	Compromise with the road parties after appeal
#7/Amagasaki pollution	2000.1.31	Partial affirm; Partial negate	Approve	Compromise with the factory parties before judgment; Compromise with the road parties after appeal
#8/Nagoya-Nanbu pollution	2000.11.27	Partial affirm; Partial negate	Approve	Compromise after appeal
#9/Tokyo pollution	2002.10.29	Partial affirm; Partial negate	Dismiss	Compromise after appeal

Sources: #1, Judgment of the 2nd Civil Division, Chiba District Court, 17/11/1988.

#2, Judgment of the 9th Civil Division, Osaka District Court, 29/3/1991.

#3, Judgment of the Civil Division, Kawasaki Branch, Yokohama District Court, 25/1/1994.

#4, Judgment of the 2nd Civil Division, Okayama District Court, 23/3/1994.

#5, Judgment of the 9th Civil Division, Osaka District Court, 5/7/1995.

#6, Judgment of the Civil Division, Kawasaki Branch, Yokohama District Court, 5/8/1998.

#7, Judgment of the 5th Civil Division, Kobe District Court, 31/1/2000.

#8, Judgment of the 3rd Civil Division, Nagoya District Court, 27/11/2000.

#9, Judgment of the Tokyo District Court, 29/10/2002.

the Date thermal power plant pollution event includes water and noise pollution disputes and the Amagasaki asbestos plant pollution event includes an occupational injury that should be ruled by labour law. Second, some cases are

yet to be decided, such as Japan's national route 2 pollution event. This paper selects nine representative lawsuits from 1988 to 2002, which have distinct characteristics compared with other types of tort lawsuits.

A). Causation is the main dispute between the two parties.

Traditionally, an air pollution tort lawsuit has multiple plaintiffs and defendants, and causation between the air pollutant emitted from every source and the intake of every victim must be proven, which is very difficult and is limited to current research on natural science methods. Most air pollution accumulates over a long period of continuous emission and is widely spread; its distribution changes in different natural and cultural environments. Generally, plaintiffs' claims in relevant cases are almost impossible to prove if the court distributes the burden of proof using the principle of 'who claim, who quote' from traditional tort law because victims markedly lack the relevant scientific knowledge and analytical ability. China addresses this problem by adopting the reversion of the burden of proof principle, meaning that plaintiffs must still prove harm, but the defendant has the liability of proving whether causation exists. Additionally, the negligence of the defendant is extended to an obligation, except for exemptions, in principle with liability and without fault.

However, Japan still adopts the burden of proof principle from traditional tort law in air pollution tort lawsuits, meaning that the plaintiff has the liability to prove causation. Because of the difficulty that plaintiffs face in providing evidence in juridical practices, Japan adopted practices from Germany to reduce the burden of proof on the plaintiff. Among these practices, the core principle is the degree of probability that only requires a certain degree of probability of causation between a particular fact and a particular result⁴²⁾. Another practice is the statistical inference and causal analysis of epidemiology, which divides causation into two parts: emission and pollutant concentration, and pollutant concentration and disease incidence and progression.

Under the guidance of these theories, the sources of evidence for causation judgments are

very limited in the aforementioned lawsuits, mainly from long-term investigation of academic institutions or governments and data on animal experiments. However, for the courts to judge causation is difficult because of various differences in the plaintiffs, such as residence, age, career, smoking history, disease and so on. For example, the causation between NO₂ (solely or as a compound with other materials) and chronic bronchitis, asthma or emphysema is negated in lawsuits #2 and #3, affirmed in lawsuits #4-6, negated again in lawsuits #7 and #8, affirmed for some of the plaintiffs and negated for the other plaintiffs in lawsuit #9. What requires special attention is that lawsuits #2 and #5, and #3 and #6 are two judgments for one event, but the causation between the pollutants emitted by the road and the plaintiffs' disease was judged to be antipodal.

B). Most judgments confirmed partial liability for damage, but showed varying attitudes towards the claims for cessation of infringement of the plaintiffs.

The plaintiffs made claims for both compensation for damages and cessation of infringement in all of the lawsuits. Without the abstruse knowledge of legal theory, it is easy to imagine that more restrictive proof is required for compensation for damages compared with cessation of infringement because the latter only needs the existence of 'infringement' and the former also needs to prove 'damages' of the 'infringement'. In other words, in traditional tort disputes, if the courts approve the claim for compensation for damages to the plaintiffs and the infringement continues, theoretically the claim for cessation of infringement of the plaintiffs should be approved simultaneously. However, the judgments in the previously described cases are not so. The courts approved the claim for compensation for damages of all plaintiffs when the causation was affirmed, but did not approve the claims for cessation of infringement of plaintiffs at the same time in seven of the nine cases. The courts ignored the

claims by reason of unlawful claims in lawsuits #1-4 and dismissed the claims in lawsuits #5-6 and #9, although they were considered lawful. The main reason for the latter action is the theory of 'tolerable limit'. In other words, the courts considered that the behaviour of the defendants involved considerable publicness, indicating that the 'tolerable limit' of the plaintiffs should exceed that of the general case.

Obviously, the judgment of publicness and a tolerable limit are applications of the Hand formula, in other words, the benefits to both parties were weighed to determine whether the defendants have the liability of cessation of infringement. However, the judgment does not explain why the defendants still have the liability of compensation for damages. The courts actually set two different tolerable limits for the plaintiffs on a single behaviour of the defendants. The lower limit offers the plaintiffs the right to ask the defendants for compensation, but the higher limit stops the plaintiffs from asking the defendants for cessation of infringement.

C). Although these cases went through prolonged court proceedings and received court decisions, the participants reached a compromise by themselves.

It is certainly favourable for both parties of a civil dispute when they come to an agreement by themselves; however, entering into a lawsuit itself shows that such an agreement cannot be reached because of high transaction costs. The court's decision should reflect an outsider's judgment, and it represents an enforcement agreement of the benefits to both parties by an impartial third party regardless of whether the judgment was made in accordance with traditional tort law or the legal and economic analysis as represented by the Hand formula. If the court's attempt fails, the discontented party or both parties will appeal until the court succeeds or gives in and comes to a better agreement through a trial class system.

The above nine lawsuits each achieved a special

outcome; one or both parties appealed after the court decision because they were unsatisfied. However, the parties then came to an agreement by themselves before the decision in the second trial. This situation is rare in other tort lawsuits. The only explanation is that the court decisions decreased transaction costs. If transaction costs do not change or even increase after the court decision, then both parties can either come to an agreement before the first trial or wait for a satisfactory agreement from the second trial court through a judgment, or a final trial.

3. Discussion

(1) The weakness of the Hand formula

The Hand formula, an ex-post institution, is a balance and a compromise between corrective justice and distributive justice. Rather than giving up the traditional three elements analysis, it underlines a prerequisite that harm and causation are determined. In contrast, in air pollution tort disputes with high transaction costs, causation is the most difficult part to determine of the three elements and is also the most essential part in influencing the final judgment on the basis of the three elements analysis. Discussing negligence without the determination of causation is meaningless. In the Hand formula, the variable P is used as the mean of the probability of loss, but causation is according to pre-behaviour—the possibility that behaviour directly causes the harm and not post-behaviour or the possibility of harm caused by the defendant's behaviour. In other words, this P is not equal to the causation that needs consideration in the three elements analysis of a court, which makes the Hand formula difficult to use in cases with over-complicated causation.

Another problem is the cost-benefit analysis of the Hand formula. For high-transaction cost issues, participants are not able to objectively examine the benefit behind the behaviour, but instead the utility. Although the judge as a

third party precisely determined the cost and benefit, it was not enough to satisfy the lawsuit participants. If the benefit considered by the judge differs significantly from the utility views of the litigants, the three elements analysis according to corrective justice may lead to endless argument and appeal, or may seek to solve the problem in an extra-legal manner. In lawsuit #9, for example, the court only supported the compensation claims from seven plaintiffs but dismissed most plaintiffs' requests because of undefined causation, indicating that the court considered that even without the pollution emission behaviour of defendant, those rights such as the personality rights claimed by plaintiffs will not increase. However, the plaintiffs are far from satisfied given their subjective judgments and still seek sanctions for the pollution emission behaviour of the defendants instead of agreeing with the court on causation. As a result, after the court decision, the plaintiffs not only continued to appeal but also expended influence by parading, petitioning and engaging in other methods to achieve their goals, ultimately succeeding in coming to an agreement with the defendants five years later. This resolution benefitted all asthmatic patients in Tokyo⁴³. Similarly, in cases #2 and #3, the court believed that the country and the road community had no responsibility. However, the cases led to the generation of cases #5 and #6, and both sides in the dispute failed to reach an agreement until the road community accepted liability. Williamson's theory on the economic institution provides us with a suggestion for solving the problem. He stated that 'indeed, transaction cost economizing is central to the study of economic organization quite generally—in capitalist and non-capitalist economies alike'⁴⁴. His view implies the precondition that it is difficult and unnecessary to find participants' effects through the institution's designer. Therefore, the institution's designer should target reducing transaction costs and ensuring that market

participants are likely to reach a voluntary agreement on right transfers. Although Williamson focused on the institution of economic organisation, law is a scale-constant institution, as mentioned previously; therefore, the theory is also suitable for legal institutions. According to the theory, the court judgment is not only an ex-post institution that complements market behaviour as per the Hand formula, but it also plays the role of an ex-ante institution, which is more obvious and important in high transaction cost issues.

(2) Measures to reduce transaction costs

To reduce transaction costs, we examine the distribution of liabilities and rights from the perspective of entering into a contract. Entering into a contract should entail two behaviours: expression of an offer and expression of acceptance. The one who is distributed with liability (does not own the right) for the will of fulfilling (or eliminating) the liability and obtaining rights is encouraged to be the offeree and to engage in a cost-benefit analysis on the available options, and then to find a counterparty with which to negotiate⁴⁵. The influence of high-transaction costs in air pollution tort disputes primarily reflects the difficulty in determining causation and discovering the subjective utility of participants. The main factors leading to high transaction costs are the numerous participants and information asymmetry. As a result, to reduce transaction costs, the institution should ensure that the liable party has the following characteristics:

- A). relatively few members;
- B). more rigorously organised; and
- C). more available information.

Liability contains not only substantive liability but also procedural liability. For example, in the reversion of the burden of proof in China's environmental pollution tort disputes, numerous plaintiffs were loosely organised and lacked scientific knowledge. Reducing transaction costs is effective when defendants have

fewer members, are tightly organised and have sufficient information. Similarly, medical negligence tort disputes occur. Japanese courts also found this point in practice. In the decision for case #5, given the available options for the defendants in preventing infringement, making a judgment for the plaintiffs is difficult because of a lack of correct scientific knowledge and information. Limited by an absence of the reversal of the burden of proof in Japan's civil law, the court adopted presumptions, such as indirect disproof and a high degree of probability for analysing causation to solve disputes, but still failed to make a decision that appeased both sides in the disputes.

On the substantive distribution of liability, cases #2 and #3, and #5-9 are representative examples. In these seven lawsuits, the plaintiffs claimed that the motor vehicles running on the roads emitted pollutants that infringed their relative rights, and the defendants were the national government, the city council and the road company. Regarding the motor vehicles' pollution issue, many options are available that may resolve the disputes: the victims can move from the pollution area, vehicle owners can switch to using mini cars or reducing usage, road owners can control traffic or incur charges, the government can adopt administrative behaviours and so on. The plaintiffs gave up selecting the vehicle owners as defendants because they knew that it was impossible for numerous counterparties to be effective. In lawsuits #2 and #3, the courts decided that the government and road owners had no liability. As a result, the plaintiffs continued to appeal, whereas in cases #5-#9, the court judged that the government and road community are liable; therefore, an agreement was reached. All of these can be explained by the theory of transaction costs, economised by choosing an offeree. For vehicle owners or plaintiffs to choose behaviour is impracticable because they are numerous and lack information, whereas the government and road owners are relatively

well organised and have sufficient information. Therefore, when they measure the available options of behaviours and consequences, ultimately an agreement that solves the problem can be reached. This process does not require the court to consider causation, and the gap between benefit and utility is also burdened by participants in disputes that they resolve by themselves⁴⁶.

(3) Rights allocation on emission issues

The main difference between carbon emission rights and traditional pollution emission rights was previously mentioned as existing in the insignificant regional variations that stand on the side of the emitters—also one of the essential theoretical bases for the global carbon trading market. However, from the victims, although the greenhouse effect is global, the harm is not simultaneous and equal.

In the case of *Massachusetts et al., Petitioners, v. Environmental Protection Agency et al.*⁴⁷, as supportive evidence for plaintiff eligibility, Massachusetts claimed that global sea levels rose by between 10 and 20 centimetres during the 20th century due to global warming and have already begun to swallow the state's coastal land. The case suggests that variations exist (from time to extent) in the harm caused by global warming in different areas. The harm actually results from carbon emissions that involve everyone, but Massachusetts and other plaintiffs also realised that selecting EPA as the defendant was beneficial in achieving their demands. As a result, according to the three factors for rights distribution, a natural person obviously owns his carbon emission rights, whether or not required for survival; otherwise, transaction costs will be too high for an effective right transaction, which then becomes meaningless. Although it is likely to be an economic explanation for human rights, the difference in legal theory is that the standard of judgment is not the legal attribute of a right but a comparison of number,

organisation and information of the actor and the victim. To a legal person, the characteristics of number, organisation and information should be considered relative to the victim to judge whether he owns carbon emission rights. An essential standard is to judge the industry involved, which should be regulated when the victim changes because of time and geography.

IV. Conclusion

This paper discusses the ownership issue of carbon emission rights from the points of view of legal theory and new institutional economics.

In legal theory, carbon emission rights have dual attributes of right to use environmental capacity as a quasi-real right and right to development as a type of human right. These types of rights have integration and are simultaneously fragmented. This paper suggests that carbon emission rights should be divided into two parts. One part is required for individual survival and includes the right to development -a kind of fundamental human right and one that ensures the efficient maintenance of other fundamental human rights. Individuals have the right to obtain, utilise and benefit, rather than the right to transfer or withdraw. The other rights are the right to use environmental capability, with the object being the atmosphere environmental capacity owned by countries. Natural persons or legal persons can obtain the right to utilise, benefit, transfer and withdraw through certain procedures or contracts.

Regarding new institutional economics, this paper uses Japan's relevant air pollution tort lawsuits as research objects. The result is that for high-transaction cost issues, such as carbon emissions, causation is difficult to confirm. The ex-post corrective function of legal institutions is weakened, and the ex-ante incentive function is more important. In other words, legal institutions should focus on economising

transaction costs to prompt both parties to reach agreements by themselves. Specifically, legal institutions should endow rights to parties with more members, looser organisation and less information, and should bestow liabilities on parties with fewer members, better organisation and more information. Thus, natural persons should obtain the right to emit carbon regardless of necessity. For legal persons, having the right depends on their industry and organisation characteristics.

Regarding the problem of which industries should be involved in the present carbon trading market, on the basis of this paper, further investigations are required using the different conditions faced by countries.

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- 3) Pei, Q., et al. (2009), pp.16-18.
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- 7) Wang, M. Y. (2010), p.97.
- 8) Hepburn, S. (2009), pp.270-271.
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- 21) See *Official Records of the Economic and Social Council, 1979, Supplement No.6 (E/1979/36), chap. XXIV, sect. A.*
- 22) U. N. General Assembly, 34th session, *Alternative approaches and ways and means within the United Nations system for improvising the effective enjoyment of human rights and fundamental freedoms* (A/RES/34/46).
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- 25) U. N. 1993, *Vienna Declaration and Programme of Action*, I.10.
- 26) No. 17 Document of the State Council (2007).
- 27) This refers to 'an absolute, arbitrary power one man has over another, to take away his life whenever he pleases'.
- 28) Locke, J. (1965), Chap. XV. 172, pp.301.
- 29) U.S. 1776, *Declaration of Independence*, Paragraph 2.
- 30) U.N. General Assembly, 3rd session, *Universal Declaration of Human Rights* (A/RES/217(III)A), Preamble.
- 31) For natural persons, selling carbon emission rights outright equals selling life because they have to emit carbon dioxide by breathing.
- 32) U. S. 1776, *Declaration of Independence*, Paragraph 2.
- 33) Savic, O. (Ed.) (1999), pp.67-83.
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- 38) Li, B. Y. (1994), p.14.
- 39) 159 F. 2d 169 (2d. Cir. 1947).
- 40) See Posner, R. A. (1992), Chap. 6.
- 41) Provided by TKK Co..
- 42) Judgment of the 2nd Petty Bench, Japan's Supreme Court, 10/24/1975.
- 43) There are some conditions, i.e., reside in Tokyo over 1 year, nonsmoker, etc.. See the *Record of Settlement* of the 8th Civil Division, Tokyo High Court, 8/8/2007.
- 44) Williamson, O. E. (1985), pp.18.
- 45) The counterparties may be the rights owner, or third parties like supplier of emission reduction devices.
- 46) This institutional theory of solving problem is possibly an explanation of 'majority' democratic system, which is a plain democratic system generated in previous condition of undeveloped science, asymmetric information and high-transaction cost. Later as the information revolution, in particular from the second half of 20th century, transaction cost reduced widely, this institution is changed gradually. But in the new issues like air pollution, the effect of transaction cost resurfaces again, and assign practical value to this system.
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(Graduate Student, Graduate School
of Economics, Nagoya University)