U4 Expert Answer

Carbon market corruption risks and mitigation strategies

Query

What kind of corruption risks does the carbon market pose? What strategies can be used to mitigate these risks?

Purpose

To provide an overview of the corruption risks in the carbon market and assess some of the strategies in place to mitigate these risks.

Content

Summary

As a new market with a developing architecture, the carbon market has proven susceptible to corruption and other integrity risks. These risks are significant, because any attempt to undermine the carbon market jeopardises one of the major elements of our global response to climate change.

This paper examines these risks and the carbon market's vulnerability in terms of both its environmental and financial integrity.

It concludes each section with an overview of some of the mitigation strategies in place to reduce corruption and ensure that the carbon market functions to fulfil its ultimate aim: to reduce greenhouse gas emissions.

Author: Rebecca Dobson, independent researcher, writer and editor, rjs.dobson@gmail.com

Reviewed by: Marie Chêne, Transparency International, mchene@transparency.org; Lisa Elges, PhD, Transparency International, lelges@tansparency.org; Dieter Zinnbauer PhD, dzinnabuer@transparency.org

Date: September 2015 **Number:** 2015: 11

U4 is a resource centre for development practitioners who wish to effectively address corruption challenges in their work. Expert Answers are produced by the U4 Helpdesk – operated by Transparency International – as quick responses to operational and policy questions from U4 Partner Agency staff.

1. The carbon market and how it works

First established with the Kyoto Protocol in 1997, the carbon market has expanded to become one of the fastest growing commodities markets in the world. Its value in 2015 was estimated at US$34 billion[1] (World Bank/ECOFYS 2015).

Its architects – policy-makers aiming to provide flexible mechanisms for countries to achieve their Kyoto Protocol commitments – sought to place a monetary value on greenhouse gas in order to trade it.

In doing so they created a new commodity: carbon.[2] Reductions in greenhouse gases under the Kyoto Protocol are measured in carbon equivalents: the equivalent of one tonne of CO_2.

As an intangible commodity, however, these carbon equivalents need a proxy to be made "real". So what is actually traded on the market is an "emissions allowance", "carbon credit" or "carbon offset", which entitles the holder to emit one tonne of CO_2 or its equivalent in another greenhouse gas.

Carbon, a new commodity

There are three basic kinds of carbon commodity traded on a carbon market:

- emission allowances: these make up a limit or cap on the amount of carbon that may be emitted by a country, sector, or company over a certain period. Such allowances are usually distributed or auctioned by a government or intergovernmental organisation. Examples include the Kyoto Protocol's Assigned Amount Units (AAUs) or the European Union's EU Allowances (EUAs).
- carbon credits: these can be used to compensate for emissions in one place by reducing them elsewhere instead. They are derived from actions that actively remove carbon from the atmosphere (such as reforestation projects) or have reduced emissions, such as through a green investment in another country or sector. The Kyoto Protocol's Clean Development Mechanism (CDM) and Joint Implementation (JI) are examples of programmes that generate carbon credits.
- carbon offsets: these are modelled on carbon credits, but are generally used specifically to describe projects in the voluntary carbon market that reduce carbon emissions in one place to neutralise emissions elsewhere.[3] They are subject to a range of standards and regulations. Voluntary carbon offset certification schemes include the Gold Standard and the Verified Carbon Standard.

A tale of two markets

What began with the Kyoto Protocol's International Emissions Trading – enabling a select number of industrialised countries to trade AAUs and carbon credits to assist them in meeting their carbon reduction commitments[4] – has become a full-fledged industry. Indeed, by 2015, there were "about 40 national and over 20 subnational jurisdictions putting a price on carbon" across the globe (World Bank/ECOFYS 2015).

This expansion has resulted in two kinds of carbon market that together seek to restrict greenhouse gas emissions:

- compliance market: runs on the basis of government and intergovernmental organisations setting limits on the number of allowances permitted to emit greenhouse gas in a given period. These are generally called cap and trade systems, whereby countries or companies can trade their surplus allowances or credits to ensure that the system as a whole remains below the set cap. Fines are levied for those that fail to acquire and submit the required allowances to cover their emissions in a given compliance period (usually a year).
- voluntary market: runs on a voluntary basis, where companies (or others) can choose to

[1] Note: Transparency International takes "billion" to refer to one thousand million (1,000,000,000).
[2] The six greenhouse gas types covered by the Kyoto Protocol: carbon dioxide (CO_2); methane (CH_4); nitrous oxide (N_2O); hydrofluorocarbons (HFCs); perfluorocarbons (PFCs); and sulphur hexafluoride (SF_6). They are measured in CO_2 equivalents, hence the term carbon market.
[3] The terms carbon credit and carbon offset are often used interchangeably.
[4] Industrialised countries were to reduce emissions to 5% below 1990 levels by 2012. In 2012 in Doha there were further commitments to reduce emissions to 18% below 1990 levels by 2020.

buy carbon offsets to increase their environmental credentials. A compliance market does not generally regulate these entities, which can include companies, non-governmental organisations, or even individuals: any entity that wishes to reduce its carbon footprint.

Dual aims, double the integrity risk

The carbon market's supporters endorse the market as "the most environmentally and economically sensible approach to controlling greenhouse gas emissions" (Environmental Defense Fund, no date) and cite evidence of its success (Buen 2013), while its opponents call it "ineffective" (Pearse and Böhm 2014) and claim it suffers from an inherent contradiction in pursuing its dual aims of "trying to save the world and trying to make money" (Funk 2015).

Indeed, the carbon market is designed to both reduce emissions to combat climate change and provide a financial mechanism to ease the "internalisation" of the costs to carbon emitting entities and retain their competitiveness (Bailey, Gouldson and Newell 2010). This dual nature makes integrity a particularly tricky problem, as these aims may be opposed and so often moneymaking trumps the environment.

The carbon market demands both environmental and financial integrity (INTERPOL 2013): environmental integrity to ensure that the commodity being sold is indeed a meaningful proxy for carbon, and financial integrity to ensure that its trade is transparent and protected from fraud.

This inevitably gives rise to a range of governance challenges and corruption risks, and the need to provide appropriate regulation and oversight to protect it from fraud (PwC 2011).

2. Environmental integrity in the carbon market

The carbon market is a valid mechanism only so long as it works to effectively reduce carbon emissions. This requires accounting for every tonne of carbon (or carbon equivalent) emitted, saved and removed from the atmosphere. This is no simple calculation, but essential for the integrity of the system.

Critics of the carbon market question its ability to do this successfully. Indeed it is difficult to find evidence for direct causal links between the markets and emissions reductions (Pearse and Böhm 2014).

The implications of this are considerable. If the commodities traded on the markets (in whatever form) do not represent real emissions reductions, rather than reducing the release of greenhouse gases into the atmosphere they actually serve to increase emissions, as they are used to environmentally justify activities that produce carbon.

According to some critics the inability to effectively account for carbon emissions and the difficulty of distinguishing "between fraudulent and non-fraudulent" calculations means that abuses of power are inherent in the market infrastructure (Lohmann 2011). In effect, the markets give "the appearance of us doing something about climate change, while actually legitimating the constant rise of emissions" (Böhm 2013).

Perverse incentives within the system can sometimes take an even craftier turn – and utterly undermine even the pretence of environmental integrity. A 2015 study of the UN's Joint Implementation programme found that some Russian projects had actually "increased waste greenhouse gas generation to unprecedented levels". This was because the revenues achieved from the credits that they received for ensuring the emissions never entered the atmosphere outstripped the practical costs of doing so (Saxena 2015).

It is clear then, that an overarching concern for carbon markets is that they typically suffer from the absence of strong incentives for buyers and sellers to validate the quality, in this case the environmental integrity, of the credits changing hands. Unlike in conventional commodities markets, where at least the purchaser has an incentive to obtain the quality promised, neither party to such transactions in carbon markets have a strong motivation as long as the credits are legally recognised and the purchaser receives an enforceable right to emit a specific quantity of carbon. As a result, the "incentives of participants in the carbon market to investigate (or self-regulate) the origin of the carbon credits" is very weak (INTERPOL 2013).

This issue brings into sharp relief the need for effective and "specific oversight by regulatory authorities" (INTERPOL 2013).

Compliance market risks and regulation

The great concerns for compliance market environmental integrity are to ensure that:

- the cap on the emissions system is maintained by issuing the correct number of allowances
- the carbon credits that are issued to offset emissions actually represent real greenhouse gas reductions

EU ETS: maintaining the cap

The European Union Emissions Trading System (EU ETS) is the largest compliance market in the world, spanning 31 European countries.

It is based on the "cap and trade" model, which sets a cap or limit on the total amount of greenhouse gases that can be emitted, with a target to lower the cap over time and so reduce emissions.

Countries and companies within the system receive (are freely allocated) or buy (through an auction) emissions allowances that are meant to maintain its cap.[5] However, the EU ETS has been beset by challenges to its cap since it was established in 2005 (Carbon Trade Watch, no date).

Free allocation of allowances and manipulating targets

The EU ETS has historically provided companies with free emissions allowances, allowances that can then be traded on the market.

These free allowances enabled "carbon-intensive industries to be eased into emissions trading with minimum harm", that is, to maintain their global competitiveness (Behn 2008/09). They also sought to avoid "carbon leakage", whereby polluting industries move their operations outside the EU in order to emit greenhouse gases without restrictions.

Overtime, the EU has attempted to reduce the number of free allowances and move towards a system of auctioning instead. However, this process has been subject to "political pressure from industries looking to benefit from free allocation" (Behn 2008/09). Indeed, free allocation coupled with the over-allocation of allowances (discussed below) has led to some high polluting industries "enjoy[ing] 'windfall profits'" (Behn 2008/09).

Free allocation continues within the system. In 2014, the European Commission agreed a €5 billion carbon permit giveaway to help European heavy industry compete in the global market (EurActive.com 2014).

This industry influence on EU decision-making is of wider concern. While communicating views and interests to policy-makers is a legitimate and important activity for all stakeholders, a strong bias of engagement and influence in favour of a small band of powerful stakeholders is raising risks of policy capture: important policy decisions unduly crafted to benefit some special interests at the expense of the public at large.

A 2015 study highlighted such risks by demonstrating that trade groups have considerable lobbying power in influencing EU climate policy. It estimated that, "77% of Global 500 companies used trade associations to lobby on climate policy", and that these lobbyists had reportedly "helped to shape the new EU 2030 targets" (Fagan-Watson 2015).

Over-estimation of baseline for caps

The EU ETS has also suffered from a surplus of emissions allowances. In part this is due to the financial crisis, which led to projected industrial emissions declining. However, there have also been concerns about the integrity of the system that estimates the required number of allowances.

The concern is that industries or countries may over-estimate their emissions to achieve a higher number of emissions allowances. This has the potential to flood the market with surplus allowances, drawing down the price.

In the EU, member states set their own emissions caps in their National Allocation Plans (NAPs). Therefore, "the potential for over-estimation of emissions … is substantial" (Behn 2008/09), particularly if there is inadequate verification of NAPs.

[5] The system also trades in international carbon credits, for example, from the Clean Development Mechanism (CDM) (described below).

This is not just an issue for the EU ETS. In Australia, there has also been evidence of overstating greenhouse gas forecasts to make climate targets easier (Taylor 2015).

EU ETS strengthened and harmonised

The EU ETS recognises the importance of "robust, transparent, consistent and accurate monitoring and reporting of greenhouse gas emissions".

In its third phase, 2013-2020, the EU strengthened and harmonised the rules to mitigate some of the integrity risks in the system. In particular, it imposed a single EU-wide cap, made the auctioning of allowances the norm (with 40% to be auctioned rather than freely allocated), and harmonised the allocation rules for those allowances still to be given away for free.

Structural reform has also taken place with the EU ETS to deal with surplus allowances in the system. The commission will postpone the auction of some allowances, establish a market stability reserve in which allowances taken off the market can be stored, and increase the speed at which the cap is reduced (for further detail see Nelsen 2015a).

The issue of establishing baselines for estimating the required number of allowances called for improved scrutiny of the NAPs by the European Commission following the first trading period (2005-07). In the second trading period of the EU ETS, scrutiny was "significantly more rigorous" (Behn 2008/09). The commission provided guidance for the NAPs that made them simpler and more transparent.

In addition, the commission has provided guidance on monitoring and reporting annual emissions, using the Monitoring and Reporting Regulation and the Accreditation and Verification Regulation, in order to "promote more harmonised and cost-effective application of the regulations in all Member States, and support to the required mutual recognition of accredited verifiers".

Clean Development Mechanism

Many cap and trade compliance markets allow trade in carbon credits. They play a significant role in the markets: the EU ETS had already traded over 1 billion carbon credits by the end of 2012, and credits are likely to account for a half of reductions under the EU ETS between 2008 and 2020 (European Commission 2013).

The Clean Development Mechanism (CDM) is the most significant mechanism for creating carbon credits. It has twofold aims: it enables an investment in a carbon reduction project in a developing country, which supports sustainable development; and produces tradable certified emissions reduction (CER) credits. These are equivalent to a permit for the emission of one tonne of carbon.

However, as there is "no general scientific consensus about the number of credits, if any, are generated by a particular project" (Lohmann 2011), the system is open to abuse. Indeed, "the intangibility of the instrument and the political basis for its value" means that, "issues of compliance, regulation and the potential for fraud are significant concerns" (Martin and Walters 2013).

The basic concept linked to carbon credits is "additionality"; credits should represent additional carbon savings: savings that would not have taken place with business as usual. This has become the most common point at which fraud and manipulation has entered the system to undermine environmental integrity.

Manipulating measurements, faking additionality

There are two main ways in which the measurements against which the additionality of a project is measured can be manipulated (INTERPOL 2013).

First, project developers may "overinflate the estimate of the emissions that would otherwise have occurred" (INTERPOL 2013), similar to the over-estimation above in relation to industries being allocated allowances.

Second, they "might fraudulently claim the project reduces emissions to a greater degree than it actually does" (INTERPOL 2013). In both cases the project will achieve a higher number of carbon credits than it merits for the reductions it achieves.

In 2011, the Stockholm Environment Institute raised concerns about the CDM methodology used to measure emissions reductions in coal power projects. They found that over a half of CERs produced by these projects were "likely to be the result of systematic over-estimation" (Lazarus and Chandler 2011).

Another scam is to claim credits for projects that already exist, or would exist with business as

usual practices. An example in the Himalayan foothills has seen applications for CDM credits for hydroelectric plants that would have otherwise existed as, "all power plants in India's northeast are hydro power stations" (Yumnam 2013).

In a study for Climate Policy, it was discovered that 40% of CDM projects would have gone ahead even without the incentive of earning CDM credits (Schapiro 2010), which undermines the additionality principle, even if significant reductions are achieved through the projects.

In 2013, WikiLeaks released evidence to suggest that, "none of the CDM projects in India … can be considered 'additional'" (Böhm 2013). A more global estimate of the CDM suggests that, "up to 70% of all offset credits issued … between 2013 and 2020 may not represent real emissions reductions" (Carbon Market Watch 2013b).

In effect, a proportion of, if not all, carbon credits may fail to provide additionality, and therefore, when sold onto the market as an offset, will contribute to an increase in emissions: thereby undermining the environmental integrity of the system.

Corruption challenges in oversight, regulation and verification

To address the issues of fraud and manipulation, the CDM has mechanisms in place to offer oversight, third party validation and verification. This is meant to ensure that additionality underpins every CDM project and every CER issued represents a carbon saving beyond business as usual.

The CDM Executive Board registers projects and issues CERs. The board has faced allegations of conflicts of interest and lack of transparency, as decisions have been made "behind closed doors" resulting in decisions that appear to be distorted. In 2011, it was reported that "China, Brazil, India and Mexico … received three-quarters of CDM project support" (Bond and Dorsey 2011).

The board also certifies Designated Operational Entities (DOEs) to act as third party verifiers of CDM projects. However, concerns have been raised about their "independence" and the "susceptibility" of these third party verifiers "to bribes or collusion to manipulate the results" (INTERPOL 2013).

Böhm (2013) highlighted that the lack democratic oversight of the CDM means it has been "infested by corruption and non-transparency". A major international consultancy was found to have "copied and pasted large chunks of documentation from one CDM project to another" (Böhm 2013), undermining the pretence that the CDM projects were legitimate.

In 2008-2009, the UN suspended two validators for "irregularities found in their project assessments". These validators had been responsible for validating "nearly two-thirds of the emissions reductions now being utilised by industries in the developed world" (Schapiro 2010, also INTERPOL 2013).

The specialist knowledge needed for the regulation of CDM has also led to a revolving door, heightening corruption and collusion risks. Böhm (2013) identified "many revolving doors between the business, policy, NGO and university worlds". Indeed, as highlighted by Schapiro (2010), there is an opportunity "for validators to cross-over to the far more lucrative business of developing projects themselves – and then requesting audits from their former colleagues".

Under the CDM Designated National Authorities (DNA) are responsible for the approval of projects and ensuring that they contribute to sustainable development. However, again concerns have been raised over their independence and integrity.

There are numerous examples of CDM projects being allowed without adequate consultation with local communities, and even in some cases jeopardising rather than promoting sustainable development and human rights.

In a recent example in Guatemala it was suggested that a dam building project, which was set to earn CERs, had failed to consult with the local community, was likely to "forcibly displace thousands of people" and that most of the electricity was destined for neighbouring countries (Nelsen 2015b).

Improving the CDM

The CDM is currently undergoing a review of its rules (Carbon Market Watch 2015) and negotiations for reform are likely to be on going at COP 21 in Paris in December 2015 (Ott et al. 2014).

In 2014, Carbon Market Watch submitted a list of recommendations for CDM reform, which highlight some remaining weaknesses in the regulation system:

- improve the demonstration of additionality by excluding projects with a low likelihood of additionality, high likelihoods of perverse incentives, and difficult baselines to determine and; ensure that additionality is reassessed at the renewal of crediting periods
- strengthen the code of conduct of the CDM Executive Board
- require rules whereby DOEs are assigned and paid for by the UNFCCC,[6] and where project developers pay validation fees to that body (rather than directly to the validators), and establish rules for dealing with deficiencies in validation, verification and certification of reports (Carbon Market Watch 2014)

Such improvements, strengthening the enforcement of regulations and increasing independence and integrity would be important steps to improving the system. However, for critics such as Lohmann (2011), the insurmountable difficulty of distinguishing between "fraudulent and non-fraudulent offset calculations" implies that "regulators' power to enforce climate benefit becomes illusory".

This remains an unsolved problem for the CDM and other carbon credit certification schemes.

Voluntary market risks and regulation

In terms of environmental integrity, the stakes are not quite as high in the voluntary markets, as they are not linked to any compulsory reductions in emissions. However, the risk related to corruption and manipulation is even greater due to the lack of binding targets and international scrutiny in the voluntary system.

The voluntary market trades in voluntary/verified emissions reductions (VERs). These are created and certified through voluntary certification processes. There are no minimum standards for these certifications, however, and regulation of the markets is weak compared to the compliance market (Martin and Walters 2013). Indeed, there is evidence to suggest that many of the projects that have not passed the CDM's additionality test have ended up instead on the voluntary market (INTERPOL 2013).

The main challenge for the market is ensuring the integrity of the certification process. Just like carbon credits in the compliance market, the intangibility of the offset commodity means that it is difficult to determine its additional benefits. What is more, many of the certification processes are organised by corporations, which raises issues of "corporate capture of the verification process" (Patterson in Martin and Walters 2013).

Without a single set of rules to govern the voluntary markets, they are vulnerable to the same underlying risks as the compliance market: manipulation of emission baselines, falsification of additionality claims, over-calculation of carbon credits generated, and bribery of officials for approvals and to secure rights (PwC 2011).

However, there is evidence of improving regulation within the market. In 2008, 96% of carbon credits on the voluntary market had been third party verified (GAA 2010), and the Gold Standard and Verified Carbon Standard are increasingly raising standards.

Gold Standard

The Gold Standard was developed in 2003 by a group of NGOs to provide voluntary standards and certification for carbon offsets. Its aim was to "go above and beyond the CDM [standards], in particular with regard to project type and co-benefits" (GAA 2010). By 2014, it claimed to have certified projects that had "taken 20 million tonnes of carbon out of the atmosphere".

The Gold Standard assesses projects on a case-by-case basis, which has the benefit of being "rigorous", but the "outcome can be rather subjective" (GAA 2010). This implies that there is some discretion in the award of the Gold Standard that could be unduly influenced.

Verified Carbon Standard (VCS)

In contrast to the Gold Standard, the VCS is a "more business-oriented foundation" (GAA 2010).

It is the most widely used certification and produces verified carbon units (VCUs). These must be "real, measurable, additional, permanent, independently verified, conservatively estimated, uniquely numbered and transparently listed."

[6] UN Framework Convention on Climate Change.

Its certification process differs from the Gold Standard, in that while the system is more "streamlined" and less "subjective", its less rigorous case-by-case assessments have led to criticisms that it opens the potential for "non-additional projects to become free-riders" in the system (GGA 2010).

This implies that there is a potential for pro-forma applications, which meet all the criteria on paper but are not fully investigated in practice, to be verified.

3. Financial integrity in the carbon market

The financial integrity of the carbon market is, intimately linked to its environmental integrity. If the market fails and turns to "junk" (Economist 2013), then the price of carbon drops to negligible levels, in effect incentivising companies to freely emit greenhouse gases.

As a financial market, the carbon market also suffers from the common risks of corruption and fraud (as detailed below), but the novelty of the market, its complexity and the fact that allowances and credits are "high value, intangible and easily moved between countries" (Mason 2011a), makes the market particularly vulnerable.

Inter-changeable credits, an integrity challenge

One of the main challenges is that the financial market assumes that the different forms of allowance and credit are fungible; that they are inter-changeable.

The Kyoto system, for example, allows carbon credits from multiple sources. In addition to the CDM's CERs:

- Removable Units (RMUs) represent one tonne of carbon removed from the atmosphere, for example by carbon sink, such as a reforestation project
- Emission Reduction Units (ERUs) represent a one tonne reduction in carbon achieved through Joint Implementation

Even within this system it is not clear that the units are equivalent. In particular, ERUs have been criticised for a "lack of transparency and a glut of credits with very questionable environmental integrity" (Carbon Market Watch 2013a).

This highlights a basic contradiction in the carbon market: on the one hand environmental integrity demands that real reductions occur, but financial integrity only requires that carbon credits are "legally recognised under the relevant legal regime" (INTERPOL 2013), and there is no incentive or mechanism for financial markets to assess the commodities' actual environmental worth.

Carbon market financial integrity risks

In 2010, Friends of the Earth listed 10 ways in which the carbon market could be "gamed" (Chan 2010). Some of these ways, such as boosting baselines, falsifying information, the potential for bribery, and rigging the rules, have already been discussed above.

Other types of scam highlighted included: Ponzi schemes, selling fake credits, carousel fraud, phishing for carbon, transfer mis-pricing and recycling carbon (Chan 2010). This section will consider a selection of these integrity risks that have a particular "carbon" element or characteristic that cannot be found so readily in other markets.

Fraud

The carbon market has been subjected to its fair share of fraudulent practices. Fraud is enabled by lax rules and inadequate oversight.

Fake offsets

One of the most damaging forms of fraud in the carbon market is the selling of fake offsets (Martin and Walters 2013). The sale of falsified offsets (or credits) not only increases the supply of offsets – potentially reducing their market value – it also affects market confidence and undermines environmental integrity by actually increasing overall levels of carbon emissions.

According to INTERPOL (2013) this practice is made easier "by the fact that there is no physical indication of the identity of the person who holds the carbon rights, beyond a piece of paper or record in a government register". This raises the risk of government corruption enabling the registration "of forged documents concerning ownership of carbon credits" (INTERPOL 2013).

Offsets derived from forestry initiatives, such as UN REDD, have been particularly prone to these types of fraud. In 2014, the supreme court of New South Wales in Australia found that a company, Shift2Neutral, had claimed, "to have generated more than $1billion in carbon credits". It had sold some of them on to a school in Sydney, thus declaring the school "carbon neutral". The credits were described by Acting Justice Nicholas as "non-existent and the numbers were bogus" (Lang 2014).

Back in 2007 the Vatican bought certificates "declaring the Holy See the world's first carbon neutral sovereign state"; it was later revealed that no trees were ever planted in the reforestation project that produced the offsets (Funk 2015).

While fake offsets are primarily an environmental integrity challenge, they belong in this section as they highlight the inability of the carbon market to deal with this kind of fraud. Indeed, once credits enter the market, identified primarily by a serial number, it is almost impossible to remove them. The UN does not have the power to remove carbon credits from the market, "even in the event of misconduct by a validator or verifier" (Schapiro 2010).

Carousel fraud

Another form of fraud that affected the EU ETS involved missing trader or carousel fraud. Such fraud involves using multiple companies and multi-jurisdictions (such as the EU) to charge VAT on carbon credits and then failing to pay it to the relevant authority.

It has been suggested that these schemes accounted for almost 60% of the money lost in the system between 2005 and 2011 (Funk 2015).

In 2013, the UK government reported that the leader of a criminal gang was "jailed for 15 years for his part in a £38 million [€53.6 million] VAT fraud" (UK Government 2013). The fraud involved importing carbon credits into the UK free of VAT, then selling them on and charging VAT that was never paid to the government. The credits were sold on to "buffer companies", before being sold on again to "legitimate companies so the trading chain appeared legal" (UK Government 2013). The entire scam occurred within "a matter of minutes", and the "stolen VAT was transferred to offshore bank accounts in the United Arab Emirates" (UK Government 2013).

Carousel fraud has now been eliminated in the EU ETS by exempting carbon credits from VAT (Funk 2015, UK Government 2013), but may remain a challenge for other emissions trading systems.

Hacking and phishing

The "electronic nature" of carbon commodities means that they are particularly vulnerable to technology crime (INTERPOL 2013).

In 2011, a scam that involved the Czech Republic, Poland, Estonia and Lichtenstein involved 500,000 stolen carbon allowances worth €28 million (Mason 2011b).

In 2013, carbon hackers Dragon, Randhawa and their associate Sangha were "sentenced to a combined five and a half years in prison for carbon hacks" (Funk 2015). In 2011, having initially failed to complete a hack of the UN's carbon registry, they managed "to siphon off 350,000 carbon credits, each worth about €15, from a Spanish registry within the European Union's carbon trading system" (Funk 2013). A couple of years later some of these credits were re-sold to BP for almost €89,000 (Funk 2015).

In 2011, the European Union faced legal action, brought by an Italian company that had 267,991 allowances stolen, over the way in which it had handled the effects of cyber crime on the EU ETS (Macalister 2011).

Double counting

Where the carbon markets' regulations are not harmonised, and where there are lax standards of cross-checking and monitoring between exchanges, there is also the risk of double counting carbon credits (INTERPOL 2013).

Double counting was a particular risk in the voluntary markets, especially when credits were "not recorded in external registries" (PwC 2011). However, the risk is also present in the compliance market, as credits may be:

- double issued: a single project registered in different crediting entities, earning double the credits
- double claimed: counted twice towards mitigation pledges, for example in the country where the reductions occur and then in a second country when the unit is sold
- double used: also referred to as double selling, where a unit is used twice by being duplicated in a registry and transferred twice

to another country, or where the same unit is used in two different years to meet mitigation pledges
- double purposed: where a unit is used to meet mitigation pledges and also technology or financial pledges (Schneider et al. 2014)

These risks come from the carbon market trading in an intangible proxy, which is fundamentally different to most other commodities. Double counting is likely to be common in the market and, as emphasised by Schneider et al. (2014), it can only "be avoided effectively through a coherent set of rules for accounting of units, design of mechanisms, and tracking and reporting of units."

However, such rules are difficult to realise. According to ICAP (2013), attempts by the International Accounting Standards Board and the Financial Accounting Standards Board have not led to a consensus on accounting standards for emissions allowances. It is clear, therefore, that to be successful an "international agreement on such rules is the most important prerequisite to preventing double counting" (Schneider et al. 2014).

Other forms of market risk

Collusion in auctions

One of the ways that the EU ETS has attempted to increase transparency and integrity in the market is to auction rather than give away emissions allowances. However, this gives rise to the risk of collusion in the auctioning process (ICAP 2013).

Collusion is usually enabled by a lack of oversight in the relationships of market participants. Indeed, increased transparency in the market "allow[s] regulators and the public to evaluate the relationships between market participants which may play a role in collusion and between market participants and regulators that may result in a conflict of interest" (ICAP 2013).

Over-pricing offsets

A 2014 case of over-pricing of carbon offsets in the voluntary market demonstrates the vulnerability of the public to offset scams. In effect, individuals or companies may be conned into buying considerably marked up carbon offsets, undermining both the financial and environmental integrity of the market.

In a UK case, Eco-Synergies Ltd were found to have sold carbon credits to a "web of ostensibly unrelated companies at an overall mark-up of up to 869%", these credits were then sold on to the public. The investigation found that "investors had paid some £19 million [€26.8 million] for carbon credits shown to have cost Eco-Synergies Ltd some £2.3 million [€3.25 million]" (UK Government 2014).

Sale of surplus emissions allowances

The existence of surplus allowances or AAUs (as described above) raises a corruption risk. For example, a country in possession of surplus allowances has the opportunity to sell them on to any buyer (depending on national regulations) and in doing so make money for the public purse.

However, without rigorous oversight at the national level, government officials may enter into deals with the private sector, which deprive the public of its fair share of revenues. A case reported in Slovakia in 2008 showed that some 15 million tonnes of its surplus AAUs had been sold below their market value "representing an estimated €75 million in lost revenue" (Siˇcáková-Beblavá and Šípoš 2011).

Derivatives

Like any other kind of commodity, the carbon markets have given rise to trading in carbon derivatives. For example, companies may choose not to hold the required allowances all year, but instead enter into contracts, which give them the right to buy allowances or credits at the point where they have to submit them for compliance purposes (ICAP 2013). These contracts themselves become a financial instrument, which can be bought and sold on the market.

Derivatives have proven very difficult to regulate and demand strong "technical and enforcement capacity", which was severely lacking during the 2008 financial crisis (INTERPOL 2013). The concern is that if regulators are unable to "manage these complex financial instruments" the "carbon market is at risk … of following the same path", making it as uncontrollable as the financial market before the crash (INTERPOL 2013).

Regulation and oversight for financial integrity

The key to financial integrity in the carbon market is effective regulation and oversight – and as

noted by Schneider et al. (2014) – coherent rules and accounting.

Some of these are already in place. For example, the UN's International Transaction Log (ITL) connects all the registries under the Kyoto Protocol mechanism. It has a mandate to ensure "accurate accounting and verification of transactions proposed by registries in order to support the review and compliance process of the Kyoto Protocol."

Information security management was improved following the lessons learned during the first Kyoto commitment period, and a Security Working Group (SWG) was established. Along with the ITL Administrator, the SWG conducted a risk assessment, which resulted in further recommendations for implementing security controls.

In each jurisdiction where a carbon market exists – according to the World Bank there are over 40 national jurisdictions – mechanisms are in place to ensure basic integrity and limit corruption and fraud.

The extent and success of these mechanisms will depend on how developed the market is and how well its regulations are designed and enforced. In many cases it has taken a scandal to ensure that the most robust measures are in place. For example VAT fraud in the EU ETS was only mitigated with the exemption of VAT on carbon allowances across Europe. Therefore, constant vigilance is needed to ensure that systems remain ahead of the curve: for example, by protecting systems from ever more innovative hackers and fraudsters.

It is clear that learning from the experiences of others will be essential for emerging markets, and those in the nascent stages of development. As such, the EU ETS is an example of a functioning and complex carbon market that has responded to integrity challenges within its system.

The EU ETS as an example

A Foreign Policy report on corruption and fraud in the carbon markets highlighted some of the many integrity challenges for the EU and its 30 national registries, including "no background checks in Denmark, lax website security in Spain and the Czech Republic, rapid VAT refunds in France" (Funk 2015).

In response to these challenges, the EU ETS centralised its operations in 2009 and set up a single EU registry, operated by the European Commission, the European Union Transaction Log (EUTL).

The EUTL checks records and authorises transactions (the transfer of allowances) between account holders to ensure that they are consistent with EU rules. It records national implementation measures, the accounts of entities holding allowances, transactions, annual verified CO_2 emissions from installations, and an annual reconciliation of allowances and verified emissions, to ensure that each company has surrendered enough allowances to cover its emissions.

All entities covered by the EU ETS must monitor and report their annual emissions in accordance with the common rules in the Monitoring and Reporting Regulation and the Accreditation and Verification Regulation. Electronic templates are provided for reporting to enhance harmonisation across the system.

In 2011, the EU ETS improved its response to fraud by adopting the security measures used in the financial sector. These include:

- preventive measures: two factor authentication, out of band confirmation of transactions, introduction of a trusted account list, an obligatory four-eye (two person) principle, strengthened know-your-customer checks, new account categories
- measures to respond quickly to fraud: completion of transfers delayed by 26 hours, ability for national administrators to freeze accounts, wider access to confidential information for competent national authorities and permanent read-only access for EUROPOL to the database and strengthened anti-money laundering provisions
- measures to avoid market disruption: allowances made fully fungible, buyers in good faith acquire full entitlement to purchase allowances, non-disclosure of allowance serial numbers, non-display of serial numbers (only visible to administrators)

Further efforts are being made to reduce market abuse and misconduct. A reviewed directive and regulation on Markets in Financial Instruments will take force in January 2017 and a reviewed Market Abuse regulation will be effective in July 2016 for

derivatives, and January 2017 for allowances. These regulations will result in:

- higher integrity standards for market participants
- greater prohibitions on profiting from insider information
- increased transparency and access to information
- anti-money laundering safeguards extended to all segments of the market

Civil society oversight for environmental and financial integrity

The role of civil society in the oversight of the carbon market is crucial for its accountability and integrity.

The media, for example, has been active in exposing corruption and highlighting flaws and loopholes in the system. However, the complexity and speed with which the system operates makes oversight challenging.

The Gold Standard (mentioned above) provides a unique oversight function in terms of the environmental integrity of offsets. It also provides for stakeholder consultations to ensure that local communities and other stakeholders are involved in decision-making processes.

Carbon Market Watch, an expansion of CDM Watch in 2012, "scrutinises carbon markets and advocates for fair and effective climate protection". As an advocacy organisation it works at the UN level and also within Europe and the Global South.

In 2014, among its recommendations for CDM reform it raised the issue of an effective grievance mechanism (Carbon Market Watch 2014). There is currently no mechanism to "raise concerns once a project is registered" (Carbon Market Watch 2013c), thus limiting civil society participation and oversight. Such mechanisms across the board would enable greater civil society and public participation in the carbon markets.

At a national level organisations such as Transparencia Mexicana (Transparency International's chapter in Mexico) are also playing their part. For example, in 2012 the organisation conducted a research programme to empirically assess public participation in CDM projects (Bohórquez and Brandão 2012).

4. Conclusion

Although the carbon markets have been with us for almost 20 years, they are still developing their regulatory and oversight mechanisms to cope with their increasing complexity.

This complexity includes the emerging markets, such as those in China (UNDP 2015) and the World Bank's promotion of carbon markets in the developing world (Böhm 2013); and the linking of trading systems, such as between California and Quebec (Marcacci 2015) and the ultimate aspiration of the World Bank and others to create globally networked markets. These changes are likely to spark further corruption and governance challenges, but also opportunities to learn and innovate.

The adoption of new and innovative technologies and regulatory mechanisms is perhaps our greatest prospect for ensuring the carbon market's integrity. As seen above, systems for regulating the financial markets are already being embraced by the EU ETS. It has also been suggested that this kind of implementation could go even further and that Blockchain – the technology underpinning Bitcoin with an automated record-keeping system that provides a permanent public record and has so far proven highly resistant to hacking – could be adapted to the carbon market to "increase transparency" (Dunkel 2015).[7]

Whatever the innovations in these areas, however, we know from experience that corruption is innovative too and can find its way into even the most secure environments. In this context then, with a growing and increasingly complex carbon market, a focus on the importance of both environmental and financial integrity will be essential to ensure that it does not lose sight of its primary aim: to reduce greenhouse gas emissions and provide some hope that catastrophic climate change can be avoided.

5. References

Bailey, I., A. Gouldson and P. Newell. 2010. *Ecological Modernisation and the Governance of Carbon: A Critical*

[7] A simple explanation of the basics of Bitcoin and Blockchain can be found on Dominic Frisby's blog (5 July 2015).

Analysis, The Governance of Clean Development Working Paper Series. www.tyndall.ac.uk/sites/default/files/GCD_WorkingPaper009.pdf

Behn, D. 2008/09. 'Methods for Allocating Allowances under the EU Emissions Trading Scheme: Assessing Their Interaction with EU State Aid Rules', *CAR* 13. http://www.dundee.ac.uk/cepmlp/gateway/?news=30836

Böhm, S. 2013. 'Why are Carbon Markets Failing?', *The Guardian* (UK), 12 April. http://www.theguardian.com/sustainable-business/blog/why-are-carbon-markets-failing

Bohórquez, E. and Brandão, B. 2012. *Reality Check Mexico: Who Participates in the CDM?*, Carbon Market Watch, 27 August. http://carbonmarketwatch.org/reality-check-mexico-who-participates-in-the-cdm-watch-this-2/

Bond, P. and Dorsey, M. 2011. 'Climate Cash Deals Are Killing Us', *The Sunday Independent* (South Africa), 21 November. http://www.iol.co.za/sundayindependent/climate-cash-deals-are-killing-us-1.1183034#.VcctqhNVikp

Buen, J. 2013. *CDM Criticisms: Don't Throw the Baby out with the Bathwater*, FNI Climate Policy Perspectives 8, February. http://www.fni.no/doc&pdf/FNI-Climate-Policy-Perspectives-8.pdf

Carbon Market Watch. 2013a. 'Joint Implementation: CDM's Little Brother Grew up To Be Big and Nasty', Newsletter No.2. http://carbonmarketwatch.org/joint-implementation-cdms-little-brother-grew-up-to-be-big-and-nasty/

Carbon Market Watch. 2013b. *The Elephant in the Room: International Offsets in EU's 2020 Climate Legislation*, Carbon Market Watch. http://carbonmarketwatch.org/wp-content/uploads/2013/10/NC-Policy-briefing-16-OCT-2013.pdf

Carbon Market Watch. 2013c. *Views to the Review of the Modalities and Procedures of the Clean Development Mechanism*, Carbon Market Watch.

Carbon Market Watch. 2014. *New Carbon Market Watch Recommendations on CDM reform*, Carbon Market Watch. http://carbonmarketwatch.org/wp-content/uploads/2014/04/New-Carbon-Market-Watch-recommendations-on-CDM-Reform.pdf

Carbon Market Watch. 2015. 'NEWS: Review of the CDM Rules at the Bonn Intersessions', Carbon Market Watch, 9 June. http://carbonmarketwatch.org/news-back-on-the-table-review-of-the-cdm-modalities-and-procedures-at-the-bonn-intersessions/

Carbon Trade Watch. No date. 'Cap and Trade', Carbon Trade Watch. http://www.carbontradewatch.org/issues/cap-and-trade2.html

Chan, M. 2010. *Ten Ways to Game the Carbon Market*, Friends of the Earth. http://www.fern.org/publications

Dunkel, S. 2015. 'Emissions Trading with Blockchain Technology: Innovative Blockchain Services Can Solve Rising Emission Trading Problems', blockchained.blogspot.co.uk, 23 February. http://blockchained.blogspot.co.uk/2015/02/emission-trading-with-blockchain.html

Economist. 2013. 'Below Junk Status', *The Economist* (UK), 16 April. http://www.economist.com/blogs/schumpeter/2013/04/carbon-trading

Environmental Defense Fund. No date. 'How Cap and Trade Works: Learn How This Key Mechanism Works to Reduce Emissions', Environmental Defense Fund. https://www.edf.org/climate/how-cap-and-trade-works

EurActive.com. 2014. 'EU Agrees €5bn Carbon Permit Giveaway', EurActive.com, 25 September. http://www.euractiv.com/sections/energy/eu-agrees-eu5bn-carbon-permit-giveaway-308702

European Commission. 2013. *The EU Emissions Trading System*, Fact Sheet, European Commission. http://ec.europa.eu/clima/publications/docs/factsheet_ets_en.pdf

Fagan-Watson, B. 2015. 'Big Business Using Trade Groups to Lobby Against EU Climate Policy', *The Guardian* (UK), 15 April. http://www.theguardian.com/sustainable-business/2015/apr/15/big-business-trade-groups-lobby-against-eu-climate-change

Funk, M., 2015. 'The Hack that Warmed the World', *Foreign Policy*, 30 January. http://foreignpolicy.com/2015/01/30/climate-change-hack-carbon-credit-black-dragon/

Global Accounting Alliance (GGA). 2010. *Standards in the Voluntary Carbon Market*. http://www.gaaaccounting.com/standards-in-the-voluntary-carbon-market-2/

ICAP. 2013. *Carbon Market Oversight Primer*, ICAP. https://icapcarbonaction.com/index.php?option=com_attach&task=download&id=257

INTERPOL. 2013. *Guide to Carbon Trading Crime*, INTERPOL, June. http://www.interpol.int/en/News-and-media/News/2013/PR090/

Lang, C. 2014. 'Supreme Court finds Shift2Neutral issued "fake" and "Valueless" Carbon Credits', *REDD Monitor*, 20 February. http://www.redd-monitor.org/2014/02/20/supreme-court-finds-shift2neutral-issued-fake-and-valueless-carbon-credits/

Lazarus, M. and C. Chandler. 2011. *Can Concerns with CDM Coal Power Projects Be Addressed through Revisions to the ACM0013 methodology?*, Policy Note, Stockholm Environment Institute, December. http://carbonmarketwatch.org/wp-content/uploads/2011/09/SEI_CDMcoalNote.pdf

Lohmann, L. 2011. 'Regulation as Corruption in Carbon Offset Markets', in Reddy, T. (ed.), *Carbon Trading in Africa*, Institute for Security Studies Monograph No. 184. https://www.issafrica.org/uploads/Mono184.pdf

Macalister, T. 2011. 'European Union Faces Legal Action over Fraudulent Carbon Emissions Trading', *The Guardian* (UK), 20 February. http://www.theguardian.com/business/2011/feb/20/carbon-emissions-trading-market-eu

Marcacci, S. 2015. 'Four Questions for Global Carbon Markets in 2015', *The Energy Collective*, 6 January. www.theenergycollective.com/silviomarcacci/2178686/four-questions-global-carbon-markets-2015

Martin, P. and R Walters. 2013. 'Fraud Risk and the Visibility of Carbon', *International Journal of Crime, Justice and Social Democracy* 2(2), 27-42. http://eprints.qut.edu.au/62420/3/62420.pdf

Mason, R. 2011a. 'European Carbon Market Suspended over Fraud Fears', *Telegraph* (UK), 11 January. http://www.telegraph.co.uk/finance/newsbysector/energy/8269907/European-carbon-market-suspended-over-fraud-fears.html

Mason, R. 2011b. 'The Great Carbon Trading Scandal', *Telegraph* (UK), 30 January. http://www.telegraph.co.uk/finance/newsbysector/energy/8290533/The-great-carbon-trading-scandal.html

Nelsen, A. 2015a. 'European Carbon Market Reform Set for 2019', *The Guardian* (UK), 24 February. http://www.theguardian.com/environment/2015/feb/24/european-carbon-emissions-trading-market-reform-set-for-2019

Nelsen, A. 2015b. ''Green' Dam Linked to Killings of Six Indigenous People in Guatemala', *The Guardian* (UK), 26 March. http://www.theguardian.com/environment/2015/mar/26/santa-rita-green-dam-killings-indigenous-people-guatemala

Ott, H., C. Arens, L. Hermwille, F. Mersmann, W. Obergassel, H. Wang-Helmreich and T. Wehnert. 2014. *Lima Climate Report – COP 20 Moves at Snail's Pace on the Road to Paris*, Wuppertal Institute. http://wupperinst.org/uploads/tx_wupperinst/lima-results.pdf

Pearse, R., and S. Böhm. 2014. 'Ten Reasons Why Carbon Markets Will Not Bring About Radical Emissions Reduction', *Carbon Management*. http://www.tandfonline.com/doi/abs/10.1080/17583004.2014.990679?journalCode=tcmt20#.Vbj2YxNViko

PwC. 2011. *How to Assess Your Green Fraud Risks*, PricewaterhouseCoopers. http://www.pwc.co.uk/assets/pdf/greenfraud.pdf

Saxena, R., 2015. 'Kyoto Protocol program may have boosted waste greenhouse gas production', *Arstechnica*, 3 September. http://arstechnica.com/science/2015/09/kyoto-protocol-program-may-have-boosted-waste-greenhouse-gas-production/

Schapiro, M. 2010. 'Conning the Climate', *Harpers*, February. http://citizensclimatelobby.org/files/Conning-the-Climate.pdf

Schneider, L. 2011. 'The Trade-offs of Trade: Realities and Risks of Carbon Markets', in Transparency International, *Global Corruption Report: Climate Change*, Earthscan.

Schneider, L., A. Kollmuss and M. Lazarus. 2014. Addressing the Risk of Double Counting Emissions Reductions under the UNFCCC, Stockholm Environment Institute. http://sei-us.org/Publications_PDF/SEI-WP-2014-02-Double-counting-risks-UNFCCC.pdf

Si˘cáková-Beblavá, E. and G. Šípoš. 2011. 'Slovak Public See No Credit in Government's Carbon Trading', in Transparency International, *Global Corruption Report: Climate Change*, Transparency International, London: Earthscan. http://www.transparency.org/whatwedo/publication/global_corruption_report_climate_change

Taylor, L. 2015. 'Australia Overstating Greenhouse Gas Forecasts, Making Climate Targets Easier', *The Guardian* (UK), 10 June. http://www.theguardian.com/environment/2015/jun/10/australia-overstating-greenhouse-gas-forecasts-making-climate-targets-easier

Transparency International. 2011. *Global Corruption Report: Climate Change*, Earthscan.

http://issuu.com/transparencyinternational/docs/global_corruption_report_climate_change_english?e=2496456/2568825

UK Government. 2013. 'Carbon Credit VAT Fraudster to Pay Back £13 Million', Gov.uk, 17 October. https://www.gov.uk/government/news/carbon-credit-vat-fraudster-to-pay-back-13-million

UK Government. 2014. 'More Multi-Million Pound Credit Companies Are Shut Down Following Insolvency Service Investigations', Gov.uk, 23 May.

UNDP. 2015. 'Launch of China Carbon Market Research Report 2015', UNDP, 11 February. http://www.cn.undp.org/content/china/en/home/presscenter/articles/2015/02/launch-of-china-carbon-market-research-report-2015-.html

World Bank/ECOFYS. 2015. Carbon Pricing Watch 2015, World Bank. http://www-wds.worldbank.org/external/default/WDSContentServer/WDSP/IB/2015/06/02/090224b082ee87a1/3_0/Rendered/PDF/Carbon0pricing0e0released0late02015.pdf

Yumnam, J. 2013. 'Mega Dams and CDM Fraud in Sikkim', Carbon Market Watch, 27 March. http://carbonmarketwatch.org/mega-dams-and-cdm-fraud-in-sikkim/

6. Further reading

Business Green. 2014. 'Is the EU's Carbon Market Safe from Fraud?' *Business Green*, 29 September. http://www.businessgreen.com/bg/analysis/2372565/is-the-eus-carbon-market-safe-from-fraud

Calel, R. 2011. *Climate Change and Carbon Markets: A Panoramic History*, Centre for Climate Change Economics and Policy Working Paper no.62, Grantham Research Institute on Climate Change and the Environment Working Paper no.52. www.cccep.ac.uk/Publications/Working-papers/Papers/60-69/WP62_Climate-change-carbon-markets-panoramic-history.pdf

Financial Conduct Authority. 2014. *Carbon Credit Trading*, Financial Conduct Authority, 15 October. http://www.fca.org.uk/consumers/scams/investment-scams/carbon-credit-trading

ICAP. 2015. *Emissions Trading Worldwide: International Carbon Action Partnership (ICAP) Status Report 2015*, ICAP. https://icapcarbonaction.com/images/StatusReport2015/ICAP_Report_2015_02_10_online_version.pdf

Interagency Working Group for the Study on Oversight of Carbon Markets. 2011. *Report on the Oversight of Existing and Prospective Carbon Markets*, 18 January. www.cftc.gov/ucm/groups/public/@swaps/documents/file/dfstudy_carbon_011811.pdf

Jacobs, R. 2013. 'The Forest Mafia: How Scammers Steal Millions Through Carbon Markets', *The Atlantic*, 11 October.

London School of Economics. 2015. *EU ETS Reform: system responsiveness and carbon market oversight*, LSE. www.lse.ac.uk/GranthamInstitute/research/eu-ets-reform-system-responsiveness-and-carbon-market-oversight/

Pew Centre. 2010. *Carbon Market Design and Oversight: A Short Overview*, Pew Centre. http://www.c2es.org/docUploads/carbon-market-design-oversight-brief.pdf

Reyes, O. 2011. 'Letting the Market Play: Corporate Lobbying and the Financial Regulation of EU Carbon Trading', Carbon Trade Watch, October. http://corporateeurope.org/sites/default/files/publications/lettingthemarketplay.pdf

UNEP. 2013. *The Impact of Corruption on Climate Change: Threatening Emissions Trading Mechanisms?* UNEP, March. http://na.unep.net/geas/getUNEPPageWithArticleIDScript.php?article_id=97

Voutsina, K. 2015. 'EU's Emissions Trading System Needs More Oversight to Improve Carbon Market', *Wall Street Journal*, 2 July. http://www.wsj.com/articles/eus-emissions-trading-system-needs-more-oversight-to-improve-carbon-market-1435838225

Williams, A. 2008. *Corruption and Carbon Trading Projects: Is Carbon Finance Helping to Combat Detrimental Climate Change?* IACC Conference Workshop, Athens, Greece. http://iacconference.org/documents/4_5_workshop_report_IACCdoc.pdf

Yeo, S. and S. Evans. 2015. 'Global Emissions Trading Scheme 'Should Be Based on UN Carbon Budget'', Carbon Brief, 12 March. http://www.carbonbrief.org/blog/2015/03/global-emissions-trading-scheme-should-be-based-on-un-carbon-budget/