Far Eastern Studies Vol.9 March 2010
Center for Far Eastern Studies, University of Toyama

Review Article

Measures to Protect the Environment and Conserve Energy Taken by the United States and Japan: Review of Quantitative Analysis

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Abstract

This paper reviews policy measures to deal with the environmental problems and energy conservation in Japan and the United States. First, we examine Japan's policy toward air pollution. Second, we discuss the effects of energy conservation policies in the consumer sector in Japan and the United States. Third, we review the voluntary approach to ameliorating environmental problems that have recently garnered attention. By reviewing the studies evaluating these policies, we find that the policies have been mostly successful in both countries. We conclude the paper by discussing the necessity for the future research in applying these policies to local cities in Asian countries.

1 Introduction

While cities in Asia have achieved rapid economic growth, they suffer from a variety of environmental problems. On the local level, Asian cities are plagued with serious air pollution and on the global level they face the consequences of global warming. At the same time, in light of expanded demand for oil and possible depletion of oil reserves in the future, Asian metropolises are expected to pay closer attention to energy security. Urban areas are thus required to promote energy conservation both to retard global warming and to contribute to energy security.

This paper reviews measures taken by Japan and the United States to tackle these issues. We pay special attention to policies that can be implemented by local governments.

[*]I appreciate editorial work and comments by Mr. Frank Baldwin. I am grateful to the Financial Support from Global Research Fund, Ministry of Environment, Japan.

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We start with recent Japan's policy toward air pollution. Second, we highlight energy conservation policies in the consumer sector in Japan and the United States. Thirdly, it is followed by the voluntary approach to ameliorating environmental problems that have recently garnered attention. Finally, we conclude the paper by discussing the necessity for the future research in applying these policies to local cities in Asian countries.

2 Japanese Countermeasures against Air Pollution

During the period of rapid economic growth from the mid-1960s, Japan had extremely serious air pollution. During the 1970s in particular a number of well-known law suits were filed by pollution victims. With the introduction of various regulations, however, Japan succeeded in improving air quality.

2.1 Regulations on Fixed Emission Sources (Factories)

2.1.1 Regulatory Measures

The causes of air pollution can be roughly divided into two categories: fixed emission sources such as factories and mobile emission sources such as automobiles. Historically, regulations on the former preceded those on the latter in both Japan and the United States. The first fixed emission source to be regulated was sulfur oxide (SOx).

Sulfur oxide has been dealt with by a regulation applied to specific facilities called the k-value control and by the total pollutant load controls imposed on factories in 24 regions designated by the government. Introduced in 1968, k-value control regulates the height of exhaust. Total pollutant load controls have been applied since 1974 to areas where emission sources are concentrated, such as industrial complexes, where it is difficult to fulfill environmental quality standards with the k-value control and other controls on individual facilities. For each of these areas, the estimated pollutant concentration is calculated by air diffusion simulation, which provides a baseline for permissible emission within environmental quality standards. This amount is applied to every factory in the region[1]. In these regions, total pollutant load control standards and fuel usage standards are determined from the total emission reduction plans prepared by local governments.

[1]See EIC net: `http://www.eic.or.jp/`

For factories that are too small for an across-the-board regulation, a limitation is imposed on the sulfur content of the fuel.

2.1.2 Economic Measures: Levy on Sulfur Oxide

Particularly noteworthy about Japan's air pollution regulations on fixed emission sources is the levy on sulfur oxide. As the result of a series of landmark pollution law suits, factories in the areas with serious air pollution in Tokyo, Nagoya, and Osaka are now obliged to compensate air pollution victims for damage done to their health. To finance this compensation, a levy is imposed on the emission of sulfur oxide from local factories. It is a de facto environmental tax though it is not hence called that and legally it may not be categorized as such. An economic penalty can be an effective regulatory tool (Committee on Japan's Experience in the Battle against Air Pollution, 1997)[2].

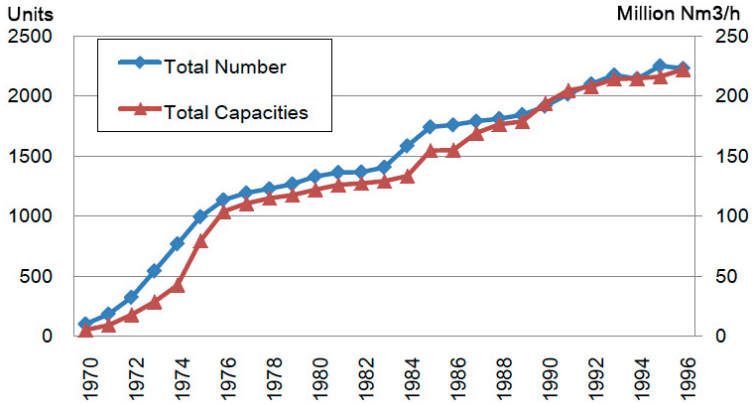

Figure 1: Changes in the Number of Desulfurizers Installed

The levy system has promoted the installation of the exhaust gas desulfurizer. According to a survey on the enforcement status of the Air Pollution Control Act[3], both the number of exhaust gas desulfurizers installed and their total capacity rapidly increased in the first half of the 1970s (see Figure 1).

[2]The committee was set up on the Pollution-Related Health Damage Compensation and Prevention Association. The association was restructured into Environmental Restoration and Conservation Agency of Japan in 2004.

[3]In 1968, this law was legislated to conserve citizen's life and environment. The latest revise on the law which introduced regulation on volatile organic compound was enacted in 2004.

2.1.3 Effects of Regulations

Regulations of factories enormously reduced air pollution from sulfur oxide. The concentration of sulfur oxide in the air had decreased greatly by the mid-1980s (see Figure 2).

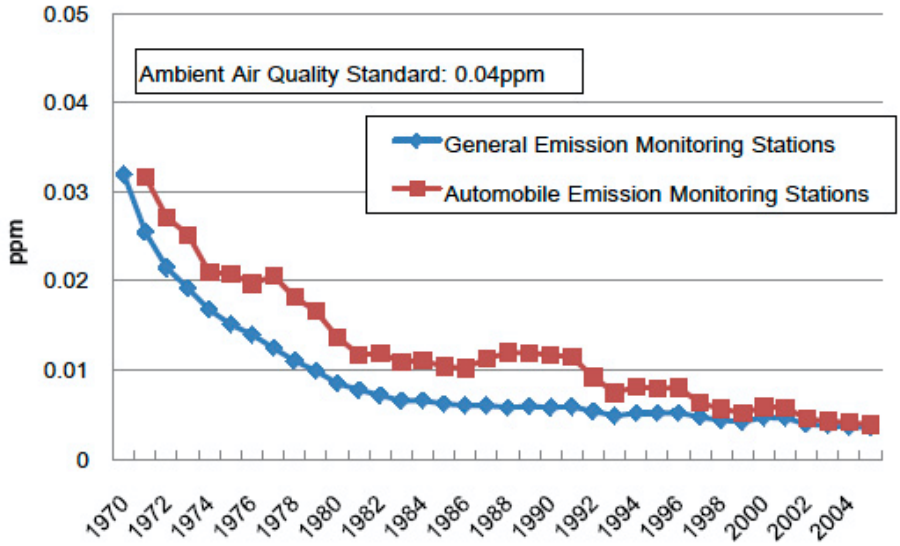

Figure 2: Average Concentration of Sulfur Oxide

2.2 Regulations on Automobiles

2.2.1 Vehicle Unit Regulations

Vehicle unit regulation, the centerpiece of laws on automobiles in Japan, sets the upper limit to the amount of chemicals emitted by an automobile over a one-kilometer drive (called "emission intensity"). Japan adopted the emission gas standard on CO in 1966; NOx and HC were added in 1973 and PM (particulate matter) in 1993; and the standard was tightened every year thereafter. The changes are shown by type of vehicle in Figure 3 below.

2.2.2 Automobile NOx-PM Law: Vehicle Type Regulation

Despite vehicle unit regulations, the achievement rate of environmental standards for NOx and PM in metropolitan areas remained low. Continued and enhanced efforts not

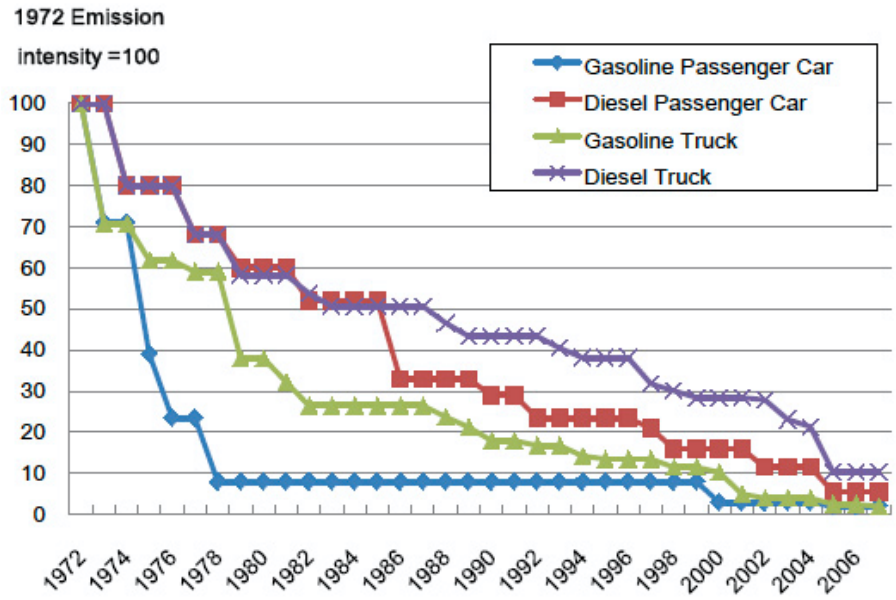

Figure 3: Changes in Automobile Emission Standards on NOx

withstanding, the improvement in NOx concentration at roadside air pollution monitoring stations remained limited (see Figure 4). In fact, only 43 percent of monitoring stations in the metropolitan areas met the national ambient air quality standard for NOx in 1998. Achievement of the environmental standard for PM was even worse at 36 percent.

In order to improve the situation, the Automobile NOx-PM Law was enacted in 2001. This law prohibits registration of a vehicle with a high polluting level (which is synonymous with setting the terminal year for the use of such vehicles). The law is intended to improve NOx concentration by shortening the life span of older vehicles, thereby inducing a switch to newer, less polluting vehicles. Because the law sets the limit by vehicle type, it is called "vehicle-type regulation." This law applies in 276 municipalities in three metropolitan areas (designated " specified areas "). For the terminal year of each type of vehicle, see Table 1.

The law applies to all vehicles currently in use except gasoline passenger/special purpose vehicles. Vehicles that met the 2005 Emission Gas Standard, the newest vehicle unit regulation standard adopted after enactment of this law in 2001, were exempt. Since all vehicles marketed after 2002 met this 2005 Emission Gas Standard, they were

Table 1: Terminal Years for Vehicle Registration Stipulated by Vehicle Type Regulation of the Automobile NOx-PM Law

Initial Registration Year	Vehicle Type	Standard	Small	Standard	Small	Standard	Small	Standard	Small	Standard	Small
		Truck		Bus		Special Use		Passenger Car			
	inspection	every two year						every one year		every two year	
1988 or before		2004	2004	2005	2004	2004	2004	2004	2004	2005	2005
1989		2004	2004	2005	2005	2005	2005	2004	2004	2005	2005
1990		2005	2004	2005	2005	2005	2005	2005	2005	2005	2005
1991		2005	2005	2006	2005	2005	2005	2005	2005	2005	2005
1992		2005	2005	2006	2005	2005	2005	2005	2005	2005	2005
1993		2005	2005	2006	2006	2006	2006	2005	2005	2005	2005
1994		2006	2005	2007	2006	2006	2006	2006	2006	2005	2005
1995		2006	2006	2008	2006	2006	2006	2006	2006	2005	2005
1996		2006	2006	2009	2007	2007	2007	2006	2006	2006	2006
1997		2007	2006	2010	2008	2008	2008	2007	2007	2007	2007
1998		2008	2007	2011	2009	2009	2009	2008	2008	2008	2008
1999		2009	2008	2012	2010	2010	2010	2009	2009	2009	2009
2000		2010	2009	2013	2011	2011	2011	2010	2010	2010	2010
2001		2011	2010	2014	2012	2012	2012	2011	2011	2011	2011
2002		2012	2011	2015	2013	2013	2013	2012	2012	2012	2012

automatically exempt from the Automobile NOx-PM Law (Ministry of Environment, 2005)[4].

Vehicle type regulation was the first attempt in Japan to reduce the impact on the environment caused by older vehicles. No other country has a similar regulation on vehicles in use. Arimura and Iwata (2008a) and Iwata and Arimura (2009) demonstrate that this regulation greatly reduced NOx and PM emissions and is highly cost effective.

2.2.3 Measures Taken by Local Governments: Driving Restriction

Under the Automobile NOx-PM Law, local governments not only encourage the prevention of air pollution but are also supposed to take action themselves. In addition to the vehicle type regulation implemented by the national government, some local governments, in order to lower PM concentration levels, have adopted a "driving restriction" that prohibits the use of older vehicles. Ten municipalities regulate automobile emissions: Tokyo, Chiba, Kanagawa, Saitama, Osaka, and Hyogo Prefectures as well as Chiba, Saitama, Kawasaki, and Yokohama. (The eight around Tokyo are hereinafter referred to as the "eight municipalities").

These eight municipalities ban old diesel trucks, buses, and special motor vehicles that do not meet the 1999 Emission Gas Standard. In order to drive these vehicles owners

[4]Due to the 2005 Emission Gas Standard set forth in 2001, manufacturers were prohibited from marketing vehicles that did not meet this standard after 2002.

are required to install designated PM removal equipments. Owners are given a certain grace period–seven years after the initial registration year across the board–before they must install the device. While the vehicle type regulation implemented by the national government is targeted at vehicles that do not meet the 2005 Emission Gas Standard, municipal regulations apply only to vehicles that do not meet the 1999 Standard.

2.2.4 Effectiveness of Regulations

As the result of these national and local government measures, about 91 percent and 93 percent of roadside air pollution monitoring stations achieved the environmental standard for NOx and PM, respectively (Ministry of Environment, 2008). Regarding concentration of NOx (Figure 4) and PM (Figure 5), while the maximum value of PM rose in 2001, both emissions declined steadily after 2001. This improvement is mostly attributable to vehicle type regulation by the national government and driving restrictions by local governments.

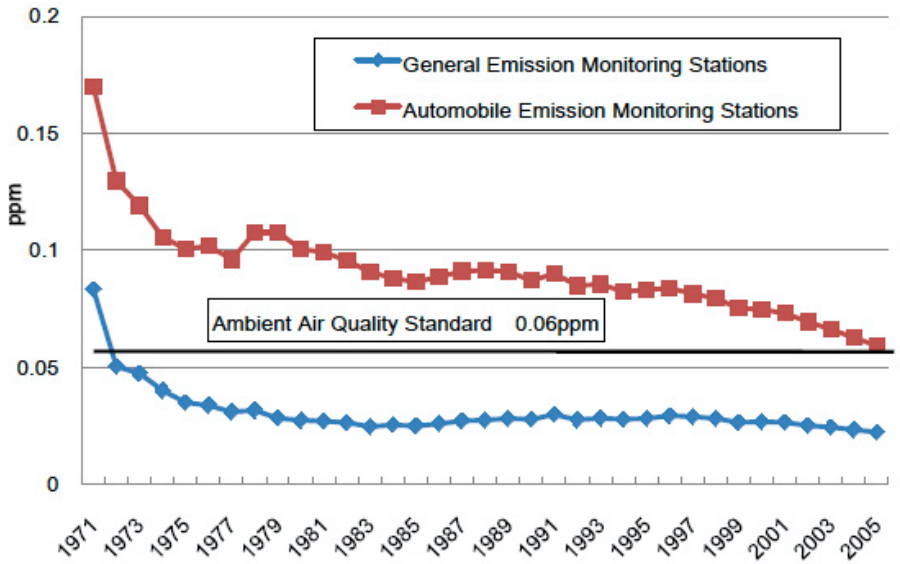

Figure 4: Changes in Annual Average Concentration of NOx

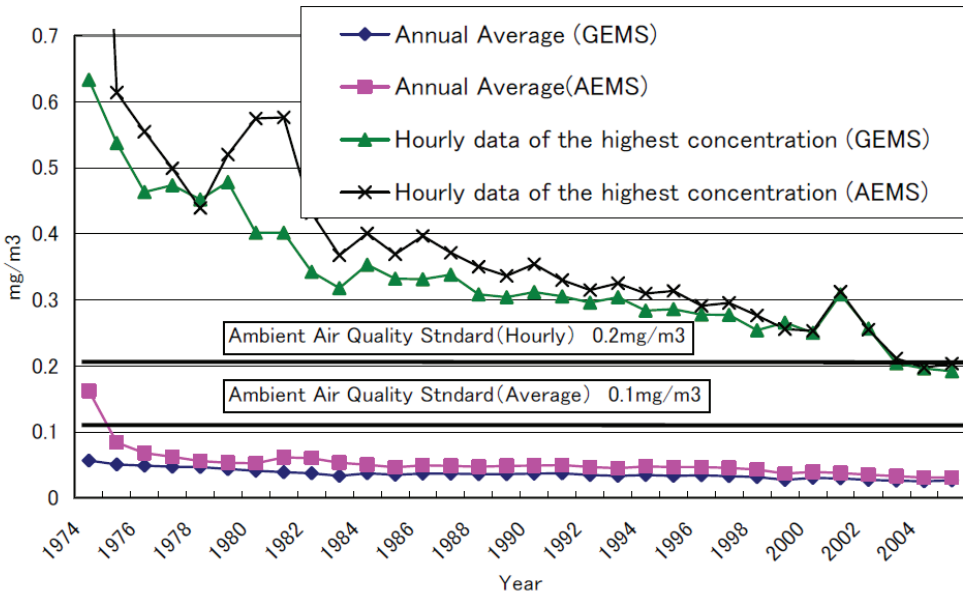

Figure 5: Changes in Annual Average Concentration of PM and Hourly Data of the Highest Concentration

Note: GEMS: General Emission Monitoring Stations, AEMS: Automobile Emission Monitoring Stations

3 Energy Conservation Policies in Japan and in the United States

Main sources of greenhouse gas are the industrial, (residential and commercial) consumer, and transport sectors. Emission amounts vary greatly by sector. In Japan, while greenhouse gas emission tends to be under control in the industrial sector, the amount of emission in the consumer and transport sectors has increased greatly compared to that in 1990. In contrast to the transport sector, whose CO2 emission has been declining since the peak year of 2001, greenhouse gas emission in the consumer sector has continued to increase (Figure 6).

The consumer sector emits about 40 percent of the total greenhouse gas in the United States and the amount has been rising rapidly. Energy consumption and greenhouse gas emission in the consumer sector will also increase in rapid growing Asian cities; energy conservation in this sector will have a significant impact on the overall fight against global warming.

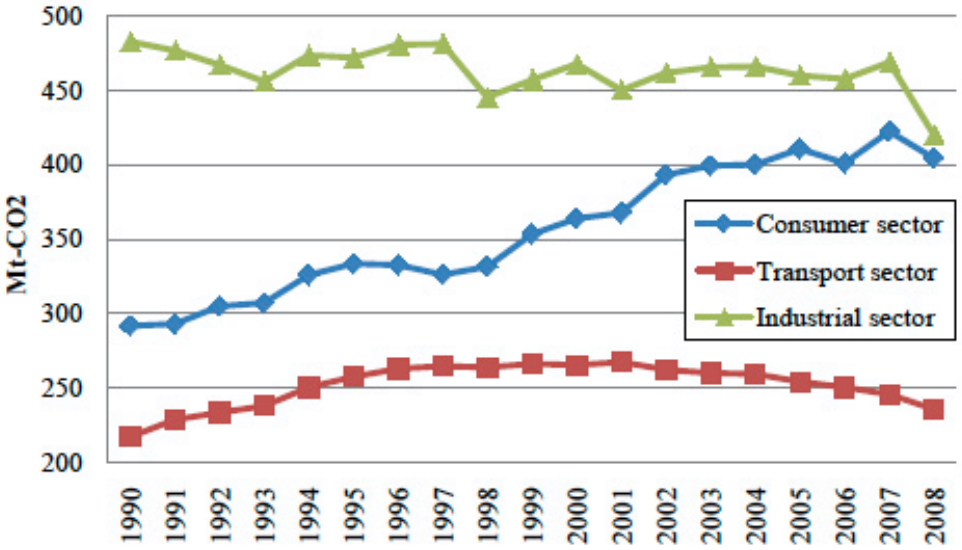

Figure 6: Annual CO2 emission by sector (Constructed from data by National Institute for Environmental Studies)

Note: the 2008 values are quick estimations

3.1 The Energy Saving Law: A Successful Case in Japan

An example of energy conservation in Japan's consumer sector is the Energy Saving Law (ESL), the popular name for the Law Concerning the Rational Use of Energy, which was enacted in 1979 to enhance energy use after the oil crisis of 1973-1974. One of ESL's important provisions is the so-called top runner regulations.

Energy management under ESL aims to reduce energy use in designated establishments by 1 percent per basic unit[5]. Although the target is less energy use (heat/electricity) and not greenhouse gas, lowering heat and electricity use entails decreasing consumption of fossil fuel and contributes to the reduction of greenhouse gas emissions. In recent years, the ESL has been categorized as a countermeasure against global warming[6]. ESL is explicitly cited in the Kyoto Protocol target achievement plan and is expected to contribute to the 3-million-ton reduction of greenhouse gas in the consumer sector[7].

[5] "Basic unit" can be measured with output in manufacturing sectors. In the case of hotel industry, the size of floor space was a popular measure.

[6] Kyoto Protocol Target Achievement Plan, 2005.

[7] See Attached Table 1: List of Measures and Policies Concerning Energy-originated Carbon Dioxide, Kyoto Protocol Target Achievement Plan, available at http://www.kantei.go.jp/foreign/policy/kyoto/050428plan_e.pdf

3.1.1 Energy Management in ESL

ESL divides fuel into “heat” and “electricity” and encourages fuel conservation in establishments that exceed the designated amount of either. Under the amended ESL of 2003, a factory that uses more than 3,000 kl (oil equivalent) of fossil fuel per year is classified as a Type 1 designated heat management factory and a factory that uses more than 1,500 kl per year is classified as Type 2. In terms of electricity use, a factory that consumes more than 12 million kwh per year is classified as a Type 1 designated electricity management factory, while a factory that uses more than 6 million kwh per year is classified as a Type 2. Establishments subject to ESL must designate energy management specialists, including qualified heat and electricity managers, and keep records on heat and electricity usage. These factories must periodically report the amount of electricity and heat consumption, the amount of production, and the energy use per units of production. They also report their own energy saving measures.

Obligations and sanctions differ for Type 1 and the Type 2 facilities. The former are required to prepare and submit a mid- to long-term plan on energy conservation. The latter are supposed to improve their operations if their energy saving efforts are found to be unsatisfactory. Type 1 factories must prepare and implement a rationalization plan. Their owners are requested to exercise more stringent control on its operation, which is expected to provide an incentive to conserve energy. How is the “ thorough management of energy ” stipulated by ESL actually implemented?

The relevant administrative authority conducts on-site inspections of factories to encourage compliance. At the self-inspection conducted at each factory on the occasion of an on-site inspection, managers must rate on a scale from zero to two such elements as the control standard, compliance with the standards, and the measuring, recording, conservation, and inspections for each main facility. If the total score is less than 50 points, the factory’s energy use rationalization efforts are rated unsatisfactory and it is subject to on-the-spot inspections and factory staff are instructed in the rationalization plan (The Energy Conservation Center, Japan, 2005).

3.1.2 Effects of the Energy Saving Law

Arimura and Iwata (2008b) examined the effect of ESL on inns and hotel industry subject to the law and found that greenhouse gas emission was reduced by 3.2 percent from heat use and 1 percent from electricity use between 2002 and 2004 (see Table 2). The effect was particularly significant in establishments designated as Type 1 facilities, qualitatively endorsing energy management under ESL as a countermeasure against global warming.

Table 2：Effect of the Energy Saving Law on Inns and Hotels (2002-2004)

	Heat	Electricity
Amount of energy saved	3.20%	1.00%
Amount of CO2 reduced	22,650 tons	7,436 tons

3.2 Energy Conservation Drive in the U.S. Consumer Sector

In the United States, an energy saving standard is applied to electric appliances and to buildings as a part of energy saving measures in the consumer sector.

3.2.1 (Mandatory) Appliance Standard

The system of (mandatory) appliance standards to conserve energy was first introduced in California in 1977 and targeted refrigerators and freezers. The state government expanded the list to include fluorescent lights, various air conditioning devices, air-conditioning equipment for entire buildings, furnaces, boilers, water heaters, and shower heads. Other states, including New York, followed suit. The federal government enacted the National Appliance Energy Conservation Act (hereinafter NAECA) in 1987. The NAECA imposes energy conservation standards on fifteen home appliance products (refrigerator, freezer, washing machine, clothes dryer, dish washer, cooking range, electric oven, air conditioner, electric heater, water heater, etc.) (Arimura et al. 2007).

The initial standards have been raised several times. In the Energy Policy Act of 1992,

standards were set on such products as induction motors, various kinds of light bulbs, and air conditioners for commercial use and these were updated in 1997, 2000, and 2001 to reflect technological advances. Sixteen products were added to the list in the Energy Policy Act of 2005. Between 2008-2011, fluorescent lights, dehumidifiers, and clothes dryers will come under the standard. The New Energy Act enacted by the 110th Congress imposes more stringent rules on light bulbs. The incandescent light bulb developed by Thomas Edison will disappear from the market in a few years, replaced by compact fluorescent lights and light-emitting diodes. The original NAECA stipulated that federal standards take precedence over state standards, but it allowed state governments to set their own standards on products not covered by federal law. The Department of Energy failed to update within the time limit standards on 20 products designated by the 1992 federal act, enabling states to set their own efficiency standards on those products. In California, for instance, efficiency standards were added in 2004 on 17 products, including incandescent light bulbs and swimming pool pumps.

3.3 Energy Saving Building Code

Building promote energy saving by setting the minimum energy efficiency standard on such items as the floor, wall, ceiling, and window of residential and commercial buildings.

State governments have also taken various independent measures in this field. The first building code regarding energy was adopted by California in 1977, followed by Florida, New York, Minnesota, Oregon, and Washington in the 1980s. Also in the 1980s, the Council of American Building Officials established a model energy standard that was renamed the International Energy Conservation Code (IECC) in the 1990s with the purpose of integrating measures taken independently by various states. Standards for commercial buildings are set by the American Society of Heating, Refrigerating, and Air-Conditioning Engineers (ASRHAE) and other related organizations. As of December 2006, a building code for energy conservation had been adopted by 39 states and Washington, D.C. Figure 7 illustrates the stringency of residential building codes by state. It should be noted, however, that these building codes are not without problems. The framework for ensuring compliance may be inadequate and there is a great discrepancy in the degree of compliance among states. (ACEEE).

In this field, the federal government has provided information on energy efficient buildings, in cooperation with ASRHAE and others, as well as economic incentives rather than establishing its own regulations. For instance, the 2005 Energy Act offers a $2,000 tax deduction to buildings whose energy efficiency exceeds the IECC standard of 2003 by more than 50 percent.

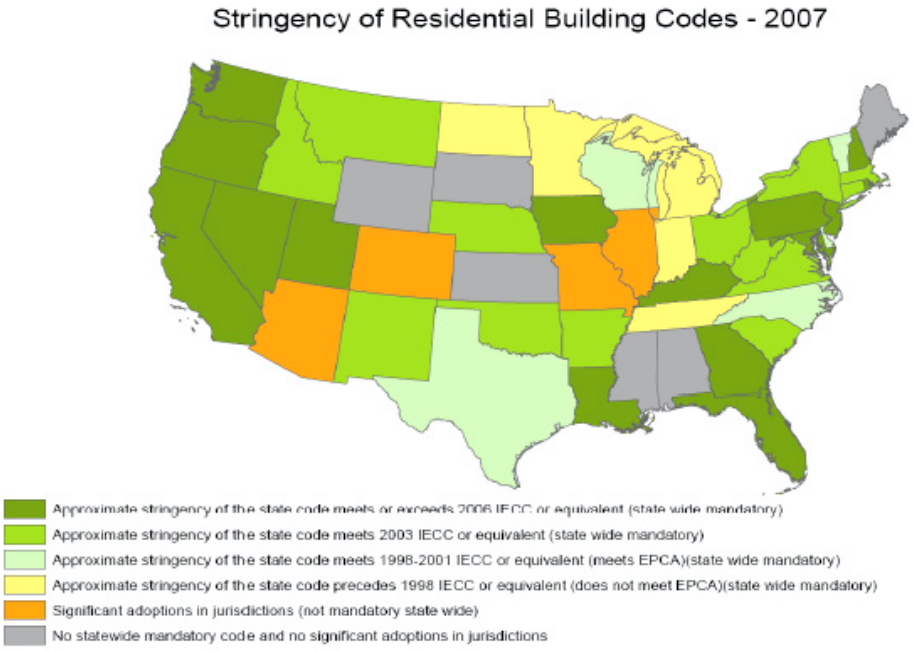

Figure 7：Stringency of Residential Building Codes

Source: Arimura et al. 2009, p.29

3.4 Utility Efficiency Program: DSM Energy Efficiency Expenditure

One distinctive feature of U.S. energy conservation efforts is the active participation of power companies through Demand-side Management (DSM) to reduce peak loads. In addition, U.S. power companies have funded energy saving programs (DSM Energy Efficiency Expenditure). This funding is usually financed by an extra fee in the electricity bill. DSM Energy Efficeincy Expenditure has been used for a variety of purposes. First, it funds education and public relations activities concerning efficient use of electricity and dissemination of information on conservation technologies. Second, it has been used to finance low-interest loans and subsidies for consumers who upgrade to more energy-efficient

equipment. The figure below depicts the changes in the energy saving expenditures of U.S. power companies. After peaking in 1993 at $1.6 billion, they shrank rapidly as deregulation progressed. The incremental upward trend has returned since 1998 due to the greater attention paid to global warming and energy security, except for temporary drops in 2003. In 2006, expenditures reached $1.25 billion.

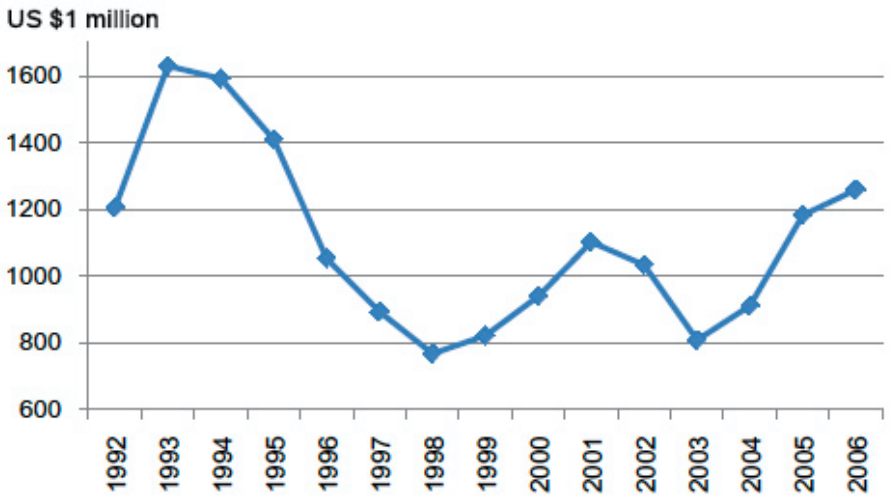

Figure 8：Changes in Energy Saving Expenditure

Note: Constructed by the author on EIA86

In recent years the effectiveness of these energy saving expenditures has been widely debated. According to reports and studies by U.S. power companies, the cost to save 1kwh of electricity varies between $0.008 and $0.229[8].

3.4.1 Effects of Energy Saving Policy: The Case of California

What impact have these energy saving standards had so far? In California they have restrained power consumption. National per capita average power consumption increased by 50 percent in the 25 years after 1975. In contrast, per capita consumption in California hardly rose. This accomplishment is credited to the efficiency standards for electrical appliances and the energy conservation standards for buildings, as well as to energy saving programs carried out by power companies. Figure 9 below shows the contribution each made to energy conservation (control of power consumption) in California.

[8]Gillingham et al.(2006)

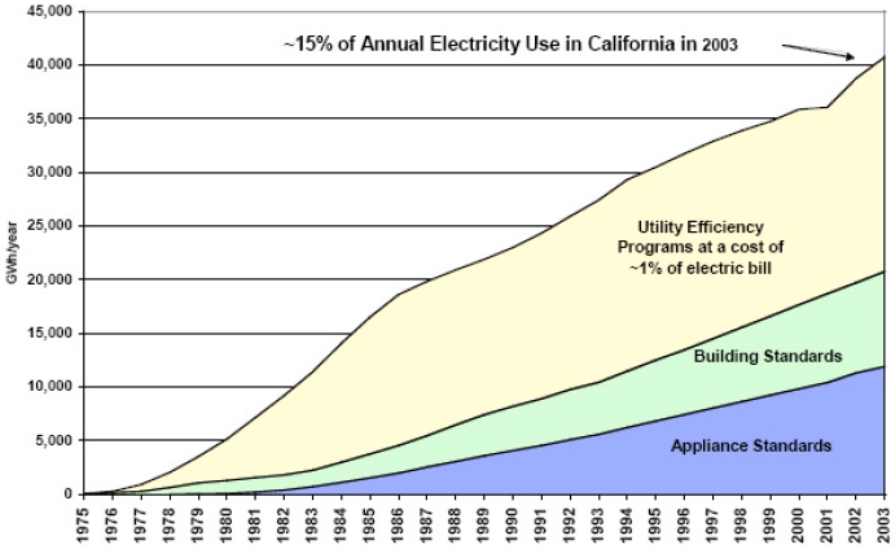

Figure 9: Components of Energy Conservation Efforts in California

Source: Rosenfeld , 2007

4 Voluntary Measures

Economic measures such as the environmental tax and carbon emission trading are important and have been adopted. Because reaching a consensus to adopt them often takes a long time, however, a system to facilitate voluntary measures by private corporations has drawn attention in Japan and the United States[9].

4.1 What is a Voluntary Approach?

The voluntary approach has several variations. One form is an emission reduction goal set through negotiations between the government and several private corporations. An example of this type is Japan's Pollution Control Agreement (Welch and Hibiki, 2002). Local governments try to use this format with corporations operating in their areas to reduce the concentration of emissions below the official standard. These agreements are only binding on corporations and offices that sign up. There are cases where private corporations voluntarily participate in a program implemented by the government and/or a

[9]For example, Morgenstern and Pizer (2007) verified the effects of voluntary approaches in various countries.

a public authority to reducedamage to the environment[10]. For instance, the United States has a voluntary program to reduce toxic chemical compounds (33/50 Program) and one to cut energy consumption by private corporations (Green Light Program). Participating companies pledge to achieve a specific goal. Since the names of the corporations are announced, they gain a reputation as friendly to the environment among consumers and investors. Failure to achieve the stated goal, however, is not penalized.

4.2 A Voluntary Approach in Japan: ISO1400 Certification

4.2.1 4.2.1 What is ISO14001?

In recent years, environmental management has become increasingly important for private corporations. Many have embraced ISO14001, a standard adopted in 1996 by the International Organization for Standardization to create an intra-corporation/office management system to reduce environmental damage. Because it is up to the discretion of each corporation/office whether to obtain ISO certification, ISO14001 is a voluntary approach. Corporations/offices that want certification establish a " PDCA " management cycle, i.e.,"plan, do, check, and act" for the reduction of emissions of toxic substances. The "act" refers to reviewing the plan after checking its achievements. Certification is valid for three years; participants are subject to regular outside audits. Those who wish to renew the certification must undergo an inspection. Enrolled organizations that are found unsatisfactory in terms of PDCA criteria in an outside audit or renewal inspection lose ISO certification or are denied renewal. According to the International Organization for Standardization (2007), 129,199 corporations in 140 countries had obtained certification as of December 2006. Compared to 5,585 in the United States and 5,415 in Germany, 22,593 corporations/offices in Japan are certified, giving Japan by far the largest number of ISO certifications.

The effect of environmental management in general on the reduction of environmental damage has been studied by Anton et al. (2004). Even ISO certification alone has been proven effective in reducing corporate emissions. For example, Potoski and Prakash

[10]There also is a case of the voluntary approach in which business organizations take the initiative in setting the emission reduction goal and request member corporations to comply with this goal, including the Federation of Economic Organization's " Keidanren Voluntary Action Plan. " It is discussed in detail in Wakabayashi and Sugiyama (2007), but it is beyond the scope of the present paper.

(2005), using data from U.S. companies, demonstrated that ISO certification can lead to the reduction of chemical substances. Arimura et al. (2008), using data from Japanese manufacturers, showed that ISO certification has reduced resource use and emission of solid waste.

4.2.2 Encouragement of a Voluntary Approach by Local Governments

Environmental management via ISO14001 is typically a voluntary measure taken by private corporations. Local governments have also implemented various measures to facilitate these voluntary steps, as shown below (Hibiki and Arimura, 2004).

(a) Reduce the frequency of regulatory inspections

(b) Expedite environmental permits

(c) Consolidate environmental permits

(d) Waive environmental regulations

(e) Reduce stringency of regulatory thresholds

(f) Offer technical assistance

(g) Provide financial support

(h) Give special recognition or awards

(i) Implement preferences for public procurement ("Green Purchasing")

(j) Disseminate information about the value of environmental management

Arimura et al. (2008) reveals that, thanks to these measures, the number of corporations obtaining ISO14001 in Japan has increased by 13.5 percent, proving that local governments can facilitate voluntary measures in the private sector.

4.3 Example of the Voluntary Approach in the United States: "Energy Star"

To improve the energy efficiency of corporations and individuals, the U.S. government has implemented a voluntary program called "Energy Star" that covers five major areas[11]

(a) Products

(b) Home Improvement

(c) New Homes

[11] `http://www.energystar.gov/`

(d) Commercial Buildings and Plants

(e) Partner Resources

The program is well known for endorsing qualified products with an "Energy Star" label and has set its own efficiency standards for more than 50 products. Products that meet the standard receive the label of energy star, which is believed to influence consumers to purchase energy-efficient goods. While the mandatory appliance standards apply to conventional products such as washing machines and refrigerators, The Energy Star program encompasses relatively newer products such as computers. In July 2007, for instance, the labeling policy for computers was amended and 649 models from 35 manufacturers were recognized as Energy Star products. New buildings are also eligible under the program, including the construction of energy-efficient new houses and a $1,000 tax credit for buildings that meet a certain standard. The program covers existing buildings too, for instance, through technical assistance to enhance the efficiency of air-conditioning.

Energy Star also helps to improve energy efficiency in existing commercial buildings and industrial plants through energy management. Buildings and factories that meet the standard can call themselves "Partners of Energy Star." The Energy Management Guideline, for offices advocates seven actions:

Step1： Make a Commitment

Step2： Assess Performance

Step3： Set Goals

Step4： Create Action Plan

Step5： Implement Action Plan

Step6： Evaluate Progress

Step7： Recognize Achievements

Step1 has three stages: (a) designate the personnel in charge of energy management; (b) form an energy team in the office, and (c) create the energy plan. In Japan, too,

designation of personnel at the office level is mandatory under the Energy Conservation Law. In Japan, however, energy consumption is divided into heat and electricity and offices are required to have both certified heat managers and certified electricity managers. Both Energy Star and Japan's Energy Conservation Law stress the importance of on-site energy managers. The steps above are illustrated in Figure 9. The circle indicates that steps four through seven are repeated over and over. The arrow-tipped line indicates all six steps (excluding the first) are repeated through Re-Assess. In that sense, this guideline is similar to ISO14001, which repeats the PDCA (Plan, Do, Check, Action).

Figure 10: Energy Management under Energy Star

Source: `http://www.energystar.gov/index.cfm?c=guidelines.guidelines_index`

This program is available on the Energy Star website. Those who accomplish the following steps qualify as a "Partner of Energy Star":

(a) Measure energy performance and set the benchmark

(b) Make a plan to improve energy performance by adopting the strategy recommended by Energy Star

(c) Inform colleagues and the public that they are a " Partner of Energy Star " and what that means

This kind of affirmative labeling is also applicable to buildings. Energy Star certification, like ISO14001, announces that the building manager is taking actions that are environmentally friendly.

How does this method conserve energy? One way is efficient utilization of existing facilities, in other words, refraining from wasteful practices. Another is investment in new conservation methods. The Environmental Protection Agency (EPA) expects that building managers will not only pursue efficient energy use in existing facilities but also become aware of hitherto unnoticed opportunities for conservation, investment, and technology.

4.3.1 Effects of Energy Management

According to EPA (2006), some 15,000 organizations have participated in the Energy Star management program[12]. This is equivalent to 16 percent of the total space in U.S, commercial buildings. Given that 18 percent of the total emission of CO2 in the United States comes from commercial buildings, this is not a negligible number[13].

How effective has energy management been in energy conservation? EPA (2003) estimates that it improved energy efficiency by 20 percent to 30 percent. Although that does not mean total energy consumption was reduced by 20 percent, nevertheless it is a significant impact. EPA's provisional calculation of the effect of energy management in absolute terms, based on the estimate of Horowitz (2001), suggests that more than 47.5 billion kwh was conserved[14].

5 Conclusions

This paper summarized air pollution policies, energy conservation policies and voluntary measures to tackle environmental issues in Japan and the United States. We reviewed studies evaluating the effectiveness of these policies. Most of the studies find that these policies have been successful in both countries. The experiences of the environmental policies and energy conservation policies reviewed in this paper may give valuable lessons to local governments in Asia.

[12]Climate Protection Partnerships Division, U.S. Environmental Protection Agency. (2003).
[13]`http://www.energystar.gov/index.cfm?c=business.bus_protect_environment`
[14]Table 3 in Climate Protection Partnerships Division, U.S. Environmental Protection (EPA, 2003).

It is not clear, however, whether these policies can be successfully applicable to cities in Asia. For example, the success of energy conservation policy in Japan may depend on the unique relationship between the regulators and private sectors. Thus, some caution or modification may be needed before they are introduced to Asian cities. Future research is needed to examine the conditions for the applicability of the reviewed policies to Asian cities.

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