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Developing Asia's Competitive Advantage in Green Products: Learning from the Japanese Experience

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Abstract

Right now, governments around the world are spending record amounts of money to kick-start their economies in response to the financial crisis. Fortunately, a great opportunity exists for this fiscal stimulus to be directed towards “green” economic growth, which can not only provide the new markets and jobs needed immediately for alleviating poverty, but also address the challenges of global warming. Working models already exist, proving that sustainable growth is possible. To achieve this will require social, technical and structural changes, as well as appropriate policies conducive to eco-innovation. For developing countries, there are lessons that can be learned from countries that have already gone through that process. The aim of this paper is to show what lessons can be learnt from the Japanese case. As the world's second largest economy, Japan is not only one of the most energy-efficient economies in the world; it also produces some of the world's leading green technologies. This paper focuses on current trends in the green product market and consumer behavior in Japan, which have been influenced by recent government policies, particularly the ¥15.4 trillion (more than US$100 billion) stimulus package. The aim of this paper is to provide some insight on, and present a repository of selected government policies promoting sustainable development. The scope of this paper will cover areas such as hybrid vehicles, renewable energy, energy efficient home appliances, and green certification schemes. It also provides a brief discussion on the environmental policies of the new Japanese government that came into power on 16 September 2009. The paper attempts to use the most recent data, from June to August 2009, however given the quickly-evolving global environment, these statistics may change drastically by the time this paper is presented.

JEL Classification: Q53, Q54, Q58

Contents

1. INTRODUCTION: ECONOMIC DOWNTURN, DEVELOPING ASIA, AND GREEN JAPAN

Developing countries in the Asia-Pacific region are at a tipping point. To absorb the shocks of the global financial crisis and to maintain a reasonable chance of avoiding catastrophic, irreversible damages to their ecosystems, acting now is essential. However, developing countries face the problem of constrained optimization: how to maximize human well-being (characterized by sustainable economic growth and poverty alleviation) while maintaining the carrying capacity of the planet. Despite this considerable challenge, a solution is by no means insurmountable. Working models of commercially-viable and competitive green product industries already exist, and many have been implemented at negative or neutral costs and are reflective of consumer needs.

Investing in green technology now is a potential way out towards sustainable development and new job creation. Stimulus packages, made possible by borrowing from future generations, must be designed to prevent a further worsening of the current crisis, while creating investments that yield future benefits. As remarked by the OECD Secretary-General, José Ángel Gurría, at this point in time, "stimulus packages are the greatest opportunity we have ever had for "greening" our economies." Already there are notable signs of growth in industries that are directly related to carbon reduction. The Asian Development Bank (ADB) estimates that the global environmental market could be worth more at USD$607 billion (2005) and could potentially rise to US$836 billion by 2015 (Asian Development Bank 2005). Notably, the environmental market is undergoing an explosion in developing countries. Compared to the global annual growth rate of 3% between 1996 and 2001, environmental markets in developing countries grew at 7–8% over the same period. The environmental goods and services market in the Asia and Pacific region alone is expected to triple by 2015, making it the fastest growing region for environmental goods and services in the world. In terms of employment, the implications of this are enormous. Up to 100 million new green jobs worldwide (2% of the total future global workforce) could be created by 2030 (Asia Business Council 2009). In the People's Republic of China (PRC) alone, the ABC recorded more than 3,000 daily postings for green jobs in 2009, followed by India and the Republic of Korea (henceforth Korea). In contrast, traditional carbon-intensive industries like mining have experienced a steady decline. For example, employment has fallen in the PRC's mining industry by 38% between 1996 and 2006 (Asia Business Council 2009). It should be noted however, that care should be taken when comparing international statistics on existing green jobs, as they remain fragmented and anecdotal. Nonetheless, what is critical to recognize is that fundamental and long-term changes are occurring, and governments must consider now how to provide the critical mass of qualified and technically skilled "green labor" to satisfy market demands in the near future.

In the long term, developing countries stand to gain the most by moving towards a more environmentally sustainable path of economic growth. Such gains could be earned from taking advantage of the social and technical "green" changes currently happening in developed countries. Developing countries, which are likely to have sectors and infrastructure that have not yet fully matured, can accelerate their economic development by bypassing inferior, less efficient and polluting technologies and policies used by developed countries. By "leapfrogging" their development, developing countries can build an economic infrastructure base that avoids the traditional stages of development that are both costly and environmentally harmful. Developed countries whose economic structures are deeply embedded in "brown" industries like coal mining, rely on aged infrastructure and depend deeply on fossil fuels, will find it the most difficult and costly to transition. While stimulus packages are being injected into the economy at an unprecedented rate, slow but significant paradigm shifts are occurring in people's consumption patterns, mindsets, and life-styles in both developed and emerging countries.

Asia's rapidly growing middle class will open up new opportunities and challenges for the future. In 2000, the middle class of South and East Asia represented 1.4% of the global population and 2.1% of global income (World Bank 2007). By 2030, this could rise to 8.9% and 7.7% respectively (however it is too early know what impact the current crisis has had on these forecasts). As incomes rise, consumption patterns and lifestyles are also expected to change towards more higher-end consumer and capital goods and services. In the PRC for example, domestic demand is projected to increase by 4.5% per annum to 138 million units by 2010, outpacing growth in most other parts of the world. One estimate by the Freedonia Group found that demand for appliances in the Asia/Pacific more broadly grew by 5.1% (1994–2004), particularly for products such as microwave ovens, refrigerators, and freezers (AllBusiness.com 2006). The key is to harness this rapidly burgeoning consumer demand and expanding domestic markets towards more eco-friendly and energy-efficient products. Doing so can prevent further reliance of the economy on environmentally poor performing products which use unnecessarily high levels of fuel, energy and water, and result in higher levels of avoidable pollution. As the current life-span of many household appliances is about 5–10 years, there is a long lag between when old existing stocks are replaced with more energy and fuel-efficient and environmentally-friendly products. Recognizing this, governments in developed countries are now spending a significant proportion of their stimulus packages to encourage the replacement of old, fuel-inefficient cars with new hybrid versions. In this regard, developing countries stand to gain significant benefits by seriously developing and enforcing effective green goods policies, now, rather than later. There are signs of progress with recent announcements by some Asian governments to expand green industries. The Socialist Republic of Viet Nam is one such country that recently approved a national strategy on the development of green industry, where 50% of local companies are to apply green technologies in their production processes by 2020. The aim is to help save around 3–8% of energy consumption and reduce harmful emissions and pollution (Du Xiaodan 2009).

New ideas and new social movements could gain momentum in a short time which will most likely affect the future of developing countries, as well as the global economy. In Copenhagen, December 2009, the international community is set to debate a new global climate deal that could enforce more stringent environmental regulations and targets on developing countries. At the citizen level, distinct changes to consumer demand in developed and developing countries could influence the success of businesses looking to penetrate those markets. For example, Japanese mindsets are already shifting. It seems that consumers in Japan have accelerated their values and behavior shift towards purchasing more green products that are affordable and economically viable – and producers are beginning to take notice. This is clearly demonstrated by the significant increase in the demand of Toyota's hybrid car, Prius, which became Japan's highest selling car in June 2009. More recently, the business strategies of the private sector are responding to the expanding green movement by putting more green products in the market, as well as taking advantage of the government's stimulus package and related policies to mitigate the financial crisis.

Since the financial meltdown was triggered by the collapse of American investment giant Lehman Brothers, global output has fallen by 2.9% and world trade by nearly 10%. Private capital flows have been plummeting and are expected to decline from US$707 billion in 2008 to US$363 billion in 2009 (OECD 2001). World growth is projected to fall to 0.5% in 2009, its lowest rate since World War II (IMF 2009). By the end of 2009, Japan is expected to lose from 3–6% of its GDP (The Economist 2009b). A highly export-dependent economy, Japan has been significantly affected by the drop in global demand for its manufactured goods. Collapse in exports had an immediate effect on Japan's major corporate firms, such as Toyota and other carmakers and Panasonic. Unemployment increased from 3.8% in October 2008, to 5.4% in June 2009 and has not stopped falling since (*The Economist* 2009a).

The American US$787 billion economic stimulus package (the American Recovery and Reinvestment Act of 2009, passed in February) is an attempt to create or save 3.5 million jobs over the next two years in a wide spectrum of sectors (US Recovery Accountability and Transparency Board 2009). Among the targeted expenditures are more than US$60 billion for clean energy investments. The US policy has included investments of US$150 billion over ten years for energy research and development, with the aim of transitioning the US economy to a clean energy economy while generating numerous jobs. Japan, EU, the PRC, and other emerging economies are also following similar efforts to reform their economies.

For example, the Japanese government announced in April 2009 that it would provide ¥15.4 trillion (around 3% of Japan's GDP) in subsidies and tax breaks to stimulate a "green" economy. The government plans to boost green markets from a total value of ¥70 trillion in 2006 to ¥120 trillion in 2020, equivalent to employment increase from 1.4 million to 2.8 million employees. So far, economic indicators have shown a slow but positive response to the package, with some sectors now returning positive profits, most notably, hybrid automobile sales. Thanks to generous incentives from the government, not only did it assist the automobile sector in Japan, but it also helped unleash the growing number of green consumers who, despite the crisis, are still willing to invest in more environmentally-friendly goods. Overall, since June 2009, production and exports have slowly started to bottom up. Nonetheless, there are still significant concerns of further deflation and the continued rise in Japan's unemployment rate.

In the People's Republic of China (PRC), the government has implemented a 4 trillion Yuan (CNY) (almost US$600 billion) in fiscal expenditures and tax relief since the package was announced in November 2008 (Bi Mingxin 2009). Approximately 12% of this amount may go directly towards energy efficiency and environmental improvements, with a further US$85 billion for rail transport and US$70 billion for new electricity grid infrastructure (Seligsohn 2008). The government has also announced a target of 20% for all energy to come from renewable sources by 2020 (Fong 2009). Economic indicators are showing signs that the economy is responding to the package. In the first half of this year, the PRC grew by 7.1%; there are even positive increases for the hard-hit real estate and construction sectors. By the end of the fiscal year, both the Organization for Economic Co-operation and Development (OECD) and International Monetary Fund (IMF) predict that the country's real GDP growth rate would reach 7.7% and 7.5%, respectively (OECD's June 2009 forecast, IMF's July 2009 forecast), and possibly rebound strongly to 9.3 % (OECD) or 8.5 % (IMF) by 2010 (Townsend 2009).

In an interesting, but perhaps predictable, twist of events, European plans to stimulate their economy and promote green growth have resulted in major benefits for Asia, particularly the Republic of Korea and India. In Germany and the UK for example, both governments are offering financial incentives for citizens to replace their old cars (which are responsible for around 75% of all automobile pollution in the UK), to more fuel-efficient varieties (Chu 2009; Avent 2009).[1] Not surprisingly, while originally targeted at stimulating the domestic car industry, it is the carmakers at the forefront of producing the most fuel-efficient eco-friendly cars that have profited. India's largest car exporter, Hyundai Motor India, also a subsidiary company of South Korean carmaker Hyundai Motor, recorded its highest export growth rate in June (33%) selling 24,241 more cars compared to the same month in 2008. Between June and May, exports grew by 21% (or 20,125 more cars than May). India's automobile sector alone has recorded a 70% growth in foreign investment (Commodity Online 2009). Coupled with the introduction of two stimulus packages announced by the Indian government at the beginning of this year, the OECD and IMF anticipate India's economy to

[1] Germans can receive a voucher worth $3,500 if they trade in cars at least 9 years old for a new car. Due to the massive response, (more than 1 million buyers have applied), the government has extended the program to the end of the year and increase its budget from $2.1 billion to $7 billion. Registrations of new cars in Germany jumped 40% in May, compared with the same period last year. Britain also introduced its "cash-for-clunkers" scheme to replace cars older than 13 years.

rise in 2010 to 7.2% (OECD) or 6.5% (IMF) (Townsend 2009). As part of the package, the Indian government is expected to pledge in September this year, its first solar target of 20 gigawatts (GW) by 2020, from current output levels of almost zero (the world now produces about 14 GW of solar power) (Energy Business Review 2009).

Although 2.5% lower than last year, the GDP of Korea grew by almost 10% in 2009, with real consumer spending rising at an annualized rate of 14% in the second quarter of this year. Again, this has been in large part due to tax cuts offered by the government on eco-friendly car purchases (and indirectly supported by purchasing incentives provided by the European government), as well as assistance for low-income families. In total, the government has announced it would provide 69 trillion won (US$51.2 billion), or 7.5% of GDP in tax breaks and environmentally friendly investments with the aim of creating more than 1.5 million jobs.

While economic indicators from the PRC, India, and Korea, or the "engines of Asia," are moderately encouraging, signs from Association of Southeast Asian Nations (ASEAN) economies are a little less so. Falling demand for ASEAN exports has hurt the region, with production contractions occurring across the ASEAN region. Latest projections by the IMF indicate zero growth for the ASEAN-5 region. Thailand and Malaysia are expected to have negative growth this year, but will begin to bounce back from next year. The Philippines is likely to be the worst of the group, with zero growth this year, and negative growth the next. Only Indonesia and Vietnam are forecasted to have positive growth this year and next (IMF 2009a).

But can these small signs of growth be continued? A lot of the rise has been attributed to expansionary fiscal policies by Asian governments. Fiscal stimulus packages implemented in Asia (according to the ASEAN Secretariat) range in size from 1% of GDP (Socialist Republic of Viet Nam), 2% of GDP (Japan), 3.8% of GDP (Korea), 9.5% of GDP (Malaysia) and 12.6% of GDP (PRC). To ensure economic growth long after the fiscal measures have been spent, governments should keenly observe the trends in global consumption over the coming years, particularly the rising demand for green products and services in developed countries, and make direct investments to take full advantage of these opportunities.

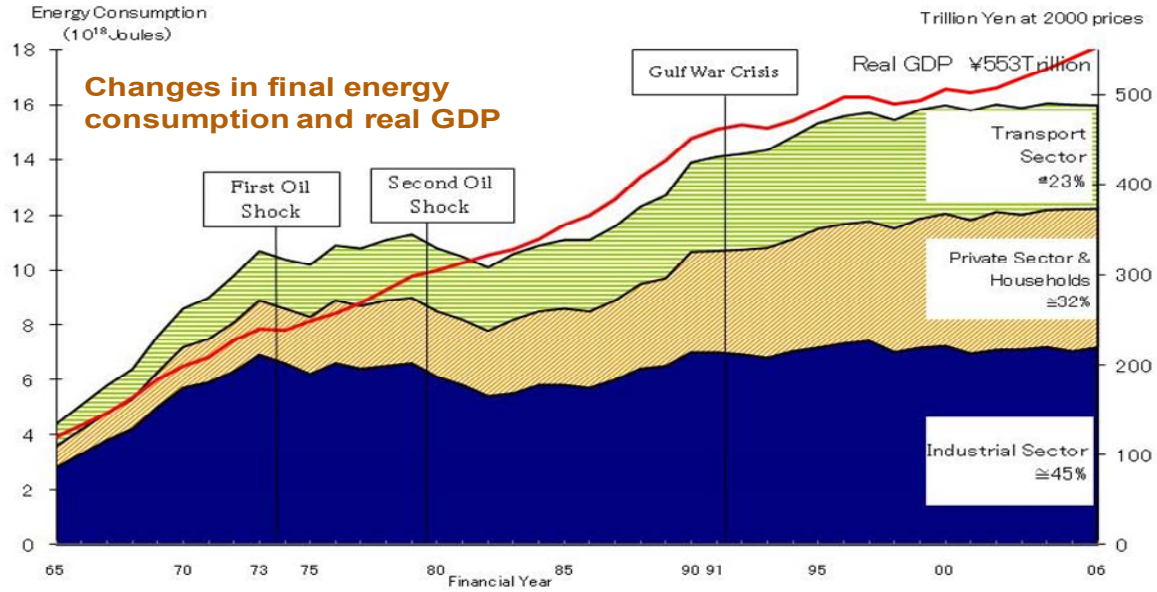
The aim of this paper is to outline recent policy and social developments in Japan, and provide both lessons learned and challenges faced from the Japanese approach towards sustainable development. Section 2 briefly sets the context in which green markets have emerged in Japan and globally, and describes the components of Japan's recent stimulus package. It will analyze the impacts of the stimulus package on the automobile and household electrical appliance sector from two perspectives: economic recovery and the structural transition to a green economy. With regards to the automobile industry, this paper also describes policies, such as fuel efficiency and emissions standards, that have had a significant impact in shaping the automobile industry today. The section ends with a discussion of Japan's energy efficiency policies, particularly its "Top-Runner" Program. Section 3 debates the possible implications of the environmental policies introduced by the new incoming government in Japan. Section 4 explores the opportunities and challenges of stimulating consumer demand for green products, particularly eco-labeling and certification as an economic tool to link consumer demands with producers. Case studies shown indicate that eco-labels should be designed to not only inform consumers of a product's environmental performance relative to its competitor, but also compel manufacturers and retailers to compete against each other to create products that provide both economic and environmental benefits for society and nature.

2. G REEN PRODUCTS MARKET DEVELOPMENT IN JAPAN

2.1 Overview of Japan's Green Technology Policies Prior to the Financial Crisis

According to Japan's Agency for Natural Resources and Energy (ANRE), in 2004, Japan imported 94% of its primary energy source from overseas (ANRE 2007). As such, securing stable and sufficient access to energy supplies is an issue of national security for the Japanese. The impact of the energy crises that emerged from the two oil shocks in the 1970s and Gulf war (Figure 1) show clearly just how vulnerable Japan's economy is to global conditions.

Figure 1: Japan's Cross-Sector Energy Consumption and Total GDP

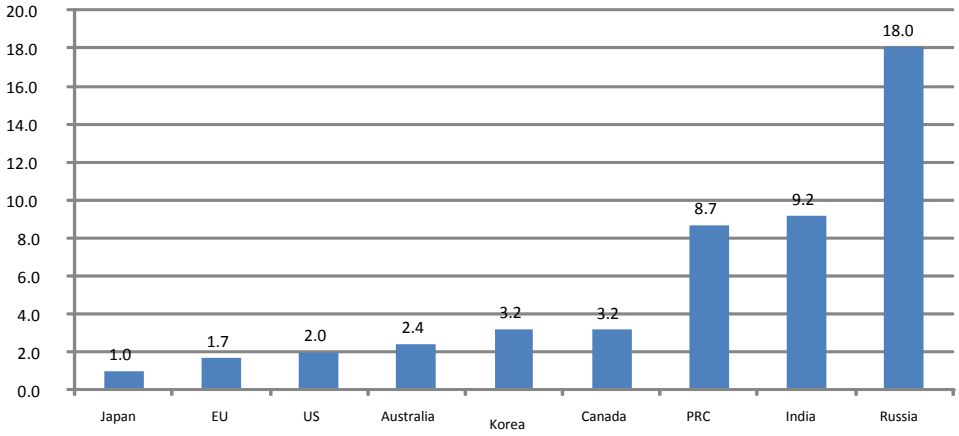


EU=European Union, US=United States, PRC=People's Republic of China

Source: Agency for Natural Resources and Energy (2009).

This reliance on other countries for energy has been the primary motivator for Japan's never-ending search to improve its energy efficiency. Establishing mechanisms that radically improve the energy efficiency of its technologies, commodities, industrial processes, and social infrastructure have helped Japan to become one of the most energy-efficient economies in the world (Figure 2). Technologies that it has developed over the years have also provided the added benefit of improving Japan's global competitiveness as a leading producer of high-tech, energy-efficient and eco-friendly goods.

Figure 2: Primary Energy Supply Per Unit GDP with Japan as 1



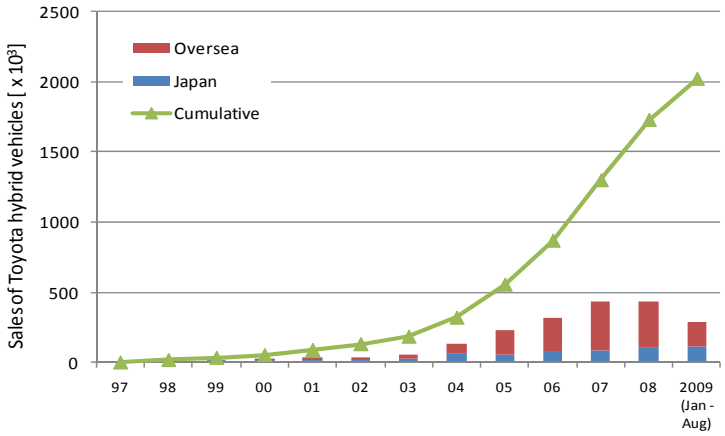
EU=European Union, US=United States, PRC=People's Republic of China

Source: ANRE (2009).

Most recently, Japan has become known for producing eco-friendly automobiles. At a time when other carmakers were focused on making the fastest and largest cars, Toyota focused on researching and developing its first commercially-viable hybrid car, the Prius. Beginning in 1993, the idea emerged out of concerns held by Toyota's executive management regarding "whether the car should remain as is through thein the 21st century?" The issue of global warming had already reached the international agenda, particularly since the testimony of Dr. James Hansen at the US Congress in 1988, where he warned about the dangers of rising CO2 emissions. The issue became crystallized in 1992 when the UN Framework Convention on Climate Change (UNFCCC) was adopted at the Rio Earth Summit, and when it later came into force in 1994. Three years later, Toyota produced the first hybrid vehicle ever to be available on the international market in 1997—the year that the Kyoto Protocol was adopted.

For several years after, however, the sales of the hybrid vehicles were slow. The pioneering product needed to wait until around 2004–2005 when society and consumers' demands slowly began to change (Figure 3). Firstly, the Kyoto Protocol, and in 2006, the momentum accelerated with the announcement of the British Government's Stern Review on 'the Economics of Climate Change' and the release of the documentary, the 'Inconvenient Truth' by Former US Vice President, Al Gore; both of which triggered large public attention on the economic costs of not taking action now.

Figure 3: Sales of Toyota Hybrid Vehicles (1997–2009)

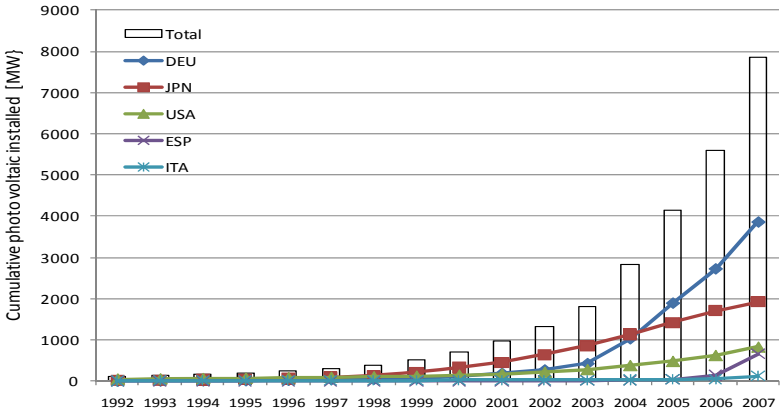


Source: Toyota (2009).

When the issue of climate change crossed from the sciences and into realms of society, policy, and business, the market grew for green products and services like the Prius. This is a historical example of where the private sector had the foresight and leadership to innovate and invest in pioneering eco-friendly technologies before there was market demand for green products. In contrast, government policies were either behind the times or not visible, largely because there was a lack of demand by constituents at a period when economic growth was stable [2.0% in 2004]. It was only later when it became evident that sales of hybrid cars would start to exceed traditional models that governments started to see this sub-sector as potential area for economic development.

Renewable energy is another sector that some perceive as receiving insufficient public policy support, particularly in recent years. Ironically, given the Japanese over-reliance on imported energy, boosting domestic sources of renewable energy should have been an immediate priority to reduce this dependency. Critics of Japan's public investment in renewable energy often refer to the photovoltaic sector. Temporal trends of social demand and technological advancements for photovoltaic technology exhibit similar correlations shown for the hybrid vehicle in Figure 3 above. However, without policy support, Japan has fallen behind Germany as the world-leader in photovoltaic production despite the level of technological advancement of Japan's renewable energy sector (Figure 4).

Figure 4: Cumulative Photovoltaics Installed in Top 5 Countries of 19 OECD Member Countries



DEU=Germany, JPN=Japan, USA=United States, ESP=Spain, ITA=Italy

Source: International Energy Agency (2009).

2.2 Japan's Stimulus Package

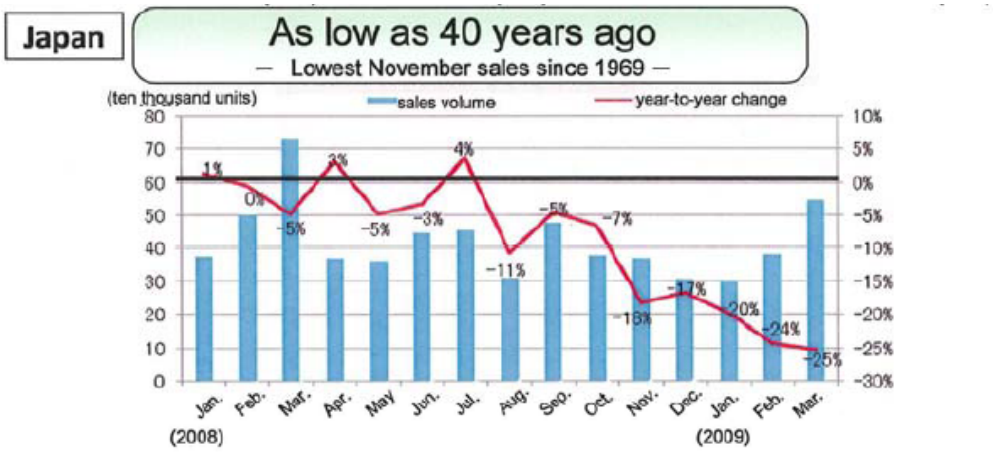
On 10 April 2009, the Japanese government announced it would implement a range of fiscal stimulus measures to both prevent the worst impacts of the immediate global financial crisis and strengthen its economy against the long term unavoidable impacts of climate change. The package, worth US$154 billion, was designed to increase Japan's GDP economic growth by 2% and create jobs for 400,000 to 500,000 people. The package included an employment adjustment subsidy, vocational training provision, financial loans and support, acceleration of the implementation of public projects planned throughout the year, encouraged innovation towards creating a low-carbon society, establishment of a "resource-circular society" (one that encourages the principles of "reduce, reuse, recycle"), revitalization of local medical care and child care, renovation of social infrastructure, enhancement of R&D, tourism promotion, social security reform, and disaster management.

As of September 2009, certain economic sectors in Japan have slowly returned to positive balance sheets, like the automobile industry. The likely cause of this is the injection of fiscal stimulus funds by the Japanese government, coupled with efforts of other governments to stabilize their own economies. Sales of household electrical appliances subsidized under the stimulus package have increased, contributing to the upturn. One notable exception was the sale of air conditioners, which suffered more from low consumer demand due to a cooler summer in Japan this year – likely caused by the El Niño effect. For other products still experiencing negative indicators, the situation may have been much worse without the stimulus package.

2.2.1 Boosting Sales of 'Green' Automobiles as a Response to the Economic Crisis

The end of 2008 to the first half of 2009 was a severe time for major carmakers worldwide. Eight Japanese and three American automobile makers reportedly lost market share by 3.3% to 55% in the first half of 2009. In contrast, other European and Korean makers increased their shares due to growth in demand for more affordable and smaller vehicles, particularly in emerging economies that were less impacted by the crisis. For Japanese vehicles particularly, sales reached their lowest point in 40 years (Figure 5).

Figure 5: Sales of Japanese Vehicles (January 2008–March 2009)



Source: Matsunaga (2009).

The automobile industry is Japan's largest employer, accounting for around 4.9 million direct and indirect jobs. In this context, the government announced it would directly provide assistance to boost the industry (Ministry of Economy, Trade and Industry 2009). Around US$2.1 billion in tax reductions was granted to "eco-cars" and around US$3.7 billion dollars

in subsidies to consumers who purchased “eco-cars” during the 2009 fiscal year. The following sub-sections will provide a brief outline the components of the subsidy.

2.2.2 Detailed Description of the Eco-car Tax Reduction and Subsidy

The eligibility of automobiles for the eco-car tax reduction and subsidy is determined by the type of engine, fuel use, level of fuel efficiency, emission levels, vehicle weight, etc. The list of eligible vehicles also includes a wide range of models, some of which have not yet been produced in mass production for the market, but are there for the purpose of promoting R&D, such as plug-in hybrid vehicles (Table 1). The diverse list of eligible cars is designed to include, rather than exclude, the best performing vehicles in all categories.

Box 1: Eco Car Subsidy Policy

The aim of the policy is to efficiently promote both economic and environmental measures by encouraging the replacement of aged vehicles with purchases of vehicles with better environmental performance standards.

Subsidies and Eligibility

Subsidies are to be provided for the purchase of vehicles of better environmental performance standards, both with and without the replacement of an older vehicle (effective for purchases made after 10 April 2009). Vehicles eligible for subsidies are passenger vehicles, light weight vehicles (engine sizes less than 0.66L), and heavy weight vehicles (trucks and buses) as follows.

Purchase of a new vehicle with better environmental performance by replacing vehicles older than 13 years since the first registration

Vehicles older than 13 years old -> Vehicles meeting the Heisei 22 (2010) fuel efficiency standard: ¥ 250,000 for passenger vehicles and ¥ 125,000 for light weight vehicles

Heavy vehicles (bus and trucks) older than 13 years old -> Heavy vehicles meeting long-term standards: ¥ 400,000 for those around 3.5tons, ¥ 800,000 for those around 8 tons, and ¥ 1,800,000 for those around 12tons.

Purchase of a new vehicle with better environmental performance without replacing old vehicles

Vehicles meeting 4 stars of emission level AND meeting +15% of the Heisei 22 fuel efficiency standard: ¥ 100,000 for passenger vehicles and ¥ 50,000 for light weight vehicles

Heavy vehicles (bus and trucks) meeting the Heisei 27 (2015) fuel efficiency standard AND +10% reduction level of NOx or PM: ¥ 200,000 for those around 3.5 tons, ¥ 400,000 for those around 8 tons, and ¥ 900,000 for those around 12 tons.

Source: Japan Ministry of Land, Infrastructure, Transport, and Tourism. Available at: http://www.mlit.go.jp/jidosha/jidosha_fr1_000008.html

Table 1: Tax Reductions for Eco-Cars

	Tonnage Tax	New Cars	Old Cars
Electric Vehicles (including fuel-cell vehicles)	Exempt	Exempt	2.7% reduction
Natural Gas Vehicles A. **Weighs <3.5 tons:** Certified ☆☆☆☆[i] B. **Weighs >3.5 tons:** Certified ☆ (NO_x)[ii]	Exempt	Exempt	2.7% reduction
Plug-in Hybrid Vehicles	Exempt	Exempt	2.4% reduction
Diesel Vehicles			
1. **Weighs <3.5 tons:** Meets the Heisei 21 (2009) Emission Standards	Exempt	Exempt	1% reduction (0.5% from 1 Oct 2009)
2. Weighs >3.5 tons			3.5-12 tons: 2% reduction
a) Meets Heisei 21 (2009) Emission Standards & Heisei 27 (2015) Heavy Vehicle Fuel efficiency Standards	75% reduction	75% reduction	>12 tons: 2% reduction (1% from 1 Oct 2009)
b) Heavy vehicles certified ☆ (NO_x or 10% lower PM levels)[iii], and also meets the Heisei 27 (2015) Heavy Vehicle Fuel efficiency Standards	50% reduction	50% reduction	No reduction
Hybrid Vehicles			
A. Weighs <3.5 tons: Certified ☆☆☆☆[iv] + more than 25% fuel-efficient[v]	Exempt	Exempt	Cars: 1.6% reduction Buses & Trucks: 2.7% reduction
B. Weighs >3.5 tons: Certified ☆ (NO_x or 10% lower PM levels)[vi], and also meets the Heisei 27 (2015) Heavy Vehicle Fuel efficiency Standard			
Certified high fuel efficiency & low-emission vehicles			
1. Certified ☆☆☆☆ + more than 25% fuel-efficient[vii]	75% reduction	75% reduction	300,000yen deduction
2. Certified ☆☆☆☆ + more than 20% fuel-efficient[2]	50% reduction	50% reduction	150,000yen deduction
3. Certified ☆☆☆☆ + more than 15% fuel-efficient[viii]			

Notes:

i. meets the 75% lower emission levels of the Heisei 17 (2005) Low Emission Standards

ii. meets the 10% lower NOx levels for heavy vehicles set by the Heisei 17 (2005) Low Emission Standard

iii. set by the Heisei 17 (2005) Emission Standards

iv. meets the 75% lower emission levels of the Heisei 17 (2005) Low Emission Standards

v. according to the Fuel efficiency Standard

vi. meets the 10% lower NOx levels for heavy vehicles set by the Heisei 17 (2005) Low Emission Standards according to the Fuel Efficiency Standard

Source: Author's translation of table from Japan Ministry of Land, Infrastructure, Transport and Tourism.

2.2.2.1 Automobile Taxes in Japan

Several types of state and provincial/municipal taxes are imposed on automobiles and light weight vehicles: the Automobile Tax, Automobile Acquisition Tax, Automobile Weight Tax, and Light Weight Vehicle Tax. The tax scales are set based on sizes, engine volumes, weights, and vehicle use purposes (private/business). In addition to these taxes, the Gasoline Tax and Diesel Oil Delivery Tax are also imposed when purchasing fuel. Among these taxes, the Gasoline Tax, Diesel Oil Delivery Tax, Automobile Weight Tax, and Automobile Acquisition Tax are deposited to the Road Construction and Improvement Special Account (Doro Tokutei Zaigen), which have been designated to specifically fund road constructions all over Japan for many years.

Table 2 lists examples of the benefits provided by the eco-car tax reduction for three models: Toyota Prius, Honda Insight, and Nissan X-Trail; all of which are 100% eligible under the stimulus package.

Table 2: Eco Car Policy Benefit Examples eligible for 100% Tax Reduction and Full Subsidy

							Discount Benefits	
Name	Maker	Type	Fuel Efficiency	Price examples	Eco Car Tax Reduction	Automobile Green Tax Reduction	With Eco Car Subsidy Replacing 13y old or older cars (250,000 yen)	With Eco Car Subsidy Without the replacement (100,000 yen)
Estima*	Toyota	Hybrid	19 - 20 km/L	3,580,952 - 4,819,048	236,700 - 309,700	22,500	509200 - 582,200 (12-14%)	359200 - 432,200 (9-10%)
Insight	Honda	Hybrid	28 - 30 km/L	1,890,000 - 2,210,000	137,700 - 151,400	-	387,700 - 401,400 (18-20%)	237,700 - 251,400 (11-12.5%)
X-Trail	Nissan	Diesel	11.6-14 km/L	2,999,850	204,100	-	454,100 (15%)	304,100 (10%)

tember 2009, eco car subsidy will not be applied to new purchase of Prius any longer

Source: Data collected from manufacturers' websites.

The total of all three Automobile Taxes (Automobile Acquisition Tax, Automobile Tax, and Automobile Weight Tax) amounts to approximately 10% of the vehicle's price. Of the vehicles that are 100% eligible for the eco-car tax reduction, 6–7% out of 10% are exempted from these taxes. With the eco-car subsidies, the stimulus package will bring the new vehicle's price down by 12–20% if it is purchased to replace a car that is 13 years or older, or 9–12.5% without the replacement. As of September 2009, the eco-car subsidy will no longer be applied to new purchases of Toyota's Prius, however, as current production capacity cannot meet the rapidly increased demands since April 2009. Consequently, those who have placed purchase orders of the Prius may not receive the vehicle before the subsidy expires at the end of March 2010.

Box 2: Taxes Related to Automobiles and Light Weight Vehicles

Upon acquisition
- Automobile Acquisition Tax (Provincial Tax)
- Automobile Tax (Provincial Tax)
- Automobile Weight Tax (State Tax)
- Consumption Tax (4% State Tax + 1% Provincial Tax)

During ownership
- Automobile Tax (Provincial Tax)
- Light Weight Vehicle Tax (Municipal Tax)

Upon Vehicle Inspection (*Shaken*[§])
- Automobile Weight Tax (State Tax)

In addition to this, the Gasoline Tax and Diesel Oil Delivery Tax are imposed at gasoline stations.

[§]*In Japan, there is a car inspection system, called "Shaken", which requires all registered vehicles to go through a car inspection for every 2 years (new cars' inspection is valid for 3 years).*

2.2.3 Impact of the Tax Reduction and Subsidy on Vehicle Sales

In August 2009, car sales in the US and Japan began to show weak but slight increases (1–2.2%) in sales for the first time in 22 and 13 months, respectively—no doubt helped in large part by the fiscal stimulus. Table 3 provides an outline of the top 10 selling cars in Japan in August 2009.

Table 3: Ranking of automobile sales in August 2009 in Japan

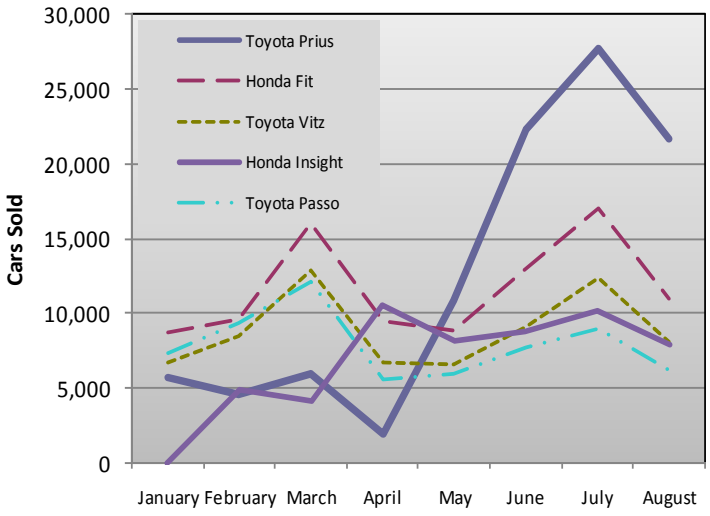
Name	Maker	# Sales	Fuel Efficiency (10*15 mode)	Lowest Price (yen)
Prius	Toyota	21,669	38 km/L (Hybrid Vehicle)	2,050,000
Wagon R	Suzuki	13,926	23.5 km/L	908,250
Move	Daihatsu	11,556	23 km/L	1,050,000
Fit	Honda	10,927	24 km/L	1,197,000
Tanto	Daihatsu	9,066	20.5 km/L	1,081,500
Vitz	Toyota	8,145	24.5 km/L	1,176,000
Insight	Honda	7,900	30 km/L (Hybrid Vehicle)	1,890,000
Passo	Toyota	6,238	21.5 km/L	966,000
Alto	Suzuki	5,934	24 km/L	808,500
Mira	Daihatsu	5,611	25.5 km/L	885,000

Vehicles in yellow are lightweight vehicles.

Source: Data collected from manufacturers' websites.

In June 2009, the Toyota Prius became the top selling passenger car for the first time in the Japanese market; 22,292 new Prius cars out of a total 219,836 were sold in June 2009 (Japan Automobile Dealers Association 2009). As of August 2009, Prius has remained as the top selling car for 4 consecutive months (see Figure 6). In July, the total number of sales of Toyota Prius and Honda Insight (another hybrid model) reached almost 38,000 out of a total 118,539 passenger cars sold (or 32%). Purchase orders for the new third-generation Toyota Prius has so far exceeded supply: more than 200,000 orders were placed since the new model was announced in May 2009, and currently there is a long waiting list for buyers who cannot receive it before March 2010.

Figure 6: Top Five Best-Selling Passenger Cars in Japan (January 2009–August 2009), Excluding Lightweight Vehicles



Source: Authors' calculations using data from Japan Automobile Dealers Association (2009).

2.2.4 Criticisms: Larger versus Lightweight Vehicles

Some argue that under the tax reduction and subsidy program, "eco-cars" have been defined in a misleading way, which has led to some larger passenger vehicles qualifying for the benefits despite their lower fuel efficiency rate compared to other eligible choices. Nonetheless, it should be noted that the first priority of the eco-car policy is to stimulate demand and alleviate the impacts of the financial crisis. Many models available in the market have already cleared the current fuel efficiency and emission standards, requirements that must be met in order to be eligible for the tax reduction. A significant reason for this is the competitive culture of Japanese car manufacturers, nurtured through the government's Top-Runner system (see 2.4.2).

There are several types of categories of automobiles for different administrative purposes (such as registration and taxes). As such, it is critical for the purpose of this paper to clearly differentiate between the two categories: passenger cars (*Joyousha*) that have engines larger than 0.66L and lightweight vehicles (*Kei Jidosha*) that are driven with engines less than 0.66L. According to the Automobile Inspection & Registration Information Association (2009), as of the end of May 2009, the total number of passenger vehicles and lightweight vehicles amounted to 57 million (30.7 million passenger cars and 26.3 million lightweight vehicles) in Japan.

The category of lightweight vehicles emerged out of market demands that began in the 1950s. Despite safety concerns that these vehicles had a less robust body, demand remains high, particularly in rural areas where having more than two cars per family is recognized as common sense. As of March 2009, the number of lightweight vehicles owned in Japan reached 26 million, corresponding to 49.5 light weight vehicles per 100 households (Japan Mini Vehicles Association 2009).

The most popular lightweight vehicle and second-best in all categories of vehicles, as of August 2009, was the Wagon R (Suzuki). Its fuel efficiency of 22–23.5 km/L (10-15 fuel efficiency measurement mode), while not better than a hybrid car, performs better than some normal-sized passenger cars. These cars are also sold at an affordable price of around 900,000 yen (US$10,000) and up, contributing to their popularity. As shown in Table 3, factors such as affordability, lower taxes and lower maintenance costs of lightweight vehicles seem to play a more significant role in consumers' decision making process than fuel efficiency. However, the total sale of lightweight vehicles in recent months has declined due to relatively larger incentives offered on normal-sized eco-cars, like hybrids[3]. While having the highest fuel efficiency rating, the Toyota Prius is one of the most expensive vehicles in similar automobile categories. Nonetheless, it has been the top-selling car since June 2009, indicating that there is a large market of Japanese consumers willing to pay higher prices for more environmentally-friendly goods. This is supported by the unusual fact that the price of a used second-generation Prius in July 2009 was the same as or even higher than that of a new Prius of the same generation. A similar demand can also be seen as a result of the American stimulus package (see Box 3). While a large part of this accelerated trend in consumer behavior is a result of the Japanese government's eco-car policy, it should also be recognized that hybrid cars are firmly perceived as an economically viable and socially responsible choice in today's global economic context. This mindset is expected to continue beyond the life of the stimulus package.

[3] The sale of light weight vehicles in August 2009 continued to decrease for the last 10 months with the reduction by 5.1% compared to the same month of the year 2008.

Box 3: Statistics of Car Allowance Rebate System in the USA

In the US, US$3 billion was allocated to subsidize consumer choices. The Car Allowance Rebate System (CARS) which already finished at the end of August 2009 received more than 690,000 dealer transactions. According to the CARS website, *84% of trade-ins under the program are trucks, and 59% of new vehicles purchased are cars. The program worked far better than anyone anticipated at moving consumers out of old, dirty trucks and SUVs and into new more fuel-efficient cars. New vehicles Mileage: 24.9 MPG Trade-in Mileage: 15.8 MPG Overall increase: 9.2 MPG, or a 58% improvement. (MPG: Miles Per Gallon)*

Excerpt from CARS website at http://www.cars.gov/

2.2.5 The Future

By the end of this year, the Japanese automotive industry is set to introduce electric and plug-in hybrid vehicles to the market. The government, in collaboration with industry and academia, has also invested ¥7.4 billion in R&D in an attempt to develop the "next generation" in high-performance automobile batteries to be used by hybrid, electric, fuel-cell and other new vehicles in the future. It is also developing the battery-charge infrastructure needed nationwide to support the mass use of such vehicles (Figure 7). Demonstration activities are expected occur at the end of 2009-early 2010, beginning first with taxi fleets and rental cars (Matsunaga 2009).

Figure 7: Demonstration of battery-charge stations

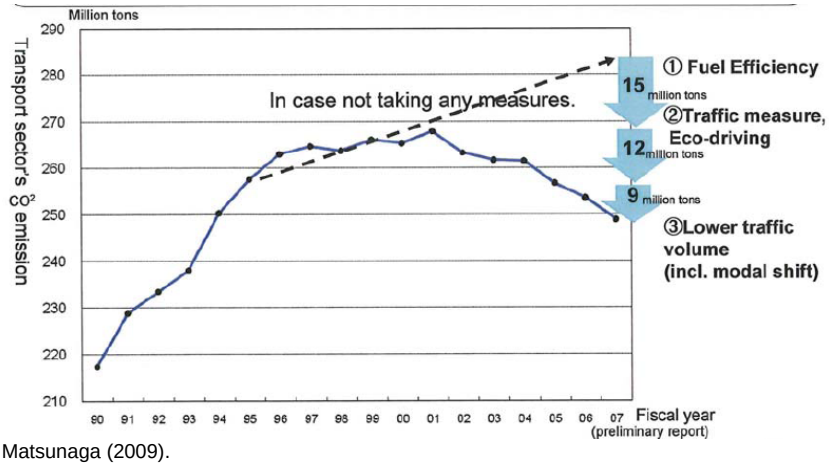
Source: Matsunaga 2009.

2.3 Tackling the Problem from Many Angles: Combining Automobile Fuel efficiency Standards, Emissions Standards, Lower Traffic Volume and Improved Traffic Management[4]

Economic growth is inevitably linked with increased motorization. There is no one policy solution that can reduce the environmental impact from the transport sector, but rather what is needed is a whole suite of well-designed policies to address the issue from different angles. This section outlines the various approaches taken by the Japanese government to achieve compatibility between environmental concerns and economic growth for the road transport sector. This includes various measures introduced to reduce automobile emissions and fuel consumption, as well as to improve traffic management and reduce traffic volume. Figure 8 traces how Japan has been able to reduce its transport CO_2 emissions since their peak in 2000.

[4] Japan's Ministry of Land, Infrastructure, Transport, and Tourism 2009.

Figure 8: CO_2 Emissions from the Transport Sector (1990–2007)



Source: Matsunaga (2009).

2.3.1 Fuel Efficiency

As CO_2 emissions from automobiles account for more than 20% of Japan's total emissions (see Figure 1), improving fuel efficiency is a critical component of any strategy aimed at mitigating climate change. Japan's *Law Concerning the Rational Use of Energy* (*Shoene Ho*) is designed to promote the continuous improvement of energy and fuel efficiency of various products including environmentally friendly vehicles produced by auto-manufacturers, dealers and retailers (UNESCAP 1999). By the end of the target year, auto manufacturers and importers of automobiles are required to improve average fuel efficiency to a level higher than the designated fuel efficiency standard set for each category of automobiles. The average fuel efficiency is calculated using the following equation.

$$\textit{Average Fuel Efficiency} = 1/[\sum (\textit{Fuel efficiencies of each model in Category A} / \textit{Number of automobiles they sold in Category A})]$$

Box 4 outlines the evolution of Japan's fuel efficiency policies over time. Notably, the years in which fuel efficiency standards were introduced or revised occurred when energy or environmental issues were acute or prominent on the global agenda.

The way in which the target fuel efficiency standards are set is based on a "Top-Runner" method. The fuel efficiency target is set at equal to the best fuel-efficient car available in the market at time. By the target year, all other models are expected to meet or better that target. By using the best available product on the market as the standard, it also demonstrates to other producers that the target has already proved to be feasible and achievable. Passenger cars and cargo vehicles fall under categories of products for which "Top-Runner" standards are adopted. In addition to fuel efficiency, the Top-Runner method is also used for improving energy-efficiency of household electrical appliances (see Section 2.4.2).

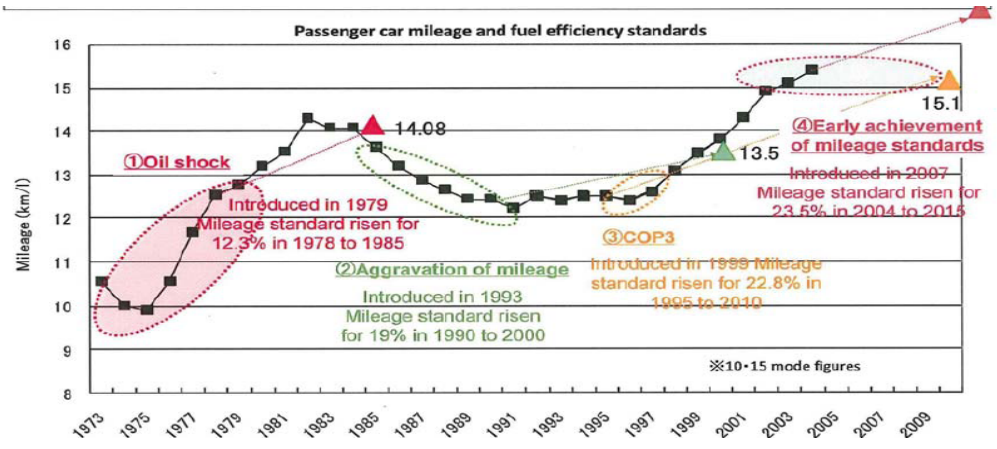
The Government also introduced in 2004 an incentive called the "Green Tax System" which exempted taxes on any cars that achieved top levels of fuel efficiency and emission reductions. As a result, the 2010 fuel efficiency standards were on average, achieved in FY 2005 by all companies (Matsunaga 2009).

Box 4: History of Japan's Fuel efficiency Policy

June 1979:	Law Concerning the Rational Use of Energy was passed
December 1979:	Fuel Efficiency Standard set for gasoline passenger vehicles (target year: FY1985)
January 1993:	Fuel Efficiency Standard renewed for gasoline passenger vehicles (target year: FY2000 (Heisei 12))
March 1996:	Fuel Efficiency Standard set for gasoline cargo vehicles (target year: FY2003 (Heisei 15))
June 1998:	Revision of Law Concerning the Rational Use of Energy (Top-Runner concept was introduced)
March 1999:	Top-Runner Standard set for passenger and small cargo vehicles (gasoline vehicle's target year: FY2010 (Heisei 22), diesel vehicle's target year: FY 2005 (Heisei 17))
July 2003:	Top-Runner Standard set for LP Gas vehicles (target year: FY 2010 (Heisei 22))
March 2006:	Top-Runner Standard set for heavy vehicles (target year: FY 2015 (Heisei 27))
July 2007:	Review of Top-Runner Standard for passenger vehicles, small bus, and small cargo vehicles (target year: FY 2015 (Heisei 27))

Source: Japan Ministry of Land, Infrastructure, Transport and Tourism (2009a)

Figure: Historical Trends of Fuel Efficiency in Japan



Source: Matsunaga (2009).

2.3.2 Emission Standards of Automobiles

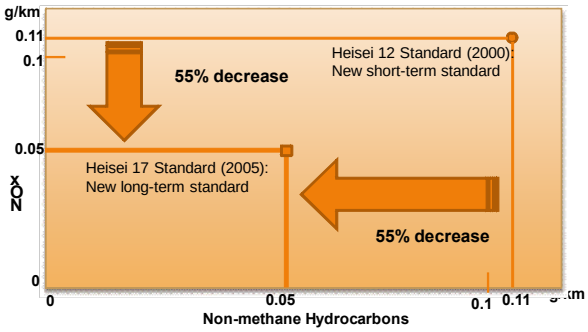
Since the 1950s, the worsening of environmental conditions, such as air pollution, began to have serious impacts on human health in Japan. In response to this, the government established legal systems such as the Environmental Agency in 1972, and the deployment of air pollution monitoring stations nationwide, to monitor a) general air quality, and b) automobile emissions along major roads. As of 2008, all general air-quality monitoring stations have recorded acceptable levels of most target pollutants; however, this was not the case for emissions monitoring stations located along major roads. In 9 out of 47 provinces in Japan, air quality along major roads did not meet environmental standards. Box 5 provides details on the automobile emissions standards established in Japan.

Box 5: Automobile Emission Standards

Japan's automobile emission standard has been revised several times since the original regulation passed in 1966. Recent revisions for gasoline vehicles were made by setting standards to be met by Heisei 12 (2000), 13 (2001), and 14 (2002) (new short term standards) which tightened emission standards for CO, hydrocarbons, and NO_x, and mandated the installation of an On-Board Diagnosis (OBD) system. Recent revisions for diesel vehicles were also made by setting standards to be met by Heisei 14, 15, and 16 (new short term standards) which tightened NO_x and Particulate Matter (PM) emission standards.

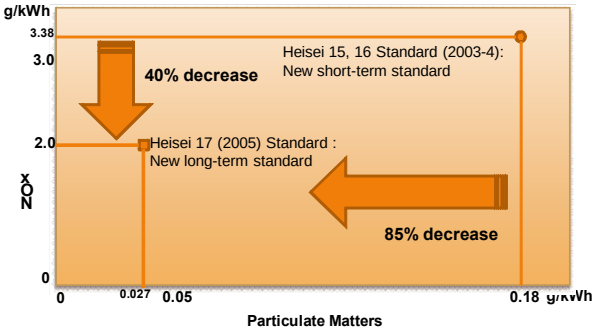
The Heisei 17 (2005) revision (new long term standards) adopted new test methods (JC08) which were designed to reproduce on-road emissions and also set more strict emission standards than any other countries (see Figures A and B) at that time of the revision. According to the Central Environmental Council of Japan, it was estimated that PM, NO_x, and Hydrocarbons will be reduced by 94% (64,000 to 4,000 tons), 66% (640,000 to 210,000 tons), and 93% (200,000 to 14,000 tons), respectively, compared to the year 2000, when all target vehicles in Japan meet this standard.

Fig A: Gasoline Vehicle's Emission Standard in the Heisei 17 Emission Standard



Emissions were measured by a new method (JE05) introduced with Heisei 17 emission gas standards

Figure B: Diesel Vehicle's Emission Standard in the Heisei 17 Emission Standard



The Heisei 21 (2009) revision of the emission standard

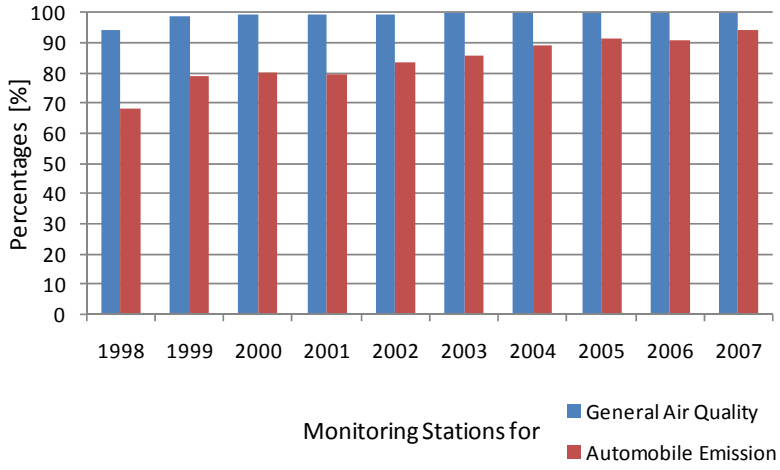
This revision aimed at updating the Heisei 17 standard to the world's tightest emission standard. In particular, the emission standards of diesel trucks, buses, and passenger vehicles further require 40-65% reduction of NO_x and 53-64% reduction of PM which now correspond to those for gasoline vehicles. The Central Environmental Council estimates 62% reduction of NO_x (270,000 to 100,000 tons) and 63% reduction of PM (3,800 to 1,400 tons), respectively, when all target vehicles in Japan meet this standard.

Source: Japan Ministry of Land, Infrastructure, Transport and Tourism (2009b).

2.3.2.1 NO_2 from Automobile Emissions

There are 1810 monitoring stations in total all over Japan; 1379 for monitoring the NO_2 in general air quality and 431 for monitoring automobile emissions along major roads. In 2007, 94.4% (up by 3.7% in 2006) of monitoring stations reported that levels of NO_2 were within acceptable levels. In the Tokyo area, monitoring data from 5 stations did not meet greater$_2$ environmental standards, however there was an 11% improvement compared to the year before (Ministry of Environment 2007).

Figure 9: Air Pollution Monitoring Stations that Meet NO2 Environmental Standards in Japan (%)

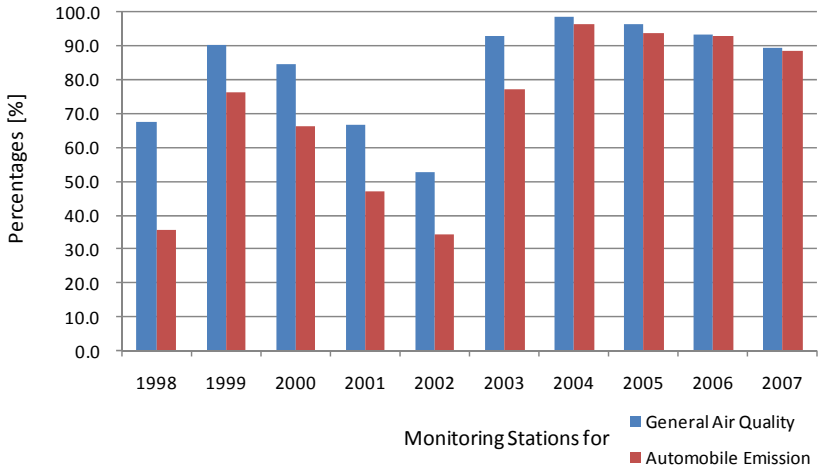


Source: Ministry of Environment 2007.

2.3.2.2 Particulate Matter

Atmospheric concentrations of particulate matter (PM) have greatly improved since the *Automobile NO_x and PM Law* was passed in 2001. In recent years, the western part of Japan has detected higher concentrations of PM and at levels higher than environmental standards, suggesting that a major source of these particulates are neither industrial nor automobile emissions.

Figure 10: Air Pollution Monitoring Stations that Meet *PM* Environmental Standards in Japan (%)

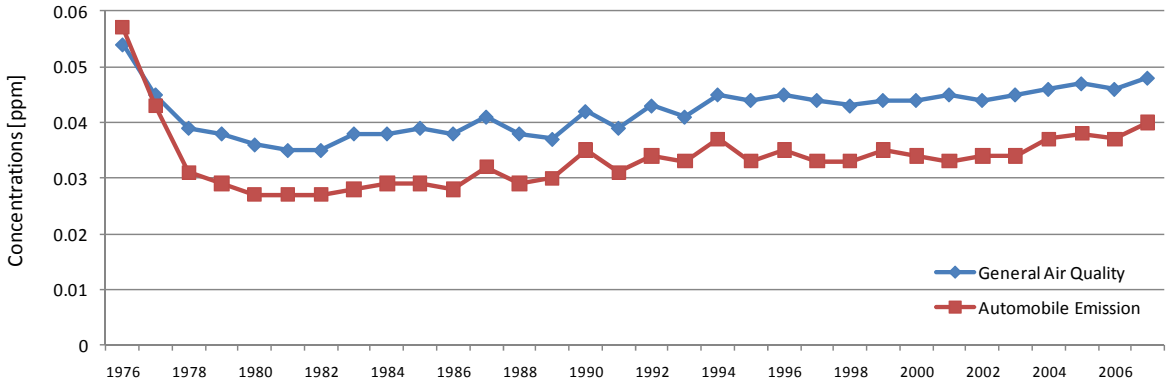


Source: Ministry of Environment 2007.

2.3.2.3 Photochemical Oxidant

Out of 1,173 monitoring stations in Japan (1143 general air-quality and 30 automobile emissions monitoring stations), only 1 station from each category achieved the photochemical oxidant environmental standard (less than 0.06 ppm over a one-hour average) in 2007. Unlike other pollutants, atmospheric concentrations of photochemical oxidant have been slightly increasing over the past few years. Managing this pollutant as well as sources of other volatile organic compounds (VOCs) or non-methane hydrocarbons (NMHC) poses a great challenge despite existing environmental standards for automobile emissions.

Figure 11: Annual Averages of Detected Day Time One-Hour Maximum Concentrations of Photochemical Oxidants at Monitoring Stations for General Air Quality and Automobile Emissions



Source: Ministry of Environment 2007.

Traffic and industrial activities appear to be the main polluting source of photochemical oxidants; this is based on data showing the distributional spread of areas where alarm warnings have been issued because photochemical oxidant levels were detected at higher than 0.12ppm. One research study in particular concluded that diesel engine vehicles emit more VOCs with higher ozone producing capacities such as non-saturated hydrocarbons and aldehydes (Hoshi et al. 2003). The Heisei 17 Emission Standard (see Box 5) has been tightened to include the Non-Methane HydroCarbons (NMHC) emission standards for gasoline vehicles. As a result, diesel filters are now increasingly installed to capture these pollutants and prevent them from entering the atmosphere.

With regards to the eco-car policy, there are no visible effects yet on photochemical oxidant atmospheric concentrations. It is clear that air pollution is still an environmental problem in Japan, so incentives like the eco-car policy to promote the further reduction of NMHC from automobiles should be incorporated throughout general policies to address photochemical oxidants and other air pollutants.

2.3.3 Improved Traffic Management in Japan

Effectively managing road traffic is an indispensable way of “greening” the transportation sector. For example, building efficient and affordable public transportation or providing bicycle infrastructure to encourage more people to cycle when traveling short distances have demonstrated to be highly effective in reducing the number of cars on the road and minimizing transport emissions. Developing countries in Asia now have the choice to either create a more environmentally-friendly transport infrastructure that is less costly in the long run (in terms of health, managing population growth, environment and maintenance costs), or follow the path of developed countries which are now spending millions of dollars to shift their original infrastructure to cope with a changing environment, population and consumer needs.

2.3.3.1 Increased Bicycle Use

In recent years, bicycle sales have been gradually increasing as more and more consumers in Japan are recognizing it as an environmentally friendly and low-cost form of transportation. According to Japan's National Police Agency (2009), in 2004, more than 80 million bicycles were in use nationwide. In response to this increase, the National Police Agency in 2006 reviewed traffic issues from having more cyclists on the street.

Although the total number of bicycle accidents has decreased in the past four years, the number of accidents between bicycles and pedestrians has increased four times since 1999 (Japan's National Police Agency 2009) . Japan's *Road Traffic Law* was revised in 2008 attempted to clarify regulations as to where and when cyclists are allowed on pedestrian paths and car lanes. In principle, cyclists are expected to use car lanes unless riders are younger than 13 years old, older than 70 years old, or are handicapped. Bicycles may be allowed on pedestrian lanes during times when car lanes are too dangerous to travel on (for example, from having too many parked cars and/or there is heavy traffic on the roads).

Another related policy change that seems to have brought visible, positive results was the introduction of countermeasures to prevent the illegal parking of cars. Since its strict enforcement in 2006, illegal parking has been drastically reduced. While these policy changes were initially aimed at reducing traffic jams, accidents and improve traffic safety, it has had some unintended but positive effects in terms of promoting an environmentally-friendly life style. It not only discouraged the use of automobiles, thereby reducing the number of cars on the road (and total traffic volume), it has also made it easier for cyclists to travel on the road. Improvements in human health have also been recorded, potentially providing large benefits to the economy over the long term (Japan's National Police Agency 2009).

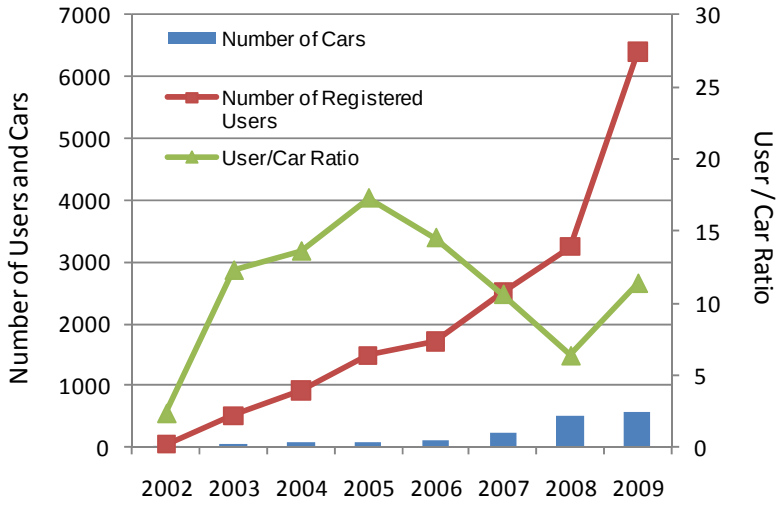
A combination of all these factors has increased the number of people shifting away from cars to bicycles. To both cope with and encourage this trend, there is a need for governments and automobile drivers in major cities in Japan to provide a safer environment for cyclists. Providing specific cycle lanes and allowing cyclists to bring their bikes on buses and trains are other ways to increase the use of public transportation and bicycles.

2.3.3.2 Car-Sharing Business Sector

In many cases, travel involves long distances which cannot ordinarily be done by bicycles. In this case, innovative ways of reducing the number of cars on the road are being explored. One way is through more "green" driver behavior, which can be achieved without purchasing hybrid vehicles and electric vehicles. Voluntary local carpooling is one such example of environmental good practice. Public policies that have encouraged such modal shifts have provided positive results, like less traffic volumes. However, carpooling or car-sharing should not be restricted to just the public policy field: they can be promising new niche markets for businesses looking to harness changing social attitudes towards green services.

The car-sharing business sector in Japan is still in its embryonic stage of marketing and system development. According to the Foundation for Promoting Personal Mobility and Ecological Transportation (2009), as of January 2009 there are 357 car-sharing stations, 563 cars available for sharing in total, and 6,396 registered members in Japan. Compared to figures in 2008, those numbers increased by 20%, 10% and 97%, respectively. There are 24 NPOs and private businesses (including both large rental car companies and small enterprises) promoting this new lifestyle. They are also given support by public policies that subsidize the establishment of car-sharing stations and information technology systems. The user/car ratio of 20 is considered to be a minimum level required for business profits in Japan.

Figure 12: The Car-Sharing Business Sector in Japan



Source: The Foundation for Promoting Personal Mobility and Ecological Transportation(,2009).

Compared to other developed countries such as the US and some European countries in which 0.07 to 0.1% of the national population is registered under a car-sharing system, only 0.01% of Japan's population is registered. Therefore, Japan still needs multi-faceted efforts at market development and policy support to enhance this emerging trend. Introducing demand-side policy incentives such as priority or free parking in convenient urban center locations would provide a visible and practical motivation to boost growth in this sector.

Box 6: Car Sharing Business in the US–Opportunity from Crisis

Due to the economic crisis, the car sharing business has been growing in the USA. For example, Zipcar now serves 300,000 members in 28 states, sharing 6,000 cars including 100 university campuses in the USA. In the US, the average transport expense relative to the total income is 19%, while Zipcar users spend only 6%. While the current crisis certainly provided an opportunity for the private sector and an incentive for consumers who could not afford to maintain a car to move towards car-sharing, the market will likely expand in the long term as oil prices increase and tighter traffic regulations are enforced to reduce traffic jams in major cities.

Source: CNBC 2009

2.4 Energy Efficiency of Household Electronic Appliances

The current economic crisis has negatively affected global sales of Japanese electronic goods. However, economic indicators show that by August 2009, most companies might have reached or are close to the worst of the crisis. Data on sales volume and gross & net profit/loss from the Q2 business period have shown that plunging sales have slowed. It is not clear if this trend will transition into a stable recovery path.

CO_2 emissions from households and offices account for about 30% of Japan's total emissions (Figure 1), exceeding the transportation sector. Reducing emissions by households will be indispensible in achieving the national CO_2 emissions reduction goal.

Despite the strong economic downturn, according to a survey on sales between 31 August 2009–6 September 2009 by the Ministry of Economy, Trade, and Industry (METI 2009a) sales of eco-household electronic appliances, particularly television sets, have increased by about 20% compared to the same month of 2008. This shift in consumer behavior was

helped in large part by a Japanese government initiative called the "Green Household Appliance Promotion Policy" or "Eco-Point System."

2.4.1 "Eco-Point System" Component of the Stimulus Package

The Eco-Point System was introduced as part of Japan's stimulus package and is designed to: encourage consumers to choose "greener" household appliances, promote energy efficient appliances, boost economic activity in the manufacturing sector, and encourage dissemination of terrestrial digital broadcasting televisions (the current broadcasting system is scheduled to transition to terrestrial digital broadcasting in 2011). Green household products that have eco-points include air-conditioners, refrigerators, and terrestrial digital broadcasting televisions which have a 4-star or greater rating on their standardized energy efficiency label (see Section 2.4.2). Consumers who purchase these products between 15 May 2009 and 31 March 2010 are entitled to receive, upon request, eco-points which can be redeemed for designated goods and services. An increasing number of retailers are now offering pre-paid cards & shop coupons, region-specific products, and energy-efficient & environmentally-friendly products that can be exchanged with eco-points.

As of 31 August 2009, METI reports that a total of 10.4 billion eco-points were distributed since the policy was established; 77% of these were issued for purchases of television sets (see Table 4). In monetary terms, 1 Eco-Point ≅1 yen**,** therefore more than ¥10.4 billion (US$104 million) of the stimulus package budget is required to fund this system. The total number of television sets purchased under this system to date, has been more than 200,000 units – which is the minimum amount estimated by assuming only 46V-sized TVs were purchased to replace older units (39,000 points given for each purchase). The price of 46V TV ranges from ¥160,000–280,000. Therefore in economic terms, the value-add of TV sets promoted by the Eco-Point system could be roughly equated to around US$440 million. A full list of eco-points earned for air conditioners, refrigerators, and television sets can be found in the Appendix.

Table 4: Impacts of Eco Point System as of 31 August 2009

	# of Applications	%	Eco Points	%
Air Conditioners	162,752	23.9	1,493,886,000	14.3
Refrigerators	72,464	10.6	905,598,000	8.7
Television Sets	446,604	65.5	8,044,019,000	77.0
Total	681,820	100.0	10,443,503,000	100.0
Points issued by recycling	482,599	70.8	1,574,031,000	15.1

Source: Ministry of Economy, Trade and Industry Ministry (2009b).

There has been criticism of the Eco-Point System however, particularly in regards to whether it provides higher incentives for larger TV sets. The actual CO_2 reduction targeted through the Eco-Point System needs to be evaluated at the end of the program to ensure the environmental impacts of the system has been beneficial.

The Eco-Point System only emerged early this year, and its management system was designed to handle 20 million transactions by the end of March 2010. It can be argued that the swift implementation of this system within such a short time frame was aided by a combination of favorable corporate and consumer attitudes formed in recent years, and reinforced through Japan's energy efficiency regulations. Established in 1979, these regulations have encouraged the market to continually improve the environmental performance of Japan's household electrical appliances.

2.4.2 "Top-Runner" Standard: Japan's Existing Energy Efficiency Policy since 1998

Several motivating factors have led to the establishment and revision of Japan's energy efficiency policies. Immediately after the second global oil shock, the national government passed the *Law Concerning the Rational Use of Energy* to slow down growing national demands for energy since 1979. Other motivating factors include the desire to achieve greater utility-cost savings and more recently, to reduce CO_2 emission from household appliances.

In 1988, the government introduced a new system that would promote technological innovation through market competition, called the "Top-Runner" system (or "Front-Runner system"). The system sets an energy efficient target to a level equal to the most energy-efficient model in the market at the time. By a certain target year, all other producers must create products that either meets, or is higher than, the target. This system differs to other international standards which are based on setting the minimum efficiency requirements. For Japanese companies, the Top-Runner system has been the key driver in their push to compete and produce goods with the world highest efficiency rating. In a highly competitive market where Japanese consumers constantly demand the latest and best models, those who fail to meet the target are not only "shamed" but are likely to lose market share. Currently, there are 21 products covered under the Top-Runner system (shown below), which are together responsible for about 50% of all household/work and office energy consumption.

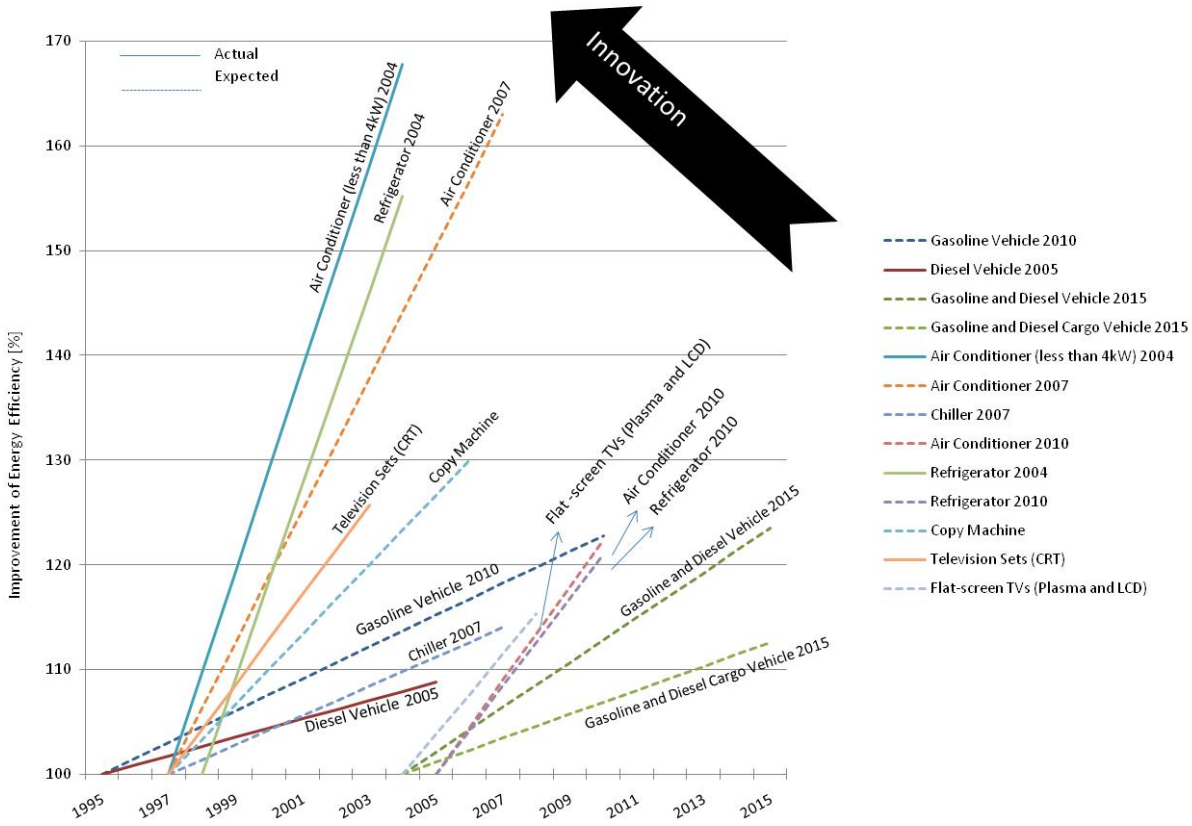
List of product categories under the Top-Runner system: (i) passenger vehicles, (ii) cargo vehicles and trucks, (iii) air conditioners, (iv) refrigerators, (v) freezers, (vi) rice cookers, (vii) microwaves, (viii) fluorescent lights, (ix) toilet seat heaters, (x) television receivers, (xi) VCRs, (xii) DVD recorders, (xiii) computers, (xiv) hard drives, (xv) copy machines, (xvi) heaters, (xvii) gas stoves, (xviii) gas water heaters, (xix) oil water heaters, (xx) vending machines and (xxi) electric transformers.

Top-Runner Standards are set for each of these 21 products, taking into consideration the range of energy efficiency performances of products currently available in the market. Each new standard has a target year. The standard is calculated by taking a weighted average of the energy efficiency rating of all existing products in that category at that particularly time. Future expectations of potential for technical advancements, energy efficiency improvement scenarios, and cost and market demand projections are then incorporated into the calculation. All manufacturers and importers in each category of products are expected to meet the new standard by the target year.

2.4.2.1 Projections of Energy Efficiency Improvements

The Top-Runner Standard uses energy efficiency improvement projections which have been set for each category. Generally, the Top-Runner Standard is within 3 to 10 years, and for 110 and 160% improvements in energy efficiency. Many products have not just met these standards but surpassed them by higher than expected margins. For example, when the energy efficiency target of refrigerators was set at 30.5%, the eventual efficiency rate gained was a total 55.2% in 2004 compared to 1998 levels.

Figure 13: Energy Efficiency Improvement Achieved and Expected in Top-Runner Standards



Source: The Energy Conservation Center Japan (2009).)

The incline of the energy efficiency scenario lines above represents the margin of innovation (Figure 13). As seen in Figure 13, in general, the more mature a technology is, the less steep the line becomes, as the potential decreases for further energy efficiency gains with the same technology. Between the different product categories, the introduction of a newer technology does not necessarily mean it will have a steeper incline. For example, the Air Conditioner Top-Runner standard by 2004 was much steeper than flat-screen TVs, indicating there was significant room for improvements in the energy efficiency of refrigerators before 2004 than flat-screen TVs before 2007.

By setting a market-based standard that considers many market and technological factors, this Top-Runner Program has proven successful in achieving its goal while encouraging a dynamic and innovative market for household electric appliances and cars.

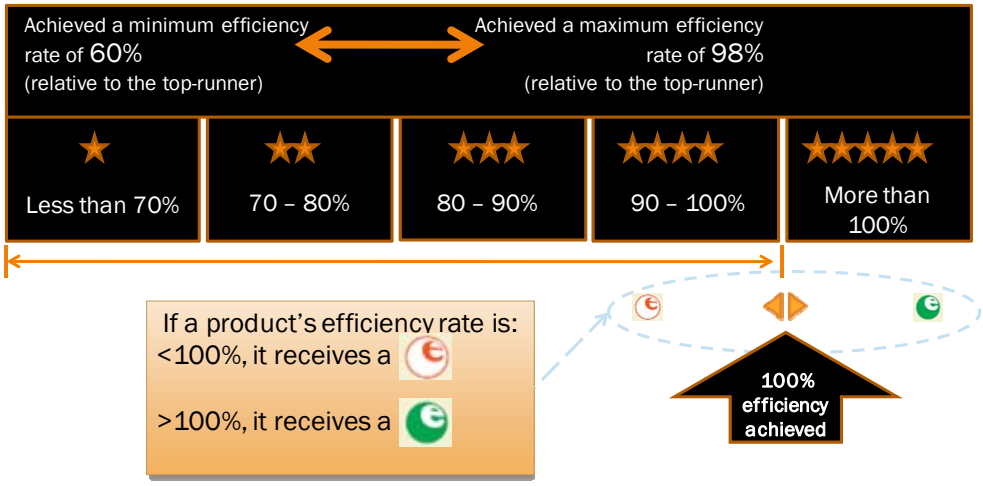
However, all of these efforts by suppliers would not have been sustained if consumers were not informed of such improvements or the overall environmental performance of the products. Without this critical information, consumers would have no ability to choose between more environmentally-friendly products and others. To inform consumers, the government introduced the *Law Concerning the Rational Use of Energy* that mandates retailers to properly display standard efficiency labels on products. There are two types of labels under the Top-Runner standard system. One uses a single criterion, which is applied to most of the products listed above. The other label is based on a Multi-Step Rating System and has five star criteria that are applicable only to three products: automobiles, household appliances and air conditioners. The following three figures will show how the multi-step

rating system promotes more energy efficient products (The Energy Conservation Center Japan 2008).

2.4.2.2 Explaining the Multi-Step Rating System

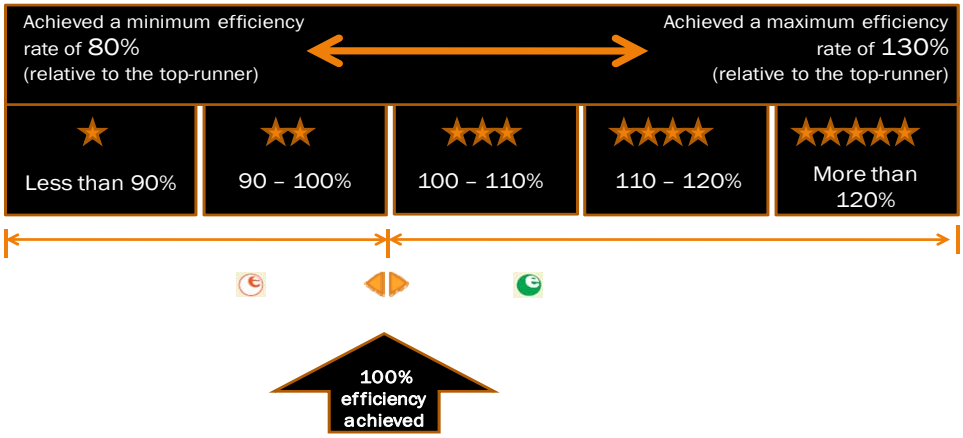
Example 1:

Immediately after a Top-Runner standard for a product category is set (at 100%), the energy-efficiency of most products in the market are lower than the Top-Runner standard. The 100% level is set by looking into products available in the market. The illustration below shows such a case where the minimum energy efficiency standard achievement rate is 60% and the maximum is 98%. In this case, the range of 60 to 100% is divided into four steps, each assigned with 1 to 4 stars as shown in the above.



Source: Translation of the Energy Conservation Center Japan (2008).

Example 2: A few years after each Top-Runner standard is set, manufacturers typically make efforts to improve the energy-efficiency of their products. As such, more products with an energy efficiency rate higher than 100% will be made available to the market. At this stage, a review of the rating system is conducted. Assuming that the quality of the products in the market increases to the point that 50% of the products are able to achieve an energy efficiency rating higher than the Top-Runner standard (100%), the multi-steps are reset with the lowest and highest performing models posting an energy efficiency rate of 80% and 130% respectively (compared to the Top-Runner). See example below.



Source: Translation of the Energy Conservation Center Japan (2008).

Example 3: By the target year, most products available in the market would have achieved the Top-Runner standard. The example below shows a case where the energy-efficiency

range of products available in the market is between 90% and 140%. The multi-steps are reset as below.

Source: Translation of the Energy Conservation Center Japan (2008).

Time to review the Top-Runner standard:

A Top-Runner standard remains the goal for several years. As the energy-efficiency of products improves however, more products are given many stars, making it more difficult to compare performance. This is when the Top-Runner standard needs to be reviewed and set higher. According to Energy Conservation Center Japan, the Top-Runner standard is reviewed when more than 30% of products achieve the standard or when most products are given five stars.

For example, the multi-step rating criteria for flat-screen TVs (including LCD and plasma TVs) underwent a revision in 2008 as it was necessary to catch up with the energy efficiency improvements of these products (which had occurred at a much faster rate than expected when the previous criteria was set).

Figure 4: Example of Multi Step Rating System Label with a 5-star performance

Source: The Energy Conservation Center Japan (2008).

There have been assessments over the applicability of implementing the Top-Runner Program in other parts of the world (Nordqvist 2006). Overall, what has been recognized is that the primary reason for the policy's success is the level of stakeholder involvement, particularly by manufacturers who are subject to the standard. In setting goals, if manufacturers' capacities and technological constraints are understood, then the best and most feasible energy efficiency scenarios and standards can be designed. However, another review also argued that by compartmentalizing standards in each product category, this may allow certain technology and products with lower energy efficiency performance to survive (Ministry of Economy, Trade, and Industry 2007).

More policy and social research on the applicability of this policy in ASEAN countries is needed, including some small scale social experiments to see if ASEAN countries could introduce such a policy with a certain level of modification or simplification to suit local needs.

3. POLICIES OF THE NEW GOVERNING PARTY OF JAPAN

Japan's post-stimulus package policy and future strategies to promote greener choices are now in the hands of the new government. The Democratic Party of Japan entered parliament on 30 August 2009 after winning a historically large margin. It was an outcome that was widely regarded as a clear demonstration of voters' frustration with the previous Liberal Democratic Party-led government's lack of leadership and action, particularly in areas such as reduced government spending, bureaucratic reform, pensions, medical services and national health insurance. According to the new government's manifesto (the only public policy information available at the moment as it is still in the process of forming a new cabinet), it will promote and implement the following environment-related policies:

- Create a target of 25% reduction of 1990 CO_2 emission levels by 2020, and 60% reduction by 2050. This will be achieved by promoting global warming countermeasures, nurturing green industries, establishing a domestic carbon trading market, and introducing a global warming measure tax (renewable energy ratio target: 10% by 2020);
- Abolish most highways toll-fees all over Japan (probably except those in large cities such as Osaka and Tokyo Metropolitan Highways);
- Eliminate provisional additional tax rates: *Gasoline Tax* (+25% provisional rate since 1974), *Diesel Oil Delivery Tax* (¥32.1 per liter), *Automobile Weight Tax*, and the *Automobile Acquisition Tax* which is equivalent to US$25 billion;
- In the future, merge the *Gasoline Tax* and *Diesel Oil Delivery Tax* into a *Global Warming Countermeasure Tax*. Merge the *Automobile Weight Tax* and *Automobile Tax*, and abolish the *Automobile Acquisition Tax* to avoid duplicate taxation with the *Consumption Tax*;
- Introduce of a *Feed-in Tariff Policy* with fixed prices to promote renewable energy electricity;
- Subsidize the following items: photovoltaic units for home use, environmentally friendly automobiles and energy-efficient household appliances.

3.1 CO_2 Reduction Target of 25% by 2020

At the Asahi World Environment Forum on Monday, 7 September 2009, the new Japanese Prime Minister Yukio Hatoyama announced that his government would reduce Japan's greenhouse gas emissions by 25% of 1990 levels by the year 2020—equivalent to reducing one-third of current levels within in just 11 years. This is in contrast to the former PM Taro Aso, who pledged a target of only 8% reduction from 1990 levels. The Hatoyama target is in line with IPCC forecasts, which estimate that a reduction of emissions by developed nations to between 25–40% of 1990 levels between 2012 and 2020 would reduce the risk of Earth's average temperature rising more than 2 degrees this century. However, there is considerable doubt on the feasibility of the target if it were to be achieved through domestic reductions alone. One study by Professor Tetsuo Yuhara, Research Director for the Canon Institute for Global Studies and a Member of the Japanese Committee established to address the feasibility of the mid-term target, argues that successfully reaching the target would require across-the-board sectoral CO_2 reductions of at least: 29% by industry, 34% by transport, 41% by commercial interests, 50% in residential usage, and 41% energy

conversion. It would also require the construction of 15 new nuclear power plants[5]. It is likely that the target would have to be achieved through a combination of domestic reductions and offsets through purchases of carbon credits from emissions reductions made in developing countries.

3.2 Proposed Abolishment of Highway Toll-fees

In general, the response from the public regarding the abolishment of the highway toll-fees has been ambivalent, with some polls showing only 30% support. One Japanese NGO has estimated that more than 9.8 million tons of CO_2 would be emitted if highway tolls were abolished (although this estimate is somewhat premature due to the usage of very limited survey models). This is equivalent to 0.75% of Japan's total emissions in 2007, which was 1.3 billion tons. This is highly significant when compared to Japan's Kyoto target of 6%. The justification for the toll-free highways is based on a study by the National Institute for Land and Infrastructure Management (under the Ministry of Land, Infrastructure, Transport, and Tourism). The study assessed the economic benefits of reducing and abolishing highway tolls by comparing the effects of what would happen if drivers who normally drove on local roads to avoid the tolls, shifted to using toll-free highways. The study compared the time required to drive, fuel expenses, and economic loss incurred by traffic accidents, and converted it into monetary values. Some toll-setting scenarios (30% discount, 50% discount, and toll-free) were proposed in this study as part of the economic stimulus package. Setting the maximum limit of highway tolls to ¥1,000 during weekends is estimated to generate economic benefits equal to US$17 billion – this policy has now already been put into action. The study also concluded that toll-free highways would bring direct economic benefits of US$27 billion or around US$78 billion if the indirect economic benefits are included.

Judging from the new government's manifesto, some (but not all) of the green policies which promote the production of environmentally-friendly goods have already been adopted as part of the economic stimulus package set by the previous administration. Therefore, it seems likely that existing policies will be extended, although the amount of subsidy provided might be lower for more long-term measures. The automobile industry has already expressed to the new government their desire to see the current policy continue.

4. OPPORTUNITIES AND CHALLENGES FOR GENERATING GREEN DEMANDS

The market transformation of certain sectors in Japan, and probably in many other parts of the world, has in large part been a result of the fiscal stimulus intervention. Calculating the overall quantitative impact of these measures will need to wait for more concrete statistical data to be gathered. However, what has been proven is that people do and have responded to government intervention.

Before the introduction of the eco-point system for household appliances or the eco car tax reduction and subsidies, there were limited economic incentives in the Japanese market for consumers to choose eco-certified products. The economically viable choices offered by the stimulus package confirmed that a green consumer movement was present and increased visibility of diverse demands for green products.

This historical moment presents an ideal opportunity to shift attention beyond the stimulus package to developing policies that would accelerate the transition towards greener economies. In some business sectors now, the green momentum generated by the fiscal stimulus may continue at an irreversible speed, causing business sectors to continue their

[5] Presented at a recent Integrated Research Systems for Sustainability Science (IR3S) and University of Tokyo symposium on "Pathway to Low Carbon Society after Kyoto Protocol" (Tokyo, 28 October 2009).

green marketing efforts for a few more years. While there may be a rebound phase before and after the ripple effects of the stimulus package has faded out, lessons should be learnt from this unprecedented social experiment. Governments should transform the pre-stimulus green market promotion policy into a crisis-proof post-stimulus policy. Appropriate regulatory mechanisms and fiscal incentives should be fully considered, as well as both supply- and demand-side monetary and non-monetary incentives. Both pull and push policies should be adequately mixed.

There are many ways that the public sector in Japan and across Asia can learn from the private sector. They include:

> (i) Non-monetary incentives could be more proactively employed. Priority parking for eco cars is an example.
>
> (ii) Policies and public communication need to be customized for different groups, as a wide spectrum of views on green products exist among the general public. Taking a more client-focused approach to public policy formulation can lead to innovative policy strategies.
>
> (iii) Different types of policies (which are often administered by different ministries) could be more flexibly linked to create greater incentives for compliance and motivation for greener choices. Compliance with a regulation could be a precondition to receive another administrative service or benefit.
>
> (iv) Opportunities to experience alternative choices should be also promoted using smaller monetary incentives (Fujii S. and Kitamura R., 2003). Experiencing green alternatives should at some point be promoted with incentives and presented as a compelling choice by a cross-sector and cross-ministerial partnership.

The specifics will of course, vary from policy to policy and from country to country. However, what is needed is for the mechanisms of innovation to be embedded into the policy itself. One of the success factors of the multi-step rating system of the Top-Runner policy is the constant revision of targets and standards based on up-to-date market information.

Small-scale social experiments could provide a useful demonstration of the applicability of a policy like the Top-Runner Standard to ASEAN countries. In addition, it could also bring other indirect benefits beyond simply strengthening energy efficiency, such as more attention to environmental regulations in general. Involving supplier-side stakeholders is also a critical element for policymaking. From the developing countries' perspective, the effectiveness of this approach when involving only importers should be further researched.

Green technology and policy do not necessarily need to be capital intensive. Without adapting to local conditions such as technological level, labor skills and costs, any market (green or otherwise) will not prevail in developing countries. In places where technological capacity needs more time to be developed for green market applications, policies supporting sustainable development could be adopted, taking advantage of the abundant labor force instead of attempting to bring technological solutions from developed countries.

Another trend that is developing in Japan is in the area of organic food and farming. As part of Japan's stimulus package, US$2 million was added to the original 2009 budget of US$4.6 million to enhance organic farming in Japan. The effect of the package on the organic farming industry needs to be assessed in a few years time: as Japanese consumers' tastes are changing and as concerns over food safety increase, this small but emerging industry is set to expand. ASEAN countries can benefit by closely observing trends in new markets such as these.

For many ASEAN countries, investing in green infrastructure should be considered part of the modernization process of their economies. As we have witnessed in the case of cell phones and fluorescent light bulbs, for instance, advanced technology can spread very rapidly in developing countries,. “Leap-frog technologies” like these and green infrastructure should be supported by public policy and technical-transfer efforts by international interventions like ADB’s US$3 billion Countercyclical Support Facility.

Finally, continuous efforts to increase consumer awareness are an important part of the effort to generate demand for green products in developing countries as well. The eco-labels explained in this paper are some of the successful ones. According to the Japan’s Ministry of Environment, there are more than 26 eco labels on environmentally friendly products, more than 17 eco labels voluntarily initiated by private sectors, and more than 60 eco-labels created by municipal/local governments (Ministry of Environment, 2009). Some of which, not all, have become widely used. But most of these do not come with incentives. Competition between these labels could be a way for building dynamic green markets in developing countries as well.

5. CONCLUSIONS

Since Fall 2008, the financial crisis has stalled global economic growth for both developed and developing countries. Stimulus packages introduced by major economies, while targeted specifically for certain sectors, have so far also functioned as a parachute for the global economy more generally—at least as of early September 2009. Although unemployment rates are still increasing, car sales in the US and Japan during August 2009 have shown weak but positive increases (1 and 2.2%) for the first time in 22 and 13 months, respectively.

The double-pronged policy to boost business sales and transform the national consumer goods portfolio to a greener one has been effective in Japan, owing largely to both consumers’ and private sector’s readiness to respond. The incentive-provision policy not only encouraged consumers to buy more, and greener, products but also pushed manufacturers and retailers to enrich their product varieties, create demand by setting prices lower and showcase them more proactively at general retail stores. This green stimulus package, however, was conceivable in a realistic sense because of the ample personal savings or disposable incomes of citizens in developed countries which may not be the case in most developing countries.

While the scale and type of intervention may not be possible or necessary in most developing countries, this financial crisis should be considered as a golden opportunity for any sector in any country to emerge as green innovator in a short space of time. Governments can support this by trimming outdated business-as-usual public policies and providing incentives for transformation.

Globally, it is time to shift our attention to post-stimulus package policies to harness the momentum of greening markets. A new global initiative that guides the world toward sustainable development is now needed, particularly as some of the current global agreements are fast approaching their deadlines: 2009 for COP15 to develop a post-Kyoto framework, 2012 for the 10th Anniversary of Johannesburg Summit, 2015 for Millennium Development Goals and 2020 for global implementation plans as well as carbon emission reduction goals for some developed countries. A space shuttle boosted by the financial stimulus package has been successfully launched. We need to ensure that its trajectory is on a right path toward a permanent orbit of sustainable development.

APPENDIX

Currency Conversion

Throughout this paper, the currency conversion from Japanese yen to US dollars used a currency rate of USD 1 = ¥100 for convenience.

Western Calendar Year vs. Japanese Year

2005 = Heisei 17
2008 = Heisei 20
2009 = Heisei 21
2010 = Heisei 22
2015 = Heisei 27

Japan's fiscal year starts on 1 April and ends on 31 March. For example, FY 2009 is from 1 April 2009 to 31 March 2010.

Abbreviations

ASEAN	Association of South East Asian Nations
CARS	Car Allowance Rebate System
DPJ	Democratic Party of Japan
GDP	Gross Domestic Product
IEA	International Energy Agency
IMF	International Monetary Fund
LCD	Liquid Crystal Display
LDP	Liberal Democratic Party of Japan
METI	Ministry of Economy, Trade, and Industry
NMHC	Non-Methane Hydrocarbons
OBD	On-Board Diagnosis System
OECD	Organizations for Economic Co-operation and Development (OECD)
PM	Particular Matter
R&D	Research and Development
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile Organic Compounds

Eco Point System

The following points are issued with purchases of air conditioners, refrigerators, and television sets with more than 4 stars for the standardized energy efficiency label.

Air Conditioners

Chilling capacity	Eco Points
Higher than 3.6 kW	9,000
2.8 or 2.5 kW	7,000
Less than 2.2 kW	6,000
Recycling old ones	Additional 3,000

Refrigerators

Volumes	Eco Points
Larger than 501 L	10,000
401 – 500 L	9,000
251 – 400 L	6,000
Less than 250 L	3,000
Recycling old ones	Additional 5,000

Terrestrial digital broadcasting televisions

TV size	Eco Points
Larger than 46V	36,000
42V or 40V	23,000
37V	17,000
32V or 26V	12,000
Smaller than 26V	7,000
Recycling old ones	Additional 3,000

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