



Recent Developments in Environmental Finance

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It is now generally accepted amongst scientists that the anthropogenic contribution to the increasing concentration of greenhouse gases (GHGs) in the atmosphere, with the most important being carbon dioxide- CO_2 and methane- CH_4 , aggravates the so-called global warming effect. The mechanism, by which this recrudescence occurs, is the so-called greenhouse gas effect (GGE). In simple terms, the GGE postulates that, after a certain threshold, the concentration of GHGs in the atmosphere destroys the ozone layer. As a result, increasing levels of radiation from the sun reach the earth's surface and thus, there is an increase in the average global temperature levels. The direct consequences of such an increase, according to many scientists, include extreme weather conditions, sea level rising and heat waves. This, with its turn, has significant, potentially catastrophic, consequences for human health, the environment and the economy. In response to the GGE risks, the United Nation's Framework Convention on Climate Change (UNFCCC) provided the foundations of what is known today as the Kyoto protocol, an initiative taken by industrialized countries in order to combat climate change.

The purpose of the celebrated Kyoto protocol was to set specific binding targets under a strict timetable and to provide the necessary tools in order to realize them. Following a long time of indecision and tenuous negotiations the Protocol came into force in 2005, following ratification by Russia. Article 3 of the Protocol stipulates that the committed industrialized countries (so-called Annex I countries) agree to reduce GHG emissions at the 95% level of the 1990-year emissions, during the period 2008-2012. Despite the fact that the Protocol covers six GHGs, its main provision is about CO_2 . The emission reductions are to be achieved at the national level, with each country's goals being clearly specified through domestic policies, e.g., emission taxes. Nevertheless, it is expected that additional emission reduction units will be required in order to attain the designated targets. Therefore, the protocol enables three flexible mechanisms: International Emissions Trading (IET), Joint Implementation (JI) and the Clean Development Mechanism (CDM). IET concerns the trading of emission units among the Annex I countries, while JI allows the Annex I countries to fund emission reducing projects in other Annex I countries, utilizing part of the reduction for their own GHG budget. CDM is similar to JI with the main difference being that the investment projects are to be funded in non-Annex I countries.

Despite the fact that all three flexible mechanisms are inter-related, the most well-suited and economic efficient one in order to attain the required targets, according to environmental economists, is the IET. The trading of emission allowances is based on the fact that every organization that emits GHGs into the atmosphere, for example, electricity producers, aluminum and cement manufacturers, must possess the necessary number of emission allowances. Each allowance gives the right to its holder to emit a certain amount of GHGs, therefore posing a limit on the amount of GHGs that each polluter can emit. The central authority of each Annex I country, allocates the emission allowances from its repository, through a National Allocation Plan, to the organizations that emit GHGs into the atmosphere. After the initial allocation, the allowances are considered to be a tradable asset. Thus, should any facility require further allowances, it must seek environmental compliance through the market in order to avoid penalties. The European Union (EU) has set the penalty for the preliminary period 2005-2007 at 40 Euros per tone of CO_2 , with the penalty increasing to 100 Euros in the first commitment period of the Protocol (2008-2012).

The EU has agreed, under the Kyoto Protocol, to reduce the GHG emissions at 8% with respect to the baseline year level 1990. The adopted strategy in order to meet this target is the establishment of a European-wide GHG emission trading scheme-EU ETS (Directive 2003/87/EC). The EU ETS started on the 1st of January 2005 and during the first three years it covered only the CO_2 emissions from certain activities. It will then run for another five years during which each member state can include more GHGs and activities.

The global offset market is estimated to be around 850-1500 million metric tones of CO_2 during the period 2008-2012 with a total market value of 24-34 billion of dollars. As far as the EU ETS is concerned, it is expected that by 2010, 1 billion dollars will be traded in allowances each year. According to The World Bank Carbon Finance Unit (CF) and the Emissions Trading Association (IETA), presently there are four active emission allowances markets: the EU ETS, the UK Emissions Trading System, the New South Wales Trading System and the Chicago Climate Exchange. The cumulative volume traded from January 2004 to March 2005 in these markets is around 56 million tones of CO_2 .

The US administration has still to ratify the Kyoto Protocol, but is not expected to do so in the near future. Nonetheless, the US Environmental Protection Agency has implemented a trading scheme for sulphur dioxide (SO_2) emissions. Similar markets exist in other countries as well, like for example in Australia, China and Japan. Emission allowances in Europe (EJAs) could have been bought and sold by the end of 2004 over-the-counter (OTC) only. Due to the EU ETS though, many countries introduced the trading of carbon allowances through a formal exchange-their energy markets. This should not come as a surprise, since emissions mainly arise from fuel consumption and energy production. Thus, emission related costs are directly related to the energy sector. More formally, energy markets reveal the marginal cost of electricity while emission ones aim at discovering the marginal abatement cost.

Up to now, there are at least six trading platforms for the trading of EJAs spot and future/forward contracts under the EU ETS: Nordpool (the Nordic power market), EEX (the German electricity market), ECX (the European Climate Exchange), EXAA (the Austrian energy exchange), Powernext (the French power exchange) and Climex (an alliance formed between the Amsterdam Power Exchange-APX, the UK Power Exchange-LKPX, the Spanish CO_2 Exchange-SENDECO₂ and a number of European companies that provide consulting and trading services in the environmental markets). EJAs future/forward contracts are traded only in Nordpool, the EEX and the ECX while the latter one does not provide EJAs spot contract trading.

Active research in the field of Environmental Finance and particularly in the context of Energy, Climate and Emissions, is being pursued within the Financial Engineering Research Center of the Management Science Laboratory. The purpose of the Environmental Finance research group is to study the emerging markets of power, climate and emissions, to analyze and provide the necessary tools and methodologies for the pricing of contingent claims with underlying asset physical electricity, various weather indices and European Union Emission Allowances and to provide the framework for an efficient risk management strategy of cooperations that need to adapt to the new environmental 'friendly' reality.