Priority Subjects — **Establishment of Optimal Risk Management**

# Analyses of Energy Saving and Environment Institutions from an Economics and Energy Security Perspective

**Background and Objective**

Nations are considering new proposals for an international framework governing greenhouse gas emissions after 2020. The agreed deadline for this is 2015 and Japan is considering its domestic emission reduction policy.
We will assess the effectiveness of policies (voluntary approach, energy efficiency policy, renewable energy policy, emission trading and so on) based on empirical analyses of policy implementation. We will propose a national greenhouse gas mitigation policy in harmony with the economy and energy security.

**Main results**

## 1 Analysis of electricity saving activities and energy efficiency programs

We conducted a questionnaire and interviews targeting households and firms to analyses their electricity saving activities, perceptions, and persistency after the summer of 2011 (Y13010) (Y13014). The results show that, while the overall activity level of saving electricity was lowered in 2013 compared to the 2011 level, reduction rate of electricity use from the 2010 level has been maintained at around 10%. It is also shown that the cumulative impact of high-efficiency equipment might be compensating the moderated behaviors (Figures 1 and 2).
We also conducted an evaluation of subsidy programs for energy efficiency (Y13028). Based on a questionnaire to firms which participated in subsidy programs, we estimated the levelized costs per energy saved by the programs, and found that the subsidy programs were mostly cost-effective when compared to the avoided costs and carbon emission prices, although the freerider rates were estimated to be rather high at around 50% to 60%.

## 2 Evaluating the Feed in Tariff of renewables in some European countries and Japan

The Feed in Tariff (FIT) makes renewables low-risk investments by securing a long-term fixed FIT price, which has led to large expansion. However, FIT has met with criticism due to its increasing cost burden, most notably with regard to so called PV bubbles. According to European countries' experiences, the causes of the PV bubbles were (1) short lead time of PV projects, (2) limited price monitoring by government agencies and (3) excessively high FIT prices. We find that the solutions to these problems, which have since been put into action, were to frequently reduce the FIT prices, restrict capacity, and retroactively cut the FIT price for existing plants (Table 1). Therefore, given the early experiences with FIT in those countries, Japan needs to pay attention to efficiency when implementing FIT (Y13031).

## 3 Assessing the effectiveness of voluntary approaches

Using a survey of approximately 1,000 firms in Japan, we find that the establishment of the Voluntary Action Plan (VAP) by Japanese sector associations influenced its member companies to take proper action against climate change. What is more, we find that the VAP significantly promotes the pro-environmental behavior of small and medium-sized companies, which typically face severe energy efficiency barriers owing to relatively smaller capacity to access information. We conclude that an important role of voluntary approach is not restricting $CO_2$ emissions, but rather establishing proper institutions within industries to distribute well-becoming information and encourage business pro-environmental activities as far as economically justifiable. Based on these facts, we recognize the success of voluntary approach is best understood by focusing on tangible activities rather than focusing on quantitative outcomes.

## 4 Analysis of international negotiations on climate change

We analyzed views of countries at negotiations on post-2020 international climate regime (Figure 3). As a result, we found that developed countries and some developing countries generally support a hybrid system in which all countries nationally determine their emissions reduction targets and actions after international consultation on an ex-ante draft of them, while China, India, and other like-minded developing countries insist that developed countries should set its target in a top-down manner and developing countries can keep discretion to decide their actions in a bottom-up manner (Y13020).

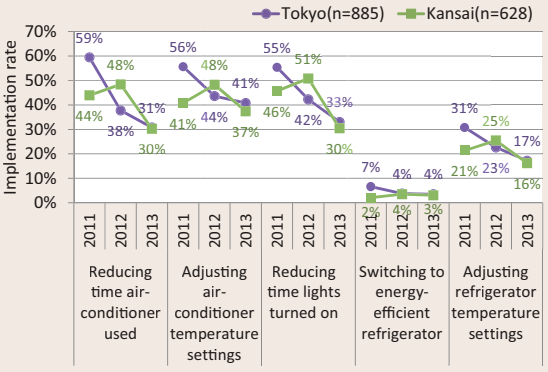


Fig.1: Implementation rates of electricity saving measures in the residential sector

Implementation rates are on a downward trend in 2013, while electricity consumption in the summer after weather adjustment remained below approx. 10% of the 2010 level. The statistical analysis shows that cumulative impact of buying new appliances accounts for about 3% in 2013. With regard to persistence, it is necessary to carefully understand the downward trend of behavior-based impact.

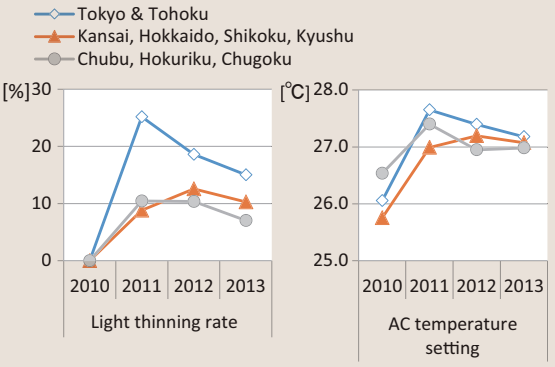


Fig. 2: AC temperature setting and light thinning rates in office buildings for the summers of 2011 through 2013

The overall activity level of saving electricity was lower in 2013 compared to 2011. However, saving activities such as limiting use of lighting and air conditioning were still persisting. The figure to the right shows that the average temperature setting in office buildings was still 1 degree C above the 2010 level in summer 2013. Similarly, the figure to the left shows the rate of light thinning was maintained at around 10% even in summer 2013. It is implied that similar levels of activities and reductions could be sustained at least in the next few years if other factors remain unchanged.

Table 1: Preventing the PV bubbles

Selected European countries have implemented the modified FITs that frequently reduce the FIT prices and restrict capacity to solve the PV bubbles.

| | Frequent reduction of the FIT prices | Restrict installed capacity |
|---|---|---|
| Germany | Revised every month since May 2012 | 2.5 GW/year |
| Italy | Revised every month to 6 months since June 2011 | 6.8 billion euro/year since Aug. 2012 |
| Spain | Revised every 4 months since April 2010 | 0.5 GW/year in 2009<br>0.47 GW/year in 2010 |
| France | Revised every 4 months since2009 | 1 GW/year since 2013 |
| UK | Revised every 4 months since 2010 | 1.06 billion pounds from 2011 to 2014 |

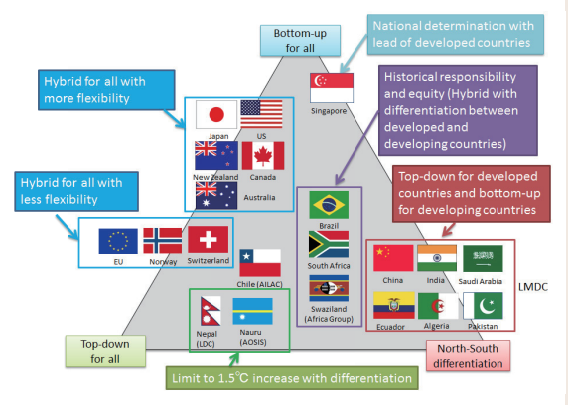


Fig. 3: Views of countries on post-2020 international climate regime

Developed countries generally support a hybrid system that is applied to all countries. Brazil and South Africa propose a hybrid system with differentiation between developed and developing countries. Like-minded developing countries including China and India insist on a top-down system for developed countries and a bottom-up system for developing countries.