

## Need for an assessment of the Kyoto Mechanisms

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In April 2014, the Annex B countries of the Kyoto Protocol published the number of transactions of Kyoto units that had taken place by the end of 2013 as well as the GHG emissions of the Annex B countries in 2012. This report summarises how each country achieved their emission reduction targets during the first commitment period of the Kyoto Protocol.

♣EU15 countries transferred 989 million t-CO<sub>2</sub> of Assigned Amount Units (AAUs) and 32 million t-CO<sub>2</sub> of Removal Units (RMUs) as well as acquiring 348 million t-CO<sub>2</sub> of Emission Reduction units (ERUs), 670 million t-CO<sub>2</sub> of Certified Emission Reductions (CERs) and 79 million t-CO<sub>2</sub> of RMUs. By using these units, the EU achieved a reduction of 12.2% from the base year.

♣The Economies in Transition (EIT) countries transferred 1,741 million t-CO<sub>2</sub> of AAUs and ERUs in total, while they acquired 9,257 million t-CO<sub>2</sub> of CERs. As a result, the EIT countries still have a surplus allowance of 9,257 t-CO<sub>2</sub>.

♣Japan achieved a 8.4% emissions reduction from the base year using GHG removals by sinks, AAUs from the Czech Republic and Ukraine, as well as primary CERs. Because Japan had an initial assigned amount that was less than the country's GHG emissions over five years from 2008 to 2012, it was necessary to use a large amount of Kyoto units to achieve Japan's target.

♣The five-year GHG emissions from Annex B countries of the Kyoto Protocol came to 9.3 billion t-CO<sub>2</sub> (22% reduction from the 1990 level). When the CERs and RMUs are counted, the GHG emissions are calculated at 8.9 billion t-CO<sub>2</sub> (26% reduction from 1990 the level).

♣For the next step, it will be necessary to conduct research into what extent the Kyoto Mechanism could contribute to substantial GHG emission reductions in consideration of external factors, such as economic recession and structural changes to energy supplies.

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## 1. Role of Kyoto Mechanism

The Kyoto Protocol is an international agreement, which commits its Parties to setting internationally binding emission reduction targets under the principle of “common but differentiated responsibilities.” Under the Marrakesh Accord, which was adopted in Morocco in 2001 and defines the detailed rules for the implementation of these targets, the first commitment period started in 2008 and ended in 2012. Under the Protocol, countries must meet their targets primarily through national measures. However, the Protocol also provides them with complementary measures to meet their emission reduction targets by way of three market-based mechanisms. These are the International Emission Trading (IET), the Joint Implementation (JI) and the Clean Development Mechanism (CDM). The IET allows Annex B parties of the Kyoto Protocol to sell emissions permits to countries that are over their targets. The JI creates Emission Reduction Units (ERUs) from an emissions reduction or emissions removal project in another Annex B country. The CDM allows Annex B parties to implement an emissions reduction project in developing countries. Such projects create Certified Emission Reductions (CERs), which can be used for the emission reduction targets of Annex B countries. These three mechanisms make up the so-called “Kyoto Mechanism”, which has the role of stimulating sustainable development through technology transfer and investment. This also helps countries with Kyoto commitments to meet their targets by reducing emissions or removing carbon from the atmosphere in other countries in a cost-effective way and encourages the private sector and developing countries to contribute to the emission reduction targets of Annex B countries of the Kyoto Protocol.

This report summarises how each country has achieved its emission reduction targets during the Kyoto Protocol first commitment period (KP-CP1). Table 1 shows the grouping categories of the Annex B countries of the Kyoto Protocol for the purpose of summarising the data regarding the transactions of Kyoto units.

**Table 1. Category of Annex B countries of the Kyoto Protocol**

	EU15 countries	EU ETS members	EIT	Others
Austria, Belgium, Denmark, Finland, France, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal, Spain, Sweden, United Kingdom	✓	✓		
Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia		✓	✓	
Iceland, Liechtenstein, Norway		✓		
Russian Federation, Ukraine, Croatia			✓	
Japan, New Zealand, Switzerland, Australia				✓

## 2. Defining the “use of Kyoto Units”

Each Annex B country of the Kyoto Protocol has its own emission reduction target and an initial assigned amount, calculated using the following equation:

$$\text{Initial assigned amount} = \text{Base year GHG emissions} * (1 - \text{emission reduction target (\%)}) * 5 \text{ years} \quad (1)$$

In principle, each country was required to reduce their GHG emissions from 2008 and 2012 in order to ensure that their emissions were lower than the initial AAUs. But, as a supplementary measure, each country is also allowed to complement its initial assigned amount with several Kyoto units (AAUs, ERUs, CERs and RMUs). Hence, each country decides whether they reduce their GHG emissions by themselves or by acquiring Kyoto units. They do this by considering minimising the cost of achieving their emission reduction targets as described in equation (2) below. When equation (2) is converted to equation (3), it also enables one to express “Reduce GHG emissions by subtracting the amount of CO<sub>2</sub> equivalent to Kyoto units”. Hence, this report adopts the calculation defined by equation (3). In order to simplify this calculation, this report assumes that a country subtracts all of its Kyoto units held in the entity holding accounts, party holding accounts, retirement accounts and cancellation accounts in its national registry from its five-year emissions.

$$\text{Five-year GHG emissions} < \text{Initial assigned amount} + \text{Transacted AAUs} + \text{ERUs} + \text{CERs} + \text{RMUs} \quad (2)$$

$$\text{Five-year GHG emissions} - \text{Transacted AAUs} - \text{ERUs} - \text{CERs} - \text{RMUs} < \text{Initial assigned amount} \quad (3)$$

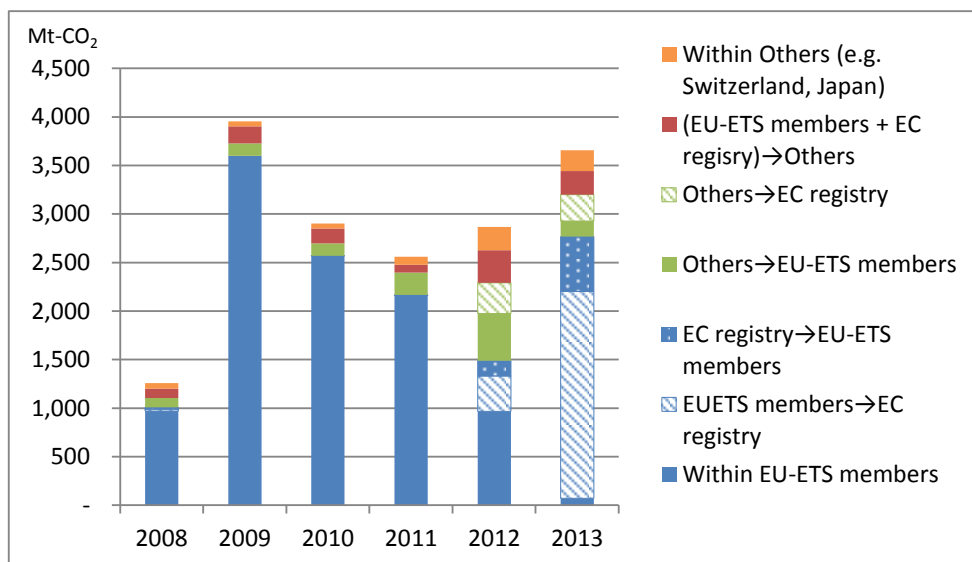
## 3. Overviews of transaction of Kyoto units

From 2008 to 2012, 17.1 billion t-CO<sub>2</sub> of emissions in Kyoto units were involved in transactions among all Annex B countries of the Kyoto Protocol, with the most transactions carried out among EU ETS members<sup>1</sup>. This is due to the links with the European Union Emissions Trading Scheme (EU ETS). In this scheme EU allowances (EUAs), which are converted from AAUs, were allocated to companies in EU countries. Any transaction involving EUA is, therefore, automatically recorded as a transaction of a Kyoto unit. In fact, the Community Independent Transaction Log (CITL) records the transaction of EUAs, and at the start of the first commitment period, this was connected to the International Transaction Log (ITL), which is administered by the UNFCCC secretariat and records transactions of Kyoto units. It also enables the EU ETS legislation to allow participants to use most categories of units from the CDM and the JI towards fulfilling a part of their EU ETS obligations.

In practice, from 2009 to 2011, around 90% of all these transactions were conducted between EU ETS members. However, in 2012, the “Other” group that includes Japan and Switzerland, was involved with 30% of transactions of units, which were transferred to the EU ETS members and the European Community Registry (EC registry). In 2013 around 60% of all transactions of Kyoto units were transferred from EU ETS members to the EC Registry. The purpose of these transactions can be considered as being in preparation for the carry-over of surplus units towards the second commitment period of the Kyoto protocol.

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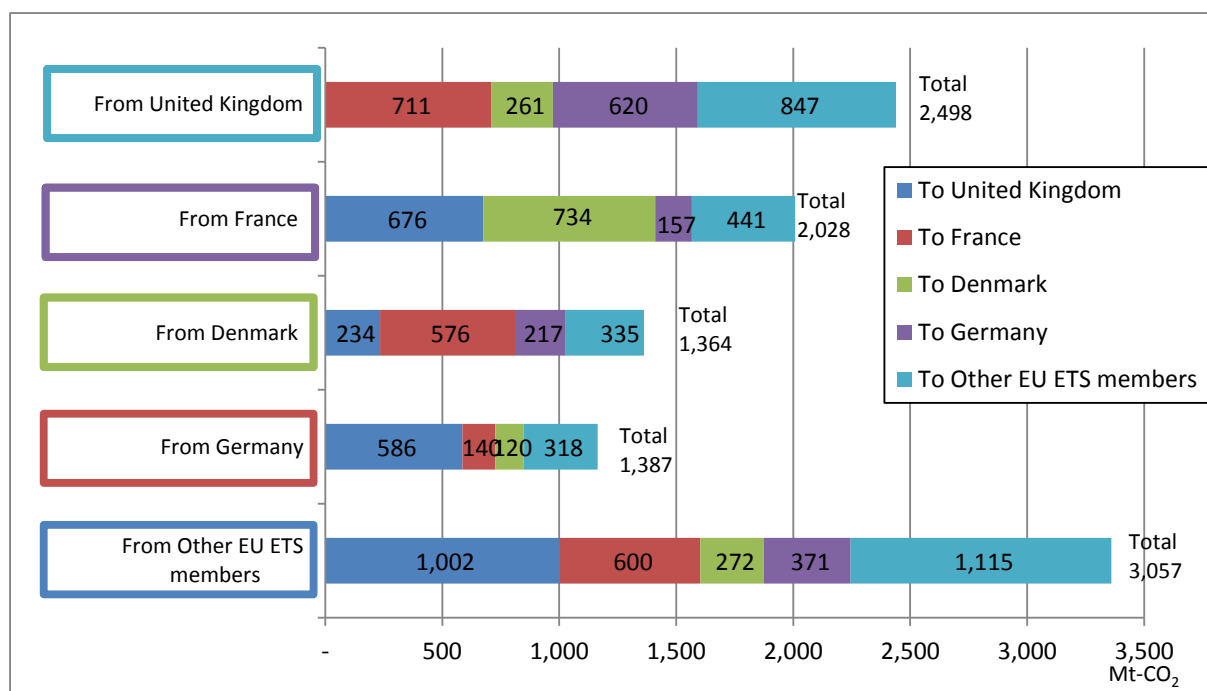
<sup>1</sup> EU ETS operates in the 18 EU countries plus Iceland, Liechtenstein and Norway (as of 2013).



Source: Author based on IGES (2014b)

**Figure 1. Total transaction of Kyoto units among the Annex B countries of the Kyoto Protocol**

Within the EU ETS members, UK, France, Denmark and Germany recorded the four largest transactions of Kyoto units within EU ETS members, as shown in Figure 2. It can be observed that the large amount of transactions including both the addition and subtraction of Kyoto units was carried out between any two members of these four countries. For example, UK added 676 million t-CO<sub>2</sub> of Kyoto units from France and, conversely, France added 711 million t-CO<sub>2</sub> of Kyoto units from the UK. This means that the transactions were carried out not only for the purpose of fulfilling the countries' commitment under the Kyoto Protocol, but also to fulfil private entities' compliances under the EU ETS. It also indicates that the use of allowances within a sector could be optimised through the transactions.



Source: Author based on IGES (2014b)

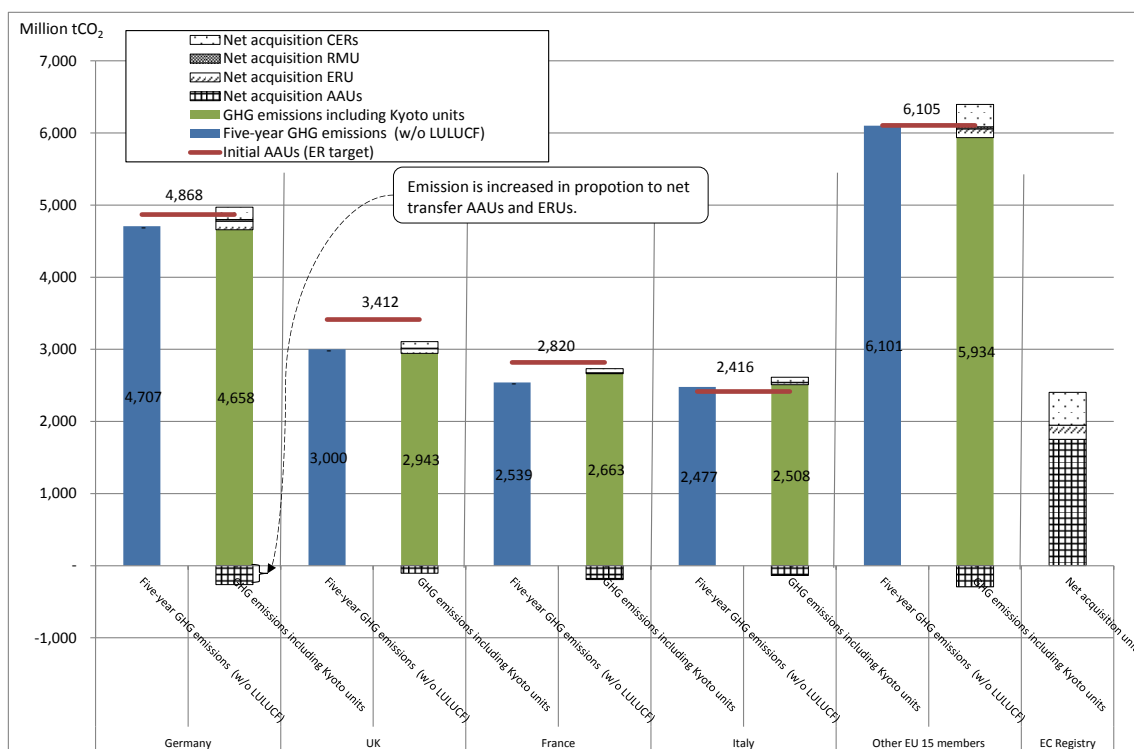
**Figure 2. Total transaction of Kyoto units within the EU ETS members between 2008 and 2013**

#### 4. Status of GHG emissions and use of Kyoto units - EU15 countries -

The total amount of GHG emissions from the EU15 countries<sup>2</sup> during CP1 occupies around 40% of the emissions from the Annex B countries of the Kyoto Protocol. The GHG emissions from Germany, UK, France and the other countries and the amount of the Kyoto units held by these countries is summarised in Figure 3. The amount of Kyoto units held by the countries shows the total number of Kyoto units in all accounts held in the national registries. Germany's GHG emissions were the largest amongst the EU15 countries, followed by the UK and France. For these countries it should be noted that their initial assigned amount exceeded their GHG emissions, although they carried out many transactions of Kyoto units, as shown in Figure 2.

By the end of 2013, Germany had transferred 264 million t-CO<sub>2</sub> of AAUs and acquired 120 million t-CO<sub>2</sub> of ERUs and 170 million t-CO<sub>2</sub> of CERs. The UK had transferred 106 million t-CO<sub>2</sub> of ERUs and acquired 91 million t-CO<sub>2</sub> of CERs. In particular, the gross amount of transactions of Kyoto units by the UK was 3,610 million t-CO<sub>2</sub> as transfers, and 3,570 t-CO<sub>2</sub> as acquisitions. This was the largest number of transactions among the Annex B countries of the Kyoto Protocol. Moreover, France transferred 189 million t-CO<sub>2</sub> of AAUs and 32 million t-CO<sub>2</sub> of RMUs and acquired 21 million t-CO<sub>2</sub> of ERUs and 58 million t-CO<sub>2</sub> of CERs.

The EU15 countries, as a whole, transferred 989 million t-CO<sub>2</sub> of AAUs and 32 million t-CO<sub>2</sub> of RMUs, as well as acquiring 348 million t-CO<sub>2</sub> of ERUs and 670 million t-CO<sub>2</sub> of CERs. Consequently, the emissions from 2008 to 2012 resulted in a 12.2% reduction compared with the base year, which was an overachievement in terms of the 8% emission reduction target set by EU15 countries (EC 2014). The greatest surplus of Kyoto units for the EU15 countries was transferred into the EC registry and amounted to 1,750 million t-CO<sub>2</sub>.



Source: Author based on IGES (2014a) and IGES (2014b)

**Figure 3. Five-year GHG emissions and amount of Kyoto units held by EU countries**

<sup>2</sup> These countries were EU members in the year 1997 when the Kyoto Protocol was adopted. Their 8% collective reduction commitment has been translated into national emission reduction targets for each of the EU-15 countries.

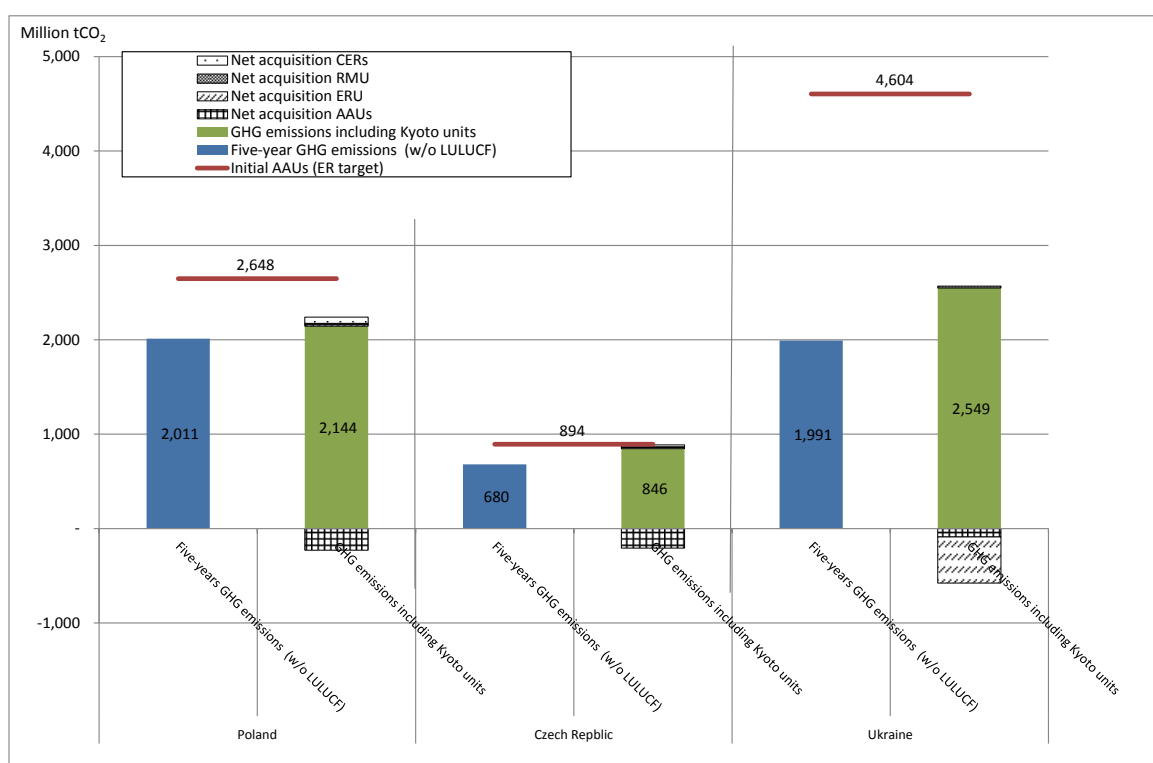
## 5. Status of GHG emissions and use of Kyoto units - EIT countries -

The Economy in Transition (EIT) countries<sup>3</sup> have transferred a large amount of Kyoto units since the net transaction of AAUs and ERUs reached 911 million t-CO<sub>2</sub> for EU15 countries and 609 million t-CO<sub>2</sub> for countries categorised as “Others” in Table 1.

Figure 4 shows the five-year GHG emissions from 2008 to 2012 and the amount of Kyoto units for EIT countries at the end of 2013. Since the initial assigned amount for those countries greatly exceeds their GHG emissions, the EIT countries were able to transfer surplus AAUs or ERUs to other countries.

By the end of 2013, Poland had transferred 212 million t-CO<sub>2</sub> of AAUs and ERUs and still has 505 million t-CO<sub>2</sub> of surplus AAUs. The Czech Republic had transferred 191 million t-CO<sub>2</sub> of AAUs and ERUs and still has 48 million t-CO<sub>2</sub> of surplus AAUs. Ukraine had transferred 577 million t-CO<sub>2</sub> of AAUs and ERUs and still has 2,056 million t-CO<sub>2</sub> of surplus AAUs.

All EIT countries, as a whole, acquired 133 million t-CO<sub>2</sub> of CERs and transferred 1,741 million t-CO<sub>2</sub> of AAUs and ERUs in total. In the end, the surplus amount of AAUs for the EIT countries reached 9,257 million t-CO<sub>2</sub>.



Source: Author based on IGES (2014a) and IGES (2014b)

**Figure 4. Five-year GHG emissions and amount of Kyoto units held by the EIT countries**

## 5. Status of GHG emissions and use of Kyoto units - Japan, New Zealand, Switzerland and Norway -

The five-year GHG emissions for Japan, New Zealand, Switzerland and Norway exceed their initial assigned amount. Therefore, in order to fulfil their emission reduction targets, those countries needed to acquire more Kyoto units than the volume that they transferred.

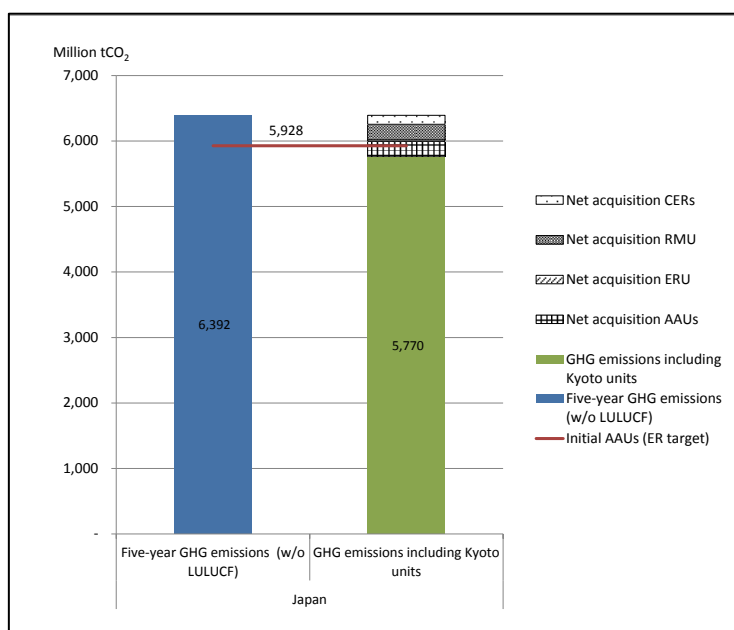
As shown in Figure 5, the five-year GHG emissions for Japan were 6.4 billion t-CO<sub>2</sub>. This means that another 500 million tCO<sub>2</sub> of Kyoto units were required to fulfil their emission reduction target. In fact,

<sup>3</sup> Consists of Bulgaria, Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia, Slovenia Russian Federation, Ukraine and Croatia

this shortage of Kyoto units was predicted by the Japanese government. The Kyoto Protocol Target Achievement Plan (Government of Japan, 2008) explicitly states that the Japanese government will acquire Kyoto units equivalent to 1.6% of GHG emissions (about 100 million t-CO<sub>2</sub>) in the base year. In addition, electric utilities and steel companies planned to acquire 320 million t-CO<sub>2</sub> of Kyoto units over the five-year period (METI, 2011) in order to fulfil the Voluntary Action Plan on the Environment (Keidanren, 1997).

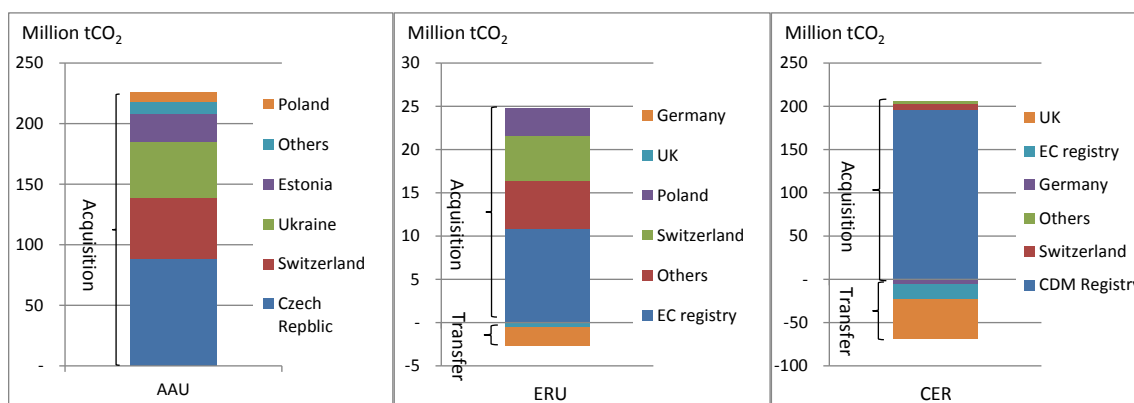
As a result, described in Figure 6 below, Japan (including government and private companies) acquired 226 million t-CO<sub>2</sub> of AAUs mainly from the Czech Republic and Ukraine, 22 million t-CO<sub>2</sub> of ERUs from the EC registry, Switzerland and Poland, as well as 136 million t-CO<sub>2</sub> of net acquisitions of CERs mainly from the CDM registry. In addition, Japan acquired 240 million t-CO<sub>2</sub> of RMUs (MOEJ, 2014) through removals by sinks resulting from forest management.

In the end, Japan's GHG emissions, including the use of Kyoto units from 2008 to 2012, resulted in an 8.4% reduction compared with the base year.



Source: Author based on IGES (2014a) and IGES (2014b)

Figure 5. Five-year GHG emissions and amount of Kyoto units held by Japan



The number is the amount of net transactions of Kyoto units in Japan's national registry

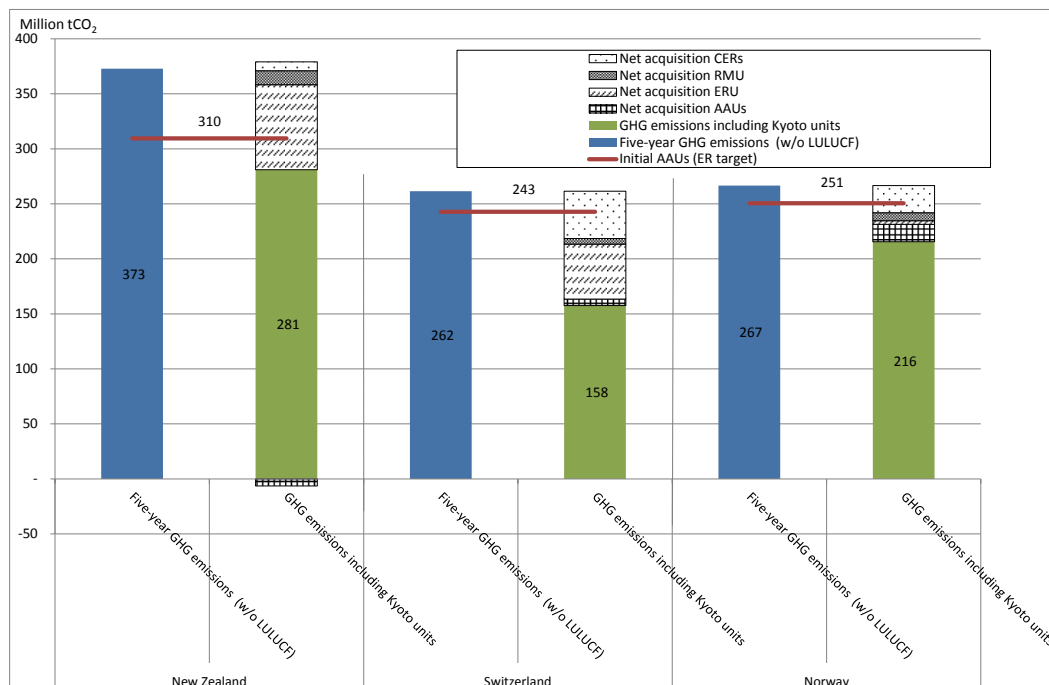
Source: Author based on IGES (2014b)

Figure 6. Japan's transactions of Kyoto units between 2008 and 2013



The state of the five-year GHG emissions and transactions of Kyoto units by New Zealand, Switzerland and Norway is described in Figure 7.

New Zealand acquired 77 million t-CO<sub>2</sub> of ERUs to complement its allowance. Switzerland acquired 50 million t-CO<sub>2</sub> of ERUs and 43 million t-CO<sub>2</sub> of CERs. In particular, the gross acquisition of Kyoto units reached 1,500 million t-CO<sub>2</sub> of CERs and the gross transfer reached 1,400 million t-CO<sub>2</sub>. Norway transferred 16 million t-CO<sub>2</sub> of AAUs and 25 million t-CO<sub>2</sub> of CERs.



Source: Author based on IGES (2014a) and IGES (2014b)

**Figure 7. Five-year GHG emissions and amount of Kyoto units held by the New Zealand, Switzerland and Norway**

## 6. Need for an Assessment of the Kyoto Mechanisms

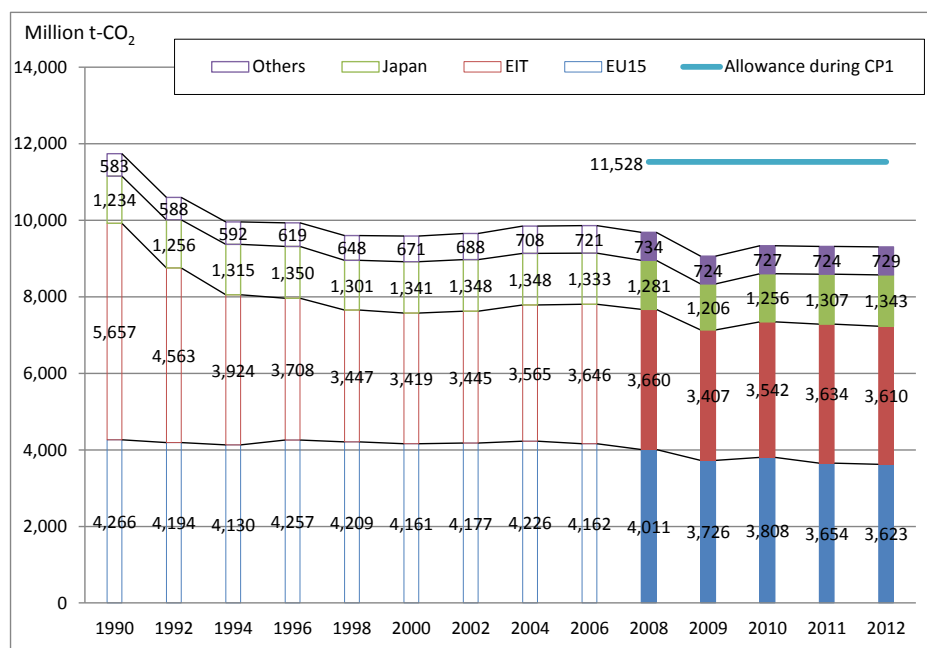
The Kyoto Protocol set an allowance of 11.5 billion t-CO<sub>2</sub> per year for all the Annex B countries of the Kyoto protocol (except the United States and Canada). This was aimed at reducing emissions by 5% compared with the base year. Owing to countries' efforts to reduce GHGs, their five-year GHG emissions is 9.3 billion t-CO<sub>2</sub> (22% reduction compared with the base year) without any use of Kyoto units and 8.9 billion t-CO<sub>2</sub> (26% reduction compared with the base year) including Kyoto units, which are emissions reductions through the CDM (i.e. CERs) and GHG removals by sinks resulting from direct human-induced land-use change and forestry activities (i.e. RMUs).

The trend in GHG emissions per year without the use of Kyoto units is described in Figure 8. From 1990 to 1996, GHG emissions have been drastically decreased by 2.2 billion t-CO<sub>2</sub>. This is because of the economic recession in EIT countries (den Elzen, et.al. 2010). As a result, GHG emissions from all the Annex B countries of the Kyoto Protocol were already lower than the allowance per year. In addition, GHG emissions from the EU15 countries in 2012 were 400 million t-CO<sub>2</sub>, which is lower than the 2008 level due to the global financial crisis which began in 2008 and the Eurozone crisis from 2010 (Reed, 2014). On the other hand, Japan was hit by the Great East Japan Earthquake in 2011. Since then, while most of the nuclear power plants in Japan have been shut down, coal-fired and gas-fired plants have been in operation to make up for the gap between electricity supply and demand. Consequently, GHG emissions in 2012 were 900 million t-CO<sub>2</sub> higher than in 2010.

In conclusion, the Annex B countries of the Kyoto Protocol have over-achieved when it comes to their GHG emissions target, that is the 5% reduction from the base year during CP1. As a next step, it is suggested that analysis is carried out the extent to which the Kyoto mechanism contributed to



these substantial GHG emissions reductions during CP1, taking into account external factors such as economic recession and structural changes in energy supplies.



Source: Author based on IGES (2014a)

**Figure 8. GHG emissions of all the Annex B countries of the Kyoto Protocol per year**

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