<Chapter 13> Cross-border Diffusion of Energy Policy in Asia: The Case of Energy Efficiency Standard and Labeling (EES&L) (Part V: Hybrid systems in environmental governance)

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1. Introduction

Cross-national diffusion, along with multilateral harmonization and unilateral imposition, is an international governance mechanism that can influence domestic politics (Busch and Jörgens, 2005). It is defined as a process of imitation or learning where information about innovative practices in one setting affects policy choice in another (Jörgens, 2004). Institutionalized diffusion under certain circumstances may increase the degree of convergence (Busch and Jörgens, 2005).

However, international institutionalized diffusion does not spread all the environmental policies and instruments rapidly. Four groups of factors influence the probability, the speed and the course of policy diffusion: (a) the existence of international or transnational channels of communication through which information on policies in other political constituencies can be communicated; (b) the specific properties of policy innovations; (c) the specific structure of the problem that a given policy is expected to deal with; and (d) the national capacities for adopting particular policy (Jörgens, 2004).

Jörgens (2004) also draws on the case of sustainable development strategy and National Environmental Action Plan to illustrate how different governance mechanism can both strengthen and obstruct each other. Tews et al. (2003) determine from the case of eco-labels that the potential of international trade can be a conduit for policy diffusion. They also suggest that policy convergence by diffusion may not only be motivated by considerations of efficiency improvement, but instead or additionally by considerations of generating legitimacy.

This chapter focuses on the energy efficiency standard and labeling (EES&L). EES&L has been widely spread over sixty nations as an innovate public policy for energy saving in the household sector. According to a survey by the International Energy Agency (IEA), climate change is the top driver for energy efficiency in IEA member nations, while energy security and economic development are the most important drivers in non-IEA Asia (IEA, 2010). With rising income levels, Asian nations have paid more attention to energy savings of the residential and commercial sectors. Aiming for domestic market transformation for clean energy products, many of them have adopted and/or attempt to adopt EES&L. In this context, energy-efficient home appliances and office equipment have become commonplace. Thus, climate change has become an important driver in several Asian nations, although their international commitment for domestic greenhouse gas (GHG) emissions reduction in the context of international negotiation is still lacking.

While many major governments have adopted EES&L for energy conservation, assessments with regard to its policy effectiveness have generated mixed results so far. Schiellerup (2002) showed that the minimum standard resulted in substantial energy savings in the United Kingdom. Various studies found substantial impacts of upgraded energy efficiency standards (Rosenquist et al. 2006; Blesl et al., 2007). Colombier and Menanteau (1997) showed that annual electricity consumption of standard size refrigerators was improved from 900kWh in 1990 to 690kWh in 1993 when the United States had implemented the first federal standards in 1987. The equipment energy efficiency program in Australia is expected to reduce household electricity use in 2020 by about 13% compared with business as usual (George Wilkenfeld and Associates Pty Ltd, 2009). KEMCO (2008) also finds that refrigerators' annual energy consumption decreased by over 60% and energy efficiency of air conditioners increased by 15% from 1996 to 2006 in South Korea which has implemented energy efficiency standards and labeling program in 1992. The energy efficiency standards and labeling programs currently in place in China are expected to save a cumulative 1,143TWh, or 9% of the cumulative consumption of residential electricity in 2020 (Fridley et al., 2007). Meanwhile, Herring (1994) shows that labeling has not had the expected effect on consumer behavior, mainly due to technical reasons, such as unsuitable or insufficient information provided to the consumer.

This chapter aims to examine to what extent the EES&L has been seriously adopted in Asia, with special focus on the four groups of factors shown by Jörgens (2004).

2. What is the EES&L Program?

2.1 Definition of EES&L

Energy-efficiency standards are procedures and regulations that prescribe the energy performance of manufactured products (Wiel and McMahon, 2003). Here we use the term "test protocol" as specifications regarding testing, and "standards" as target limits on energy performance. Wiel and McMahon (2003) have divided energy efficiency standards into three types—prescriptive standards, minimum energy performance standards and class average standards. Prescriptive standards require that a particular feature or device be installed in all new products. Minimum energy performance standards (MEPS) specify the minimum level of efficiencies that manufacturers must achieve in each and every product, but not the technology or design details of the product. Class average standards specify the average efficiency of a manufactured product, allowing each manufacturer to select the level of efficiency for each model so that the overall average is achieved (Wiel and McMahon, 2003).

Energy-efficiency labels are informative labels affixed to manufactured products to describe the product's energy performance, providing consumers with the data necessary to make informed

purchases. There are two types of labels: endorsement and comparative labels. Endorsement label is a seal of approval given according to specified criteria. Comparative label allows consumers to compare performance among similar products using either discrete categories of performance or a continuous scale (Wiel and McMahon, 2005).

While labeling programs can be mandatory or voluntary, MEPS are mandatory in general. Endorsement labels are usually voluntary while comparative labels can be mandatory or voluntary. The majority of labeling programs are implemented by governments, but some endorsement labels are introduced by non-profit organizations or industry associations (Steenblik et al., 2006).

2.2 Rationale, types and effectiveness

It is well known that the purchasing behavior of the consumers is sensitive to different attributes, such as price, brand, and appliance features, but rarely to the energy criterion. This indifference has often been regarded as a strong barrier to the diffusion of energy-efficient appliances (Colombier and Menanteau, 1997). Energy efficiency regulations and labels aim for market transformation that is shown in historical rates of changes. Standards shift distribution of energy efficient models of products upward by eliminating the least efficient models. Labels also shift the distribution of energy efficient models of products upward by providing information with consumers to make rational decisions and by stimulating manufacturers to design products whose efficiency is higher than the minimum standard (Wiel and McMahon, 2003).

MEPS have an advantage in eliminating less energy efficient appliances from the market. However, it cannot provide incentives for manufacturers to go beyond the prescribed performance levels. To encourage them to design new, more efficient appliances, the government has to revise MEPS to raise the standards periodically. But this arouses resistance from manufacturers because it requires company to promote research and development and to change production process. The two-tier approach is employed to convince manufacturers to comply with a more stringent efficiency level. It involves initial adoption and a more aggressive level of energy efficiency for implementation three to five years later. The time lag between the initial adoption and implementation gives manufacturers time to re-design their products and to re-tool their production facilities. This practice has been very effective in the US MEPS program and Japan’s Top Runner Program. China also adopted the two-tier approach in 2003 (Lin and Fridely, 2007).

By contrast, class average standard gives manufacturers discretion to achieve different levels of energy efficiency in various models as long as the overall energy-savings target is achieved and all the machinery and equipment products covered by MEPS exceed the standard. A typical program that employs this standard is the top runner program in Japan. It set the value of the product with the highest energy consumption efficiency on the market at the time of the standard establishment

process and standard values by considering potential technological improvements (METI, 2010). Higher target standard values in the top runner program impose substantial technological and economic burdens on manufacturers. It is estimated that each product category has attained efficiency improvement exceeding government's initial expectations: 67% of energy efficiency improvements of air conditioners as compared with 66.1% of initial expectation, and 55.2% for refrigerators as compared with 30.5% respectively.

3. State of Diffusion

3.1 EES&L diffusion profiles in Asian nations

The energy efficiency standard and labeling programs have been progressively implemented in the Asian region (Figure 13-1). A first wave of widespread diffusion occurred from the end of 1980s to the early 1990s when eight developing Asian nations including China and India implemented energy performance standards or labels for one or more energy using products [(1)].

Japan was a pioneer to adopt energy performance standard, implementing a first national energy efficiency standards for appliances as far back as 1979. The two oil crises in 1970s triggered the establishment of the "Law concerning the Rational Use of Energy" (Energy Conservation Law) in 1979 and this provided a legal basis for energy efficiency standards. Japan adopted a class-average standards system that required achieving a weighted average value by the deadline. Its initial standard program covered only three products: refrigerators, air conditioners and passenger cars. The Kyoto Protocol pushed it to implement the top runner program in 1999 that set the standard value of the product with the highest energy consumption efficiency on the market at the time of the standard establishment process as a way of achieving its obligation of reducing GHG emissions by 6% from the 1990 level. Japan's first national labeling program was implemented in 2000 in conjunction with the top runner program, two decades after an adoption of standards.

In 1985, shortly after China's economic reforms began, surging coal price and shortage of electricity supply were became public concerns in China. These spurred the government to develop China's first regulatory program on equipment standards which was established in 1989 covering refrigerators, air conditioners, clothes washers, electric irons, electric rice cookers, televisions, radios and electric fans.

China implemented the voluntary energy efficiency endorsement-labeling program similar to the US Energy Star program in 1999, and launched a categorical mandatory energy information label that was adapted from the EU categorical energy label in 2004. The initial standards program in the 1980s has been developed on Chinese government's own while labeling programs and expansion and upgrade of standards have been enhanced with international assistance such as United States Agency for International Development (USAID). Initial Chinese standards specifications were not

consistent with international norms. For example, the first refrigerator standard stipulated an absolute daily consumption figure based on the nominal capacity of the refrigerator, in contrast to the standards in Japan, the US, and EU which all use “adjusted volume” considering the size and temperature of the freezer compartment (Fridely et al, 2007). Standards have been harmonized in line with international standards during 1990s to 2000s. These were driven by international support and shift of China’s position to a major global producer and exporter of appliance product.

South Korea launched both of national energy performance standard and a categorical mandatory label in 1992. Its initial standards, covering refrigerators, air conditioners, lightings and cars, are two tiers scheme−MEPS for initial implementation and a second tier at a more aggressive level of energy efficiency for implementation three years later. In the late 1980s, it emerged as a global appliance manufacturer. Adoption of MEPS in EU and US was considered as an import restriction. It can be assumed that South Korea adopted EES&L not only to reduce domestic energy consumption but also to avoid possible global trade barrier by developed nations as attention on global environment was being placed on increasingly.

During the 1990s energy performance standards or labels have been widespread in Malaysia, Singapore, Philippines, India, Thailand and sequentially neighboring nations. In general, most of the initial programs in the Asian region were limited in scope and slowed to take effect. Then nations with strong local manufactures such as Japan, South Korea and China have expanded the scope and graded up the level of standard for ten to twenty years. However, much of the programs in the Asian developing nations have remained rather symbolic and poorly implemented due to the lack of government support and consumer awareness, which slowed down the speed of diffusion.

The second wave of diffusion came in late 2000s. An increasing number of Asian nations is in the process of developing EES&L and is expanding the scope of existing schemes. Vietnam has introduced voluntary endorsement labels for lighting in 2007 under the initiative of public lighting program by the United Nations Development Program (UNDP)[(2)], and will introduce MEPS and mandatory comparative energy information labels from 2013. Indonesia is preparing implementation of MEPS and mandatory comparative labeling program with the support of the World Bank, UNDP and Japan. India has developed voluntary based MEPS and voluntary endorsement labeling from early 1990s. However, the effect of programs has been compromised due to a lack of institutional capacity and resistance by local manufactures. India’s Energy Conservation Bill was passed in 2001 that created the legal framework and authority necessary to implement the EES&L program. Several international funding agencies including USAID, United States Environmental Protection Agency (USEPA) and United Nations Foundation (UNF) have supported the development of the EES&L program in India since the late 1990s.

Three similarities can be found in these latecomer nations. At first, international assistance that is

aiming to maximize energy savings and GHG emissions reductions has been accelerated. Secondly, domestic pressure for energy saving has risen rapidly due to budget deficit originating in energy price gap between global and domestic market and electricity shortage result from rapid economic growth. Thirdly, there emerges consumer market with fast growing penetration of appliances.

The analysis of historical EES&L diffusion profiles in Asia leads to the conclusion that the early policy adoption was uncoordinated imposition of foreign policy model. Industry structure such as presence of local manufactures has affected both of positive and negative way to the adoption of EES&L. Nations with competitive domestic manufactures such as Japan and South Korea have strengthened EES&L in the objective of industrial policy, while local manufactures resist has delayed the introduction of mandatory program or upgrade of standards level in nations such as China and India. International involvement through direct policy assistance has clearly contributed to fast adoption of EES&L, but on the other hand, uncoordinated international assistance results in variability of each program design in part.

3.2 Variations among scheme

Program design and implementation status of EES&L vary considerably among Asian nations. There are differences in the coverage of program, the state of legal binding and the stringency of efficiency thresholds specified for standards and labels across the nations, reflecting the efficiency of product markets, energy prices, timing of adoption, and levels of policy ambition. Japan, China and South Korea set the energy efficiency standards for more than twenty products while that of Southeast Asian nations covers only a limited range of products despite long history of EES&L. Table 13-1 shows the legal status of energy efficiency labeling for four major products and Table 13-2 shows the differences in EES&L scheme among Asian nations.

It should be noted here, that there are significant deviations from test procedures at the national level, which makes it difficult to compare product’s energy efficiency by nation. In other words, Asian nations do not always take the same energy efficiency formulas for calculating energy efficiency of products even if adopting international test procedures to measure energy consumption. These diversities can be explained in part by diffusion dynamic. The early adoptions during 1980s and 1990s were mainly driven by national factors with uncoordinated imposition of foreign policy model. Uncoordinated international assistance spurred the second wave of diffusion in 2000s while keeping variability of program design.

At present, ASEAN nations begin to shift their approach away from a nationally fragmented to a regionally harmonized approach, away from a voluntary to a legally based mandatory one, and away from simple endorsement to comparative energy performance labels scheme. Regional convergence of regulatory patterns in EES&L policy is expected to reduce trade barriers and

program costs.

4. EES&L Program in Practice: Case Studies of Vietnam and China

4.1 Vietnam

From 2000 to 2008, Vietnam enjoyed unprecedented economic growth, and accordingly increased energy demand. Substantial expansion of the energy sector required to meet this rapid increase in energy demand, which was deemed infeasible in the short term. The Vietnamese government approved the Vietnam National Targeted Program in Energy Saving and Energy Efficiency in 2006. This is the first-ever comprehensive plan to institute measures for improving energy efficiency and conservation in all sectors of the economy to meet the energy saving target of 3- 5% during 2006-2010 and 5-8% during 2011-2015, respectively. The Ministry of Industry and Trade (MOIT) was appointed to take charge of developing a standards and labeling program, and the Energy Efficiency and Conservation Office (EECO) was established in the ministry for implementation. The National Target Program requires that a standards and labeling program should be launched for five products in the period from 2006 to 2010, and another group of five products should be added in the period of 2011 to 2015[(2)].

In July 2007, MOIT launched a first voluntary labeling program for linear fluorescent tubes and electromagnetic ballasts. It planned to take a three-tier approach by first implementing an endorsement scheme, then introducing comparative labels and MEPS that are compatible with the international best practice, and finally expanding the coverage to air-conditioner and refrigerator. [(3)]

However, lack of legal basis and insufficient national capability forced MOIT to put off the plan until 2012. Despite a few years of discussion, the government failed to pass the Energy Conservation Act that would constitute the essential legal basis in implementing any mandatory system. EECO was forced to postpone the launch of the voluntary labeling program for air conditioner and refrigerator, which was expected to increase awareness of energy information labeling among businesses and consumers, and to accumulate administrative experience for effective implementation.

In addition, commercial operation of testing laboratory was delayed. The government adopted the testing procedures from the International Organization for Standards (ISO) and the International Electro technical Commission (IEC). Yet the start-up of the national test laboratory has been hindered by the lack of testing capacity including selection of equipment, supervision of installation, employee training, and writing of detailed operation procedures. In general, the energy performance testing methods vary across products and nations to reflect local conditions. These complicated skills are often developed in manufacturing sector that manages product development cycle. In Vietnam, the market for electrical appliances is dominated by large multinational corporations that

are usually not vertically integrated and by import components from Japan, China, Thailand, Malaysia and South Korea for assembly (Baillargeon and Li, 2008). This makes it difficult for Vietnam to find testing experts in domestic markets, and to initiate not only comparative labels and MEPS, but also voluntary labels.

4.2 China

China adopted MEPS in 1989 and started a mandatory energy information label in 2004 that covers four products including air conditioners, refrigerators, washing machines and unitary air conditioners. However, the government has primarily focused on the technical requirements for specifying efficiency performance, and paid less attention to monitoring and enforcement. It has made a minimal commitment of resources and expanded little administrative capacity in this area (Zhou et al., 2008). The China National Institute of Standardization conducted sample testing to check label information for refrigerators and air conditioners in 2006 and for refrigerators, air conditioners and washing machines in 2007. Compliance rates in 2007 vary by product type and by city, from 100 percent for air-conditioners in Beijing to 67 percent for clothes washers in Guangzhou (Figure 13-2). The number of non-compliant product models decreased from 11 out of 54 in 2006, to only three out of 73 models in 2007. This implies that the sample testing has a meaningful impact of forcing manufacturers to ensure compliance.

At the same time, the compliance check in 2007 revealed that testing results could vary significantly by laboratories. Tests were done two times, and the product that failed to pass the first test was tested again at the same or at a different laboratory. The seven manufacturers whose product sample models failed the first spot-check inspection test were notified. Then, six out of the seven had submitted two additional samples per non-compliant product model for re-testing. Five of the six retested product models turn out to be in compliance with its label's energy consumption standards (Zhou et al., 2008). This undoubtedly undermines the confidence of EES&L program. Dianshe et al. (2010) investigated the barriers to energy efficiency in one province in China and highlighted pervasive distrust in energy efficiency labels and product standards among consumers against both manufacturers and the supervision of government.

4.3 Discussions

The above case studies give insights into why the mandatory EES&L program has not yet been implemented effectively in Asian nations.

Policymakers referred international practice on EES&L as a guiding model and adopted standards and protocol of international organization. Industrialized nations also have extended their efforts for diffusing EES&L, recognizing adverse effects of differences in energy efficiency

regulations on trade barriers in electrical appliances (EES, 1999: Steenblik, 2005: Steenblik et al, 2006). The recent shift in production and export of home electric appliances to Southeast Asia and China has reinforced their efforts for diffusion and harmonization. Some of them sought to diffuse their own EES&L program standards to gain competitive advantage to their manufacturers.

Nonetheless, three factors have hindered a more effective implementation. First, only oil-importing nations have shown urgent concern. Household and office electrical appliances represent the fastest growing segment of total energy consumption in Asian nations even though the volume is still low. Aside from Japan, the average annual growth rate of residential and commercial energy consumption in the Asian region was 6.5% from 2000 to 2008. Vietnam enjoyed the most rapid growth with an annual growth rate of 10.4%, followed by China of 9%. This increase has been driven by the increased access to electricity, increased population with modern commercial fuel, increasing electricity for household use, motorization of transport and energy price subsidy and the low retail price that follows.

Thus, seriousness of commitment differs greatly between oil exporting nations and importing nations. Heavy oil importing nations of China, South Korea and Japan recognize energy security seriously, and have taken serious measures to improve energy efficiency. In the eleventh Five-year plan (2006-2010), the Chinese government announced to reduce energy intensity by 20% as a mandatory commitment. To respond to global pressure for carbon reduction, it continues to make a clear commitment on the reduction of energy intensity in the Twelfth Give-Year Plan. Vietnam, by contrast, is classified as an exporting nation (Figure 9-6), which is a consequence of the insufficient domestic capacity of refinery. In other words, it exports crude oil at low price and imports refined one at high price. As a means of ensuring energy security and reducing trade deficit, it attaches more importance to an increase in supply capacity than energy efficiency, leading to a failure in promulgating an energy conservation law. The oil exporting nation of Malaysia, on its part, has had little incentive for improving energy efficiency, as it can keep the domestic oil price low and does not have a high level of domestic energy consumption.

The recent oil price hike and a subsequent heavy fiscal burden urged East Asian nations, including Indonesia, Malaysia, Thailand and Vietnam, to review their subsidy policies and to improve energy efficiency [(5)]. Price subsidy imposed a significant fiscal burden on state budgets and reduced export earning, worsening macroeconomic balance and leading to energy and economic crisis [(6)]. However, they faced difficulties in phasing out such subsidies because they are considered as a means of alleviating energy poverty [(7)]. It is in this context that energy efficiency is recognized as an option to reduce excess energy demand, enhance energy security and to reduce risks that cause macroeconomic instability.

Second, EES&L is not always compatible with the existing domestic institutions and politically

feasible, even if the government recognizes it as urgent. As EES&L aims to eliminate the least efficient models, it may face resistance of manufactures. This has delayed the adoption of mandatory scheme in India and Indonesia, and the upgrade of standard level in China. EES&L is not political acceptable for heads of local governments in China. It is the last resort for them to shut down local plants, as it would lower local economic performance and reduce local fiscal revenue, and more importantly their political standing might be at risk. Hence, they have sufficient incentive to distort the testing results to protect local plants, even at the risk of the credibility of the EES&L program.

Third, many Asian nations lack national capacity, especially technical experts. This reflects the difficulties of development and implementation of class average standards. Class average standards require a more sophisticated procedure for assessing and enforcing compliance, and add considerable complexity to manufacturer production and shipment schedules. This makes it difficult to ensure actual attainment of the target on the reporting date for compliance with the standards (Wiel and McMahon, 2005). It also requires substantial prior negotiations on feasibility of achieving standard values to the administration and industry. Furthermore, manufacturers adopt sales promotion measures for products that have achieved target values (METI, 2010). These requirements have constrained massive diffusion of class average standards that encourage manufacturers to further innovation of energy efficiency technologies.

5. Conclusions

In this chapter, we determined to what extent the EES&L has been diffused, how serious government efforts have been to adopt it and what has hindered effective implementation in Asia. The main findings are summarized as follows:

(a) EES&L is widely adopted in Asia, but its program design and implementation status varies among nations.

(b) International initiatives and assistance have accelerated diffusion of EES&L. However, uncoordinated imposition of foreign policy model and uncoordinated bilateral assistance that was self motivated by industrialized nations have resulted in variation of program design even in neighboring nations.

(c) Effectiveness of EES&L varies among nations by urgency of ensuring energy security and carbon reduction, compatibility with the existing institutions, local political acceptability, and domestic technical expertise.

Notes

(1) The first MEPS have been introduced as early as 1962 in Poland followed by France in 1966. Other European governments introduced EES&L through 1960s and 1970s. Energy efficiency standards were adopted in California in 1974 for refrigerators and became effective in 1988 in national widely in United States (Wiel and McMahon, 2005).

(2) The Efficient Lighting Initiative was established in the mid-1990s with funding from the Global Environment Facility (GEF). The Vietnam Energy Efficient Public Lighting project was implemented by UNDP aiming to increase the efficiency of public lighting systems including the program development of EE S&L for lighting products. UNDP creates and implements different programs related to Vietnam's development priorities. One of those is climate change and energy efficiency activities are included within that framework.

(3) The products targeted for the 2006-2010 period include electric motors, fans; air conditioners, fluorescent lights and ballasts.

(4) According to the author's interview in March 2008, MOIT intended to implement MEPS and a mandatory label to refrigerators and air-conditioners by the end of 2008.

(5) Asia-Pacific Economic Cooperation (APEC) leaders, for example, committed to rationalize and phase out the inefficient fossil fuel subsidies in November 2009.

(6) Energy subsidies cost Indonesia government $22 billion, around 4.5% of GDP and Malaysian government $14 billion, around 4% of GDP in 2008 (IEA, 2009).

(7) The IEA's World Energy Outlook 2010 estimates that 799 million people of developing Asia lack access to electricity and 1.9 billion people rely on the traditional use of biomass for cooking.

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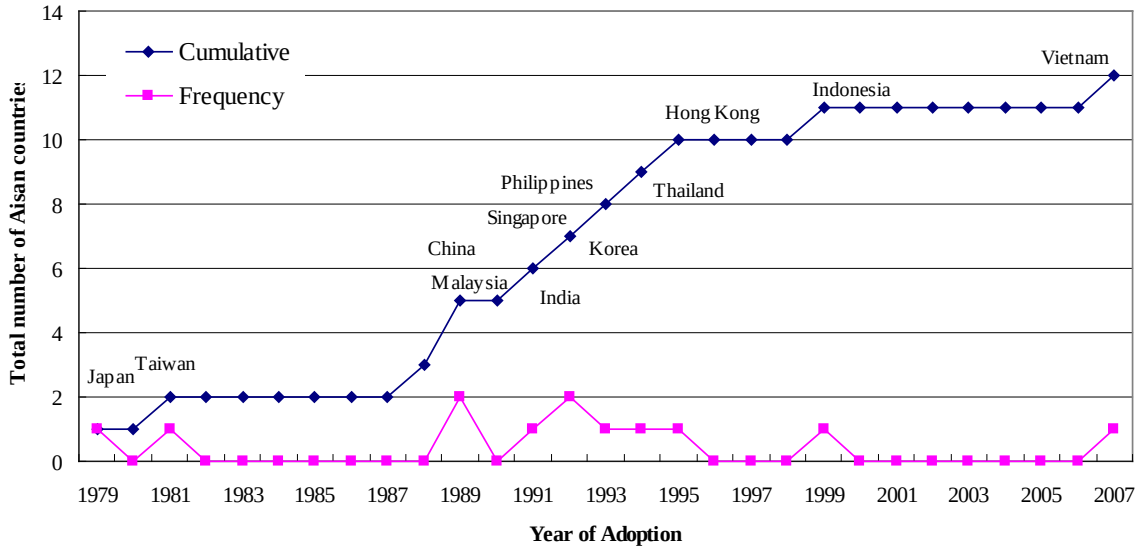
Figure 13-1 Diffusion Profile of EES&L in Asian Region



Source: Compiled by authors based on data from the APEC-ESIS website

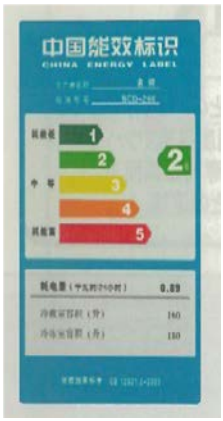
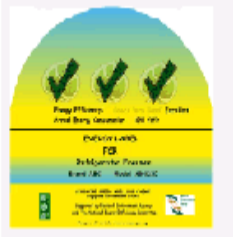
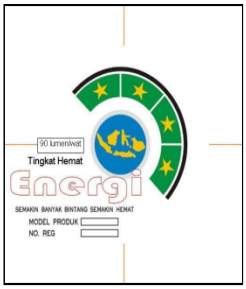
Table13-1 State of Energy Efficiency Labeling by Products and Nations in 2010

	Lighting	AC	TV	Refrigerators
China	M	M		M
Japan	V	V	V	V
South Korea	M	M		M
India	M	M	M	M
Indonesia	V	under consideration		
Singapore		M		M
Thailand		V		M
Vietnam	V	under consideration		under consideration
Malaysia		under consideration		
Philippines	M	M		M

Note: V: voluntary; M: mandatory; AC: Air conditioners, TV: Television sets

Source: Compiled by authors based on data from the APEC-ESIS website

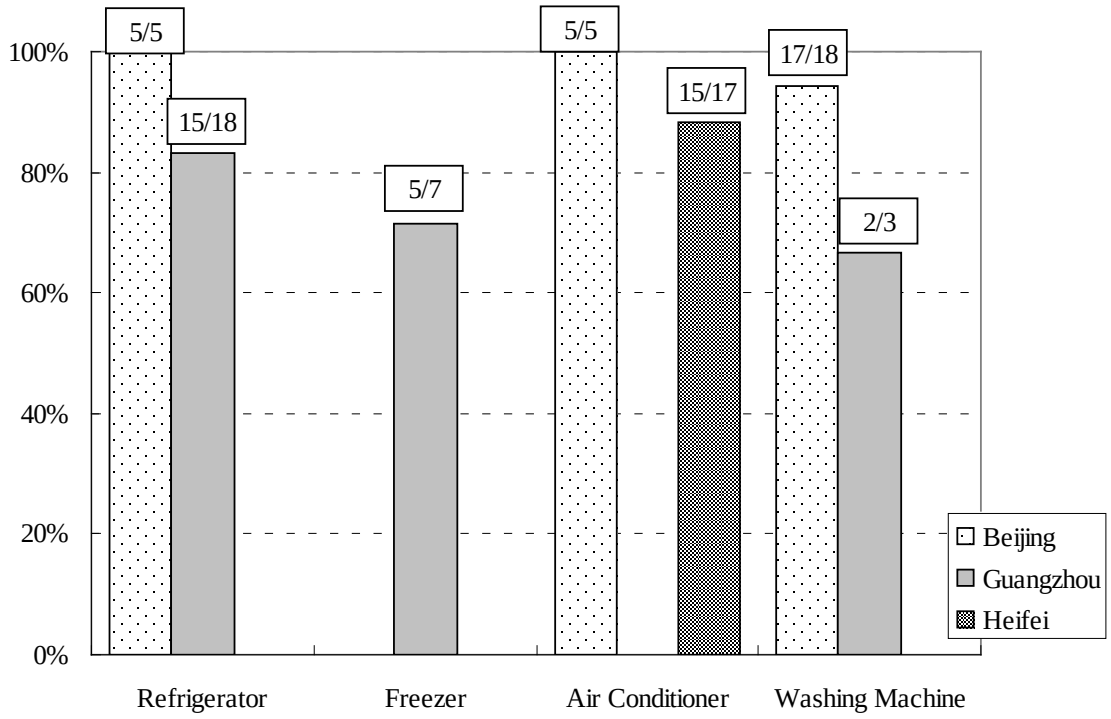
Table 13-2 Differences in Standards and Labeling Program among Asian Nations

	China	Japan	Korea	Malaysia
Energy ratio	COP	APF	SEER	COP
Testing point	Cooling 1 point, Heating 1 point	Cooling 2 point, Heating 3 point	Cooling, Heating plural point	Cooling 1 point
Compliance check	Spot testing by government	Spot testing by manufacturers association	Spot testing by government	Testing at manufacture's laboratory at presence of government
Label				
	Singapore	Thiland	Vietnam	Indonesia
Energy ratio	COP	COP	COP (under consideration)	under consideration
Testing point	Cooling 1 point	Cooling 1 point	Cooling 1 point	Cooling 1 point
Compliance check	Testing at manufacture's laboratory at presence of government	Testing at designated Laboratory	under consideration	under consideration
Label				

Note: COP (Coefficient Of Performance), APF (Annual Performance Factor), SEER (Seasonal Energy Efficiency Ratio)

Source: Compiled by authors based on data from the APEC-ESIS website and interview with government agency.

Figure 13-2 Compliance Rates at 2007 Test by Product Type



Source: Zhou et al. (2008).