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2016/17 REPORT

BRIDGING THE AMBITION GAP.

THE RISE, REACH AND POWER OF CARBON MARKETS.

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THE RISE, REACH AND POWER OF A GLOBAL MARKET

Professionals in carbon markets see great strength in the Paris Agreement's ambitions. Its power is grounded not so much in the amount of reductions delivered in initial national mitigation plans, but in the strength that will grow from the foundations established for future cooperation.

Paris offers the promise of meeting the climate challenge through new markets that rise up, reach out and empower an economic and energy transformation – one that is revolutionary. The Agreement's market provisions are based on sound economic fundamentals.

The challenge of limiting warming to 2° Celsius – or better – requires action at a scale we have never seen. It must transform our energy and manufacturing systems, combined with large amounts of carbon storage in forests and underground.

SOLID ECONOMIC FOUNDATIONS

The fundamental economics are simple: climate change is one of those challenges that is best met together. Acting in isolation often costs more and accomplishes less. This reality derives from the fact that emissions reduction and sequestration opportunities are not spread evenly across the earth. In some places, action costs more than in other places. That's why the need for cooperative linkages is an essential element for the long term success of the Paris Agreement.

Linked markets help reduce costs for participating industries – and their national economies. The World Bank estimates that linkages between global pricing systems could save 30% by 2030 and 50% by 2050. These economic gains accrue to both high- and low-cost systems when cooperation occurs, because compliance costs are levelised. The modest economic transfers are worth the cost to business, because both sides meet their obligations more cost-effectively.

Linked markets also reduce the risk of emissions "leakage" from one place to another. This is a major concern of industries covered by carbon pricing systems: they fear that when they reduce emissions to comply with their obligations, the environmental benefit is lost (or "leaks") if competitors in uncovered jurisdictions bear no carbon price. They worry that the cost advantage enables the competitor to increase production and grow their emissions.

Linked markets reduce this risk in two ways: first, by requiring similar levels of stringency before markets are linked; and second, by giving covered industries access to the same market pricing. That's the beauty of Article 6 – it offers Parties the choice of creating and participating in a linked system to take advantage of these attributes.

THE PARIS SURPRISE

For many businesses, Article 6 emerged as the last-minute surprise of the Paris Agreement. They knew that the hangover from the financial crisis left many Parties skeptical of reliance on markets. At the same time, they understood that it was an essential element for enabling the transition to occur in an economically efficient manner. They hoped for a sentence, a phrase, even a couple of words, that would assure the availability of market-based approaches. Instead, they got a full article devoted to cooperation through markets.

This was a testament to years of hard work from market negotiators, who finally responded to a strong call for carbon pricing policies from CEOs and presidents, NGOs and Nobel laureates - even Al Gore and Leonardo di Caprio!

FOR MANY BUSINESSES, ARTICLE 6 EMERGED AS THE LAST-MINUTE SURPRISE OF THE PARIS AGREEMENT.

Article 6 holds true potential for change. It can inspire countries to erect strong national market based systems that can link with others. Markets rooted in national (or subnational) law provide stability to the system, which inspires business confidence. It is not a requirement to participate but instead – because the provision begins with the notion of voluntary cooperation – a freedom to choose the path that works best.

THE RISE OF NEW MARKETS

If nations take the 2°C challenge seriously, then we will see a steady rise of new carbon markets throughout the coming decade. Korea's national emissions trading system started last year. And next year, China's plans for a national market will nearly double the amount of global emissions subject to carbon pricing.

China could inspire others in Asia to step up their own plans for national markets. Already, a number of other Asian countries are investigating market options, as well as jurisdictions across North America, Latin America and Africa.

The International Civil Aviation Organization will launch a new global market-based mechanism for the aviation sector, starting in 2020. This sector offers to bring carbon market experience to a number of leading countries.

REACHING OUT

For this "rising up" of new markets to stand the test of time, nations will need to reach out to partners to forge links between markets. This is where the real economic efficiency lies. When markets are linked and transfers are enabled, both the sender and receiver benefit – as does the planet. Linkages can embolden national ambitions and create a pathway to a 2°C level of climate protection.

We see the first examples appearing on the horizon: Ontario is poised to join the California-Quebec carbon market. Mexico has signed a Memorandum of Understanding with California and with Ontario and Quebec to explore market linkages. The Pacific Alliance countries (Chile, Peru, Colombia and Mexico) announced their intent to explore a common carbon market. In Asia, early discussions convened by the Asia Society Policy Institute explored how market linkages might emerge with China, Korea and Japan .

BACK TO FUNDAMENTALS

The foundations for cooperation begin with good accounting. That's why Article 6 aims to set guidelines early so that nations can develop policies that properly account for results. This focus on results is an imperative for nations to have confidence in the Agreement. The basic accounting requirements should apply to both market and non-market approaches so that the public understands what is actually being accomplished.

Good accounting promotes confidence all around. Honest reporting of imports and exports offers transparency to nations and their industries, and it gives the public assurance that progress is being made. Nations should report according to a standard format that sums up the amounts transferred by jurisdiction. If both sender and receiver report accurately, then an outside observer should be able to see that the amounts match up.

Countries are empowered under Article 6 to give consent to transfers, so they have a clear channel for tracking amounts sent and received. The accounts should show corresponding adjustments from each party to a transfer. This approach is analogous to the double entry bookkeeping system that is standard in most businesses.

LAUNCHING A NEW EMISSIONS MITIGATION MECHANISM

Article 6 outlines a new emissions mitigation mechanism to promote sustainable development. This mechanism could become a valuable tool. It could ease market access for developing countries by offering central infrastructure for issuance of emission mitigation units. This mechanism can draw upon the CDM and JI experiences of the past – but it should be upgraded to modern standards to assure highest credibility.

The Article 6 mechanism can be read narrowly or broadly. Its maximum strength could be attained with a reading that innovates on the past and builds infrastructure for the future.

An innovation in this mechanism could be to enhance its transfer function by tapping the power of a centralized UNFCCC registry system. This could, for example, serve those interested in both allowance trading systems or baseline-and-credit (or project crediting) systems. While large jurisdictions, like the EU, the US and China, are large enough to operate their own registries,others might see value in tapping into a central UN registry – especially if it has transfer functions to other major registries.

The mechanism could extend further to offer unbundled components that nations could use in establishing their own systems. For example, the mechanism could offer a fully integrated crediting system as well as a set of tools:

- Defined units of measure;
- Standardized baselines;
- Compliance standards and procedures;
- Verification procedures – and licensing systems for verifiers;
- Issuance procedures;
- Registry services;
- Market oversight procedures.

For a small or developing country interested in becoming "market-ready", the use of such common elements could accelerate its ability to link to others in the future.

To realize the promise of Paris, the provisions of Article 6 must be elaborated soon, so that nations can know how to use the tools it provides. They can inspire new markets to rise up, encourage partners to reach out through linkages – and power a new wave of entrepreneurial climate action that will breathe life into the words of the Paris Agreement.

JOS DELBEKE

HOW THE PARIS AGREEMENT WAS WON (AND WHY THE HARD WORK HAS JUST BEGUN)

The adoption of the Paris Agreement on 12 December 2015 marked a defining moment in the fight against climate change. After the missed opportunity in Copenhagen in 2009, a great sense of expectation hung over the 195 parties at the Paris conference. The pressure was on to adopt a universal and legally binding global climate deal. When the cheers rang out across the world from the conference centre in Le Bourget on that Saturday evening in December when the Paris Agreement was finalized, they sounded a critical turning point in the history of international climate governance. At last an ambitious and global international climate change treaty was agreed upon. Now, one year later, Parties face the challenge to build the framework to put the Paris Agreement into practice on the ground.

NEGOTIATING THE PARIS AGREEMENT

The Paris Agreement was more ambitious than many expected. Not only did governments commit to keep global temperatures well below 2°C, but they also agreed to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels. The Paris package included provisions on climate finance and on addressing needs linked to loss and damage from climate change impacts.

The Paris Agreement has all the characteristics of a regime that is realistic, achievable and long-lasting. The European Union fought hard for three key components to be included in the Paris Agreement: a common long-term goal, a five-year ambition cycle to progressively update targets, and a transparency and accountability system to track progress against long-term objectives.

Work in the years leading up to Paris undoubtedly helped lay the ground for success. For example, while the time was not yet right in Copenhagen to deliver the legally binding, comprehensive agreement many had hoped for, it encouraged many countries that had never done so before to take on voluntary pledges and start planning for a climate-compatible economy. Ultimately, the Paris Agreement was the result of excellent climate diplomacy and extraordinary political will. The attendance on the opening day of 150 heads of state and government sent a strong message to the world of their collective resolve. Leaders also engaged in telephone conversations in the final days to help find compromise on outstanding issues.

The diplomatic skills of the French hosts have been widely recognised as contributing to the success of COP 21, and rightly so. France's Foreign Minister and President of COP21 Laurent Fabius demonstrated great skill in leading diplomatic efforts towards a balanced and ambitious agreement. By keeping an open ear to all Parties and ensuring predictability on the negotiating process, the French hosts maintained steady progress on all matters of substance throughout the conference and generated a sense of inevitability that an ambitious agreement would eventually be concluded.

The EU played a central role in avoiding the threat of a low-ambition deal by leveraging its strong track record of international support and – through cooperation and dialogue – agreeing to a more contemporary approach to the outdated distinction between developed and developing countries.

In advance of Paris, EU Commissioner for Climate Action and Energy Miguel Arias Cañete travelled the world in 2015 to build an alliance of countries united for an ambitious deal. In Paris, the EU and the Group of African, Caribbean and Pacific countries (ACP), announced a coalition of developed and developing countries in favour of the highest level of ambition, the so-called High Ambition Coalition. They were joined by the US, Canada, Japan, Mexico, Colombia, Brazil and others.

Another specific example of successful collaboration in Paris was the joint EU - Brazil submission on international markets. This was instrumental in delivering an ambitious framework for common and robust rules to account for the use of

WHEN THE PARIS AGREEMENT WAS FINALIZED, THEY SOUNDED A CRITICAL TURNING POINT IN THE HISTORY OF INTERNATIONAL CLIMATE GOVERNANCE.

IT IS CLEAR THAT CARBON MARKETS HAVE A KEY ROLE TO PLAY IN DELIVERING THE EMISSIONS CUTS NEEDED TO KEEP THE GLOBAL TEMPERATURE WELL BELOW 2°C BY THE END OF THE CENTURY.

international carbon markets and an ambitious mitigation mechanism to replace the Clean Development Mechanism. The proposal sought to underpin an ambitious and robust agreement by providing a common basis to avoid double counting – a key concern for both Brazil and the EU – to ensure the environmental integrity of carbon markets. All of these efforts, prior to Paris and during the two weeks of negotiations, were key to ultimately delivering the final Paris Agreement.

It is clear that carbon markets have a key role to play in delivering the emissions cuts needed to keep the global temperature well below 2°C by the end of the century.

We know that carbon markets are a cost-effective tool. Emissions from power plants and factories covered by the EU Emissions Trading System (EU ETS) are falling. By 2020, emissions from these sectors will be 21% lower than in 2005, and to achieve the EU's ambitious emissions reduction target of at least 40%, they will need to be 43% lower than 2005 by 2030. The EU ETS also contributes to direct investment in clean energy and energy efficiency. A recent report shows that in 2014, Member States used or planned to use almost €3 billion generated from the auctioning of ETS allowances on climate and energy related action.

We are already seeing new emissions trading systems emerging and the EU has been sharing more than a decade of experience with international partners. For example, the EU is working with the Republic of Korea to support the implementation of East Asia's first national ETS. The EU is also collaborating closely with China through a new €10 million project, as China prepares for the launch of a nationwide carbon market next year. In addition, the European Commission is the biggest contributor to the World Bank's Partnership for Market Readiness, through which some €110 million has been made available to help 17 countries develop and implement domestic market proposals.

But while the Paris Agreement can facilitate markets through its framework, functioning carbon markets require countries to create the necessary supply and demand through their domestic policies. I am convinced that more carbon markets will likely emerge as countries move to implement their national climate policy plans prepared in the run-up to Paris. More than 90 countries have said they intend to use market-based measures to achieve their emissions reduction targets.

In the shorter term, we may see some demand if the International Civil Aviation Organization is successful in agreeing a global market-based mechanism this autumn to deliver the sector's fair share of emissions towards the global effort. One of the most pressing challenges for all countries, therefore, is to put the Paris Agreement into practice on the ground. The EU is forging ahead with its preparations for delivering on its Paris commitments. In fact, before Paris proposals were made to strengthen the EU ETS to ensure the energy sector and energy intensive industries deliver the necessary emission reductions.

In July 2016, the EC brought forward proposals to accelerate the low-carbon transition of key sectors of the economy in Europe, including transportation, buildings, agriculture and waste. The Commission also presented a strategy on low-emission mobility, which sets the course for the development of EU-wide measures on low- and zero-emission vehicles and alternative low-emissions fuels. Later this year, the EC will come forward with proposals to adapt the EU's regulatory framework in order to put energy efficiency first and to foster the EU's role as a world leader in the field of renewable energy.

So, as COP 22 approaches and we resume the task of filling in the technical details of the landmark Paris Agreement, the EU will continue to do our homework and prepare the ground for its swift implementation in the EU.

Jos Delbeke *has been the Director-General of the European Commission's Directorate-General for Climate Action since its creation in 2010.*

VIKRAM WIDGE

SCALING UP CARBON MARKETS POST-PARIS

Even veterans of carbon markets seldom speak any more of the time when the price of carbon in the EU ETS was steadily above €20 per ton and Carbon Expo was filled with entrepreneurs and bankers from around the world striking deals in what many hoped would become the largest commodity market in history.

While that is not how it worked out, is it possible that the heyday of carbon markets is yet to come?

As we look to the future and the imperative for countries to deliver on promises made in Paris, it's time to focus on the opportunities. Investment needs to amount to more than $1 trillion per year over the next 15 years -- a multi-trillion dollar financing opportunity for the private sector and governments to help turn climate mitigation commitments into climate-smart investments that create jobs and improve lives.

A long-term, predictable price on carbon is widely recognized as critical to this effort. Our analysis in the State and Trends of Carbon Market 2015 report indicated that the use of market-based mechanisms is often the most cost-efficient way to achieve GHG reductions when aligned with other climate mitigation policies, regulations, taxes, removal of subsidies and energy efficiency incentives. Carbon pricing initiatives give the private sector the certainty it needs to make long-term decisions and drive investment in low-carbon technologies, in turn reducing emissions.

Already 40 countries and more than 20 cities, states and provinces are putting a price on the pollutants that cause warming, covering some 13 percent of all greenhouse gas emissions, according to the World Bank's most recent Carbon Pricing Watch[1]. This includes 7 out of 10 of the world's largest economies and 3 out of 5 of the world's largest emitters[2], which are planning or considering the use of market mechanisms including ETSs, offset mechanisms and results-based climate finance.

This year saw the launch of two new carbon pricing initiatives: British Columbia established an ETS for the liquefied natural gas industry alongside its carbon tax, followed by Australia's implementation of a safeguard mechanism to the Emissions Reduction Fund, pricing emissions of large emitters that exceed their set limit.

ALREADY 40 COUNTRIES AND MORE THAN 20 CITIES, STATES AND PROVINCES ARE PUTTING A PRICE ON THE POLLUTANTS THAT CAUSE WARMING, COVERING SOME 13 PERCENT OF ALL GREENHOUSE GAS EMISSIONS, ACCORDING TO THE WORLD BANK'S MOST RECENT CARBON PRICING WATCH.

Moreover, France announced its intention to introduce a carbon floor price for the coal-fired power sector from 2017 and Canada is exploring options for carbon pricing on a national level. Mexico announced it is testing a cap-and-trade system to enable a national carbon market starting in 2018 and strong interest in linking to a North American carbon market. Panama also said it is preparing a carbon market, with the aim of becoming a regional hub for sustainable forest management and trade in international emissions.

Looking forward, China's move to set up a national emissions trading system in 2017 will potentially alter the landscape. If the initial phase goes as planned, China will immediately pass the EU ETS in having the largest carbon market in the world. We predict the global value of carbon pricing initiatives could double to $100 billion.[3]

About 100 countries – accounting for roughly 58% of global emissions – included references to carbon pricing initiatives and use of market-based mechanisms in their Intended Nationally Determined Contributions. The Paris Agreement gave an additional boost to expectations for renewed carbon markets with a separate Article 6. We at the World Bank Group were happily surprised to see the extent to which this language enables the establishment of a new carbon market, validating our decades of work in supporting governments and mobilizing the private sector to finance climate mitigation, beginning with the first ever carbon fund in 2000.

What will it take to further scale up market-based carbon pricing instruments to help meet the demand for climate-smart investment?

The 1997 Kyoto Protocol envisioned a global trade architecture for greenhouse gas emissions that allowed developed countries to offset their emissions by financing low-carbon projects in developing countries through the Clean Development and Joint Implementation Mechanisms. The Paris Agreement, through Article 6, will rely on different, and more complex, rules of the game with all countries and jurisdictions having the ability to design and implement carbon pricing initiatives that fit their domestic circumstance, while voluntarily participating in cooperative arrangements to allow for carbon trading across borders.

Establishing an international carbon market would go a long way toward spurring climate mitigation efforts by giving carbon emitters the possibility of acquiring greenhouse gas emission reductions where it is most cost effective for them to do so. This requires linking of carbon reduction actions, and the World Bank's Networked Carbon Markets initiative is focused on facilitating such cross-border trade based on a shared understanding of the relative value of these different approaches, ultimately allowing for a fungible international carbon market.

The State and Trends[4] analysis shows the earlier that such a market is developed, the larger the savings and hence the greater the potential to scale up ambition in the short term. In fact, we believe that while not a panacea, without an international market for carbon, it will be not be possible to cost-effectively stay below the 2 degree Celsius target set by the Paris Agreement. That is why the World Bank has established the first global fund to pilot the development and transfer of carbon

ULTIMATELY, AN INTERNATIONAL CARBON MARKET WILL GROW OUT OF THE PATCHWORK OF MITIGATION ACTIONS TAKEN BY COUNTRIES, STATES, CITIES AND INDUSTRIES.

assets under the Paris Agreement. The Transformative Carbon Asset Facility (TCAF) will assist countries to leverage public finance to create favourable conditions for private sector investment in low-carbon technologies, providing blueprints to scale up efficient and low-cost mitigation on a global level. Specifically, the $500 million facility will develop innovative carbon accounting methodologies to attribute emission reductions to the implementations of policies and economy or sector-wide programs, going beyond project-by-project mitigation while ensuring the environmental integrity of the assets. And it will test approaches to transparently transfer these mitigation outcomes, or "ITMOs", as they are referred to in Article 6.

The experience of the more than 35 participants in the Partnership for Market Readiness[5] (PMR) further demonstrates the necessity of establishing robust emissions monitoring, reporting and verification (MRV) systems as for countries to identify opportunities to reduce GHG emissions, and an important prerequisite to launching carbon pricing initiatives at least-cost. For example, countries like Turkey and Ukraine are currently designing and implementing national programs to monitor, report and verify greenhouse gas emissions from emitters in the energy and industrial sectors.

Regulation of emissions is also spreading also into new areas. With aviation representing about 2% of global emissions, equivalent to the world's 7th largest emitter, 191 countries signed an historic agreement in October 2016 to keep greenhouse gas emissions from international aviation to 2020 levels, despite the sector's anticipated continuing growth, using carbon offsets. The World Bank is offering assistance going forward to establish new registries and MRV systems needed for this.

The importance of supporting the 'readiness' of the private sector to engage actively in the carbon market is also the premise of the International Finance Corporation's (IFC) advisory engagement in China, particularly focused on the role of the financial sector and industry in carbon trading. Together with the Shenzhen emissions exchange, IFC, the arm of the World Bank Group that works with the private sector, helped develop a specialized non-spot emissions trading product to help advance this carbon market pilot. IFC is also exploring interest from Chinese financial institutions and their clients in carbon advisory, brokerage and risk management products for use once liquidity improves as the pilots transition to a national market.

Ultimately, an international carbon market will grow out of the patchwork of mitigation actions taken by countries, states, cities and industries. New services and institutions that enable environmental integrity, transparency, comparability and, ultimately, linkage will be the cornerstones of this new and improved carbon market of the future.

Vikram Widge *is Manager of the joint World Bank-IFC Climate & Carbon Finance Unit*

(1) https://openknowledge.worldbank.org/handle/10986/24288 (2) China, India and Brazil. The US and EU did not state the use of carbon pricing in their INDCs, despite initiatives already being in place at a regional, national and/or subnational level. (3) Value of approximate emissions covered under the Chinese ETS multiplied by the weighted average carbon price over all initiatives globally in 2016. (4) State and Trends of Carbon Pricing, 2016 (5) www.thepmr.org

RISING UP TO NEW OPPORTUNITIES


RISE

FELIPE FERREIRA, LUIZ DE ANDRADE FILHO AND TÚLIO ANDRADE

ARTICLE 6 OF THE PARIS AGREEMENT: THE PATH TO EFFECTIVENESS

The adoption of the Paris Agreement reaffirmed the UNFCCC's role as the central political arena for tackling global climate change. Among many of its distinctive elements, the Paris Agreement set multilaterally-agreed parameters for the voluntary use of market instruments, aimed at enabling higher levels of ambition by public and private agents.

Article 6 recognizes, on one side, that Parties may choose to engage in the international transfer of mitigation outcomes while implementing their Nationally Determined Contributions (NDCs), a similar model to the emissions trading under the Kyoto Protocol. Transfers are to be guided by strong accounting and governance rules – currently under discussion – adding on to other transparency obligations contained in the Agreement, most notably Article 13 and Article 4, paragraph 13.

For those cooperative approaches to be successful, guidance needs to establish clear procedures for robust accounting and clarity on governance requirements, with a view to ensure authorization by participating Parties and avoid double counting. By thoroughly complying with such guidance, Parties – who are ultimately accountable for transfers involving their territories – will be able to demonstrate the environmental integrity of any action involving transfer of mitigation outcomes.

At the core of Article 6 of the Paris Agreement is the establishment of a mechanism to contribute to the mitigation of greenhouse gas emissions and to support sustainable development. The Sustainable Development Mechanism (SDM), as it is often referred to, highlights the centrality of sustainable development in tackling climate change.

The SDM was inspired by the successful experience of the Kyoto Protocol's Clean Development Mechanism (CDM), through which over 1.7 billion certified emission reduction (CER) units were issued from projects in developing countries that also provide social and economic benefits. Like its predecessor, the SDM was created as a centralized crediting mechanism that will function under multilateral authority and guidance, supervised by a designated body. It was designed to contribute to emission cuts that are additional to what would otherwise occur. Whether credits are retained domestically or internationally transferred, mitigation benefits will always be reflected in host countries' inventories, in periodic "snapshots" of their national emission levels. While credits used to fulfil a Party's NDC would be assigned to the acquiring country, the benefit of mitigation achieved will still be owned by the host country.

The SDM innovates further in the sense that it was originally conceived to incentivize and facilitate participation by non-state stakeholders, while helping parties implementing their NDCs to the Paris Agreement. Its comprehensiveness in scope, together with multilateral assurances with respect to environmental integrity, can make the mechanism the prevalent offsetting instrument globally. Stringent governance under the auspices of the United Nations will guarantee that one certified emission reduction credit does indeed represent one less tonne of carbon in the atmosphere. The "UN quality stamp" will ensure comparability of internationally transferred mitigation outcomes, thus favouring coherence, liquidity and expansion of the carbon market. In other words, it will provide a global public certification scheme for mitigation activities with the highest integrity standards, along with recognition by the international community and national governments.

For a developing country, this means more green investment and technologies, improved livelihoods, and enhanced ambition. Ultimately, the SDM can play a key role in promoting the green economy, in the context of sustainable development and poverty eradication.

Felipe Ferreira, Luiz de Andrade Filho *and T****úlio Andrade*** *are Brazilian diplomats involved in the negotiations under the UNFCCC.*

AT THE CORE OF ARTICLE 6 OF THE PARIS AGREEMENT IS THE ESTABLISHMENT OF A MECHANISM TO CONTRIBUTE TO THE MITIGATION OF GREENHOUSE GAS EMISSIONS AND TO SUPPORT SUSTAINABLE DEVELOPMENT.

ULRIKA RAAB & KENNETH MÖLLERSTEN

COOPERATION UNDER ARTICLE 6: THE KEY TO SCALED UP EMISSION REDUCTIONS

The ambitious temperature goal of the Paris agreement significantly raises the ambition of international cooperation on climate change. Immediate and radical change will be needed.

By 2030 greenhouse gas emission cuts need to go well beyond what is implied by the INDCs communicated by Parties. Immediate action is needed to prevent lock-in into carbon-intensive infrastructure. Otherwise, attaining the long-term temperature goal will most likely require future negative emissions of almost unimaginable magnitude.

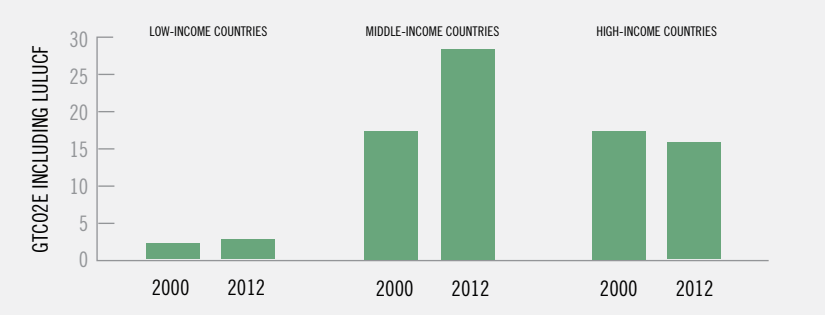
An overwhelming majority of global greenhouse gas emissions occur in high- and middle-income countries. Limiting warming to well below 2 degrees requires strategic action that is compatible with the long-term transformation of energy systems required world-wide.

To achieve the ambitious temperature target, long-term thinking is needed; Long-Term Low Greenhouse Gas Emission Development Strategies (LEDS) may facilitate a long-term perspective and long-term objectives may be supported by results-based payments on the basis of transformational indicators (e.g. the carbon intensity of new-build in a sector) in addition to the conventional CO2e.

The Kyoto Protocol successfully used market-based instruments to assist industrialised countries to achieve their emission limitation commitments. This approach created a global multi-billion dollar market engaging the private sector in climate friendly investments and enhanced cost efficiency by activating an efficient market-search function. Incentives for investment in climate-friendly technologies were introduced in countries and regions where national energy and climate policy were not yet incentivising such technologies.

The market-based approaches under Article 6 will have to be designed so that those accomplishments can be repeated, and even scaled up, under the Paris Agreement. But as the task has grown in magnitude, we see a different role for Article 6 compared to the Kyoto Protocol mechanisms; cooperation under Article 6 needs to aim at achieving substantially more reductions.

CHANGE IN GHG EMISSIONS FROM 2000 TO 2012



The illustration shows GHG emissions in 2000 and 2012 for low-, middle- and high-income countries, respectively. Data from the World Resources Institute data base CAIT.

Due to the urgency in reducing global emissions on the near-term, there is probably not much space for offsetting – considerable mitigation is needed in all countries, particularly in high- and middle income countries.

Under Article 6, the tool for co-operation needs to expand from a project-/programme-based approach to a broader scope, such as a sector. In order to ensure that more really is achieved through working together, a robust and credible set of rules will be required.

A robust and transparent common accounting framework is needed, so that transferred units can be tracked and match national inventories and progress towards pledges can be monitored. A certain level of accounting and inventory sophistication is in our view a necessary prerequisite, in particular for activities under Article 6.2.

Even with proper accounting of transferred units, environmental integrity cannot be guaranteed without adequate consideration of baselines and additionality. NDCs cannot automatically be used as a basis for a baseline; one possibility for getting a better grip on what an NDC will entail in form of domestic action, and what would be suitable for international support under Article 6, would be to relate NDC emission levels to scientifically robust low-emission development strategies.

The Swedish Energy Agency has used the CDM MRV toolkit for over a decade to channel results-based payments towards real and meaningful mitigation projects in developing countries.

Provided that there are robust and credible rules, Article 6.4 in particular, could be used as a way of channelling results-based climate finance towards real and meaningful mitigation activities to achieve sufficient levels of mitigation in middle income countries, in addition to the radical reductions needed in all advanced industrialised countries.

It is our firm belief that we can do more together.

Ulrika Raab *is senior climate change advisor and* ***Kenneth Möllersten*** *is a member of the Market Development Department at the Swedish Energy Agency*

SAM FANKHAUSER

SHOULD WE TAX OR TRADE CARBON?

Ask policy makers to name the most important climate change policy and most of them will choose carbon pricing. They would be right. Unless emitters face the full cost of their actions they will not control their carbon output. It is one of the unequivocal successes of the EU Emissions Trading Scheme that all major emitter in Europe now manage their carbon footprint.

But ask further what the best way is to price carbon, and disagreement starts. There are two main pricing instruments – emissions trading (including most prominently cap and trade) and carbon taxation. Both have their proponents and detractors.

There are other ways to price carbon. Direct regulation puts an implicit price on emissions, but it is a blunt instrument, and baseline-and-trade has yet to recover from the experience with the Clean Development Mechanism.

The two main methods have both been implemented in practice.1 British Columbia has gained much praise for its revenue-neutral carbon tax, which returns all proceeds to businesses and individuals. Sweden has taxed carbon for 25 years now and at an eye-watering rate (currently $150 per tCO2), but there are extensive exemptions. Carbon is also taxed in, among other countries, Australia, Chile, Ireland and the UK.

The cap-and-trade world is dominated by three prominent schemes: California, China's provincial pilots and of course the EU ETS. But carbon is also traded in for example New Zealand, South Korea, Kazakhstan the North-East US, Tokyo and Quebec. Switzerland has both taxation and a trading scheme.

SOME COUNTRIES HAVE ALREADY CONVERTED THE GLOBAL CONSTRAINT INTO LEGALLY BINDING TARGETS FOR THEMSELVES.

From this experience it is hard to judge what has been more successful, taxing or trading. Both instruments have been operated with relative (though not perfect) success. Different circumstances will require different solutions, and many of the lessons we have learnt are relevant for either design.

A CHOICE OF RISK

From an environmental point of view, the choice between tax and trade is a choice between two forms of risk. Taxes offer certainty over the cost of compliance (the tax rate), but there is a risk emissions may not come down as expected. Trading schemes offer certainty over emissions (the cap), but compliance costs are unpredictable.

So what is worse, getting emissions wrong or getting compliance costs wrong? The theoretical answer was provided already 42 years ago by Martin Weitzman.[2] He showed that it depends on the biophysical relationship between climate damages and emissions. If damages increase steeply with emissions it is better to be certain about those emissions and set a cap. Conversely, if damages are relatively constant it is better to tax.

For many economists the Weitzman argument favours a carbon tax, since the climate change damage curve is relatively flat. There is so much natural carbon in the atmosphere that the impact of each anthropogenic tonne is roughly the same However, climate control is ultimately about quantity constraints. Scientists have calculated the global "carbon budget" that remains if we are to meet the Paris objective: at most 1,000 GtCO2 for a reasonable chance of 2°C and less for "well below 2°C.

Some countries have already converted the global constraint into legally binding targets for themselves. The UK with its statutory carbon budgets is a case in point. Once there is a binding constraint, certainty to meet it becomes important, and that would favour cap-and-trade.

CARBON PRICING THROUGH THE BUSINESS CYCLE

Proponents of cap-and-trade have argued that trading is more responsive than taxation to the business cycle. During an economic downturn emissions fall. Carbon prices also drop and this provides a stimulus to the economy, similar to a tax cut. In other words, carbon price fluctuations act as an economic stabiliser.

This is true. However, analysis has shown that trading schemes over-adjust.[3] It is a good idea to ease the regulatory burden during difficult times, but not by as much as trading schemes do.

An economic downturn is also a good time to reduce emissions. It is likely to cost less than when the economy is booming. To encourage that, the permit supply has to be tightened a little bit. Although motivated by oversupply the EU ETS is moving in this direction with its market stability reserve.

Of course the same argument also holds for a carbon tax. During a downturn the authorities should lower the tax rate to stimulate the economy, but not so much as to disincentivise emission reductions.

TRADING SCHEMES ARE EASIER TO GET APPROVAL THAN NEW TAXES. THE ARGUMENT HOLDS BOTH DOMESTICALLY AND INTERNATIONALLY.

In other words, both taxes and trading schemes warrant some intervention over the business cycle, and neither scheme offers an inherent advantage.

THE ADMINISTRATIVE BURDEN

There is also not much difference between the two in terms of administrative costs. The monitoring requirements for regulated firms are exactly the same, whether emissions are measured for tax or trading purposes.

Both measures make administrative demands on the public sector, but in each case there are existing bodies than can assume the new responsibilities – tax authorities in one case and commodity market regulators in the other.

Carbon trading also requires specialist skills, which not all firms will have. Larger firms will build them up and indeed many of them, energy producers in particular, already have trading desks.

But for smaller firms active trading will be burdensome. They may find it easier to pay a tax than mastering options and futures.

The counterargument of course is that carbon trading, like tax compliance, can be outsourced to specialist firms.

THE POLITICS

A key argument in favour of carbon trading has always been the political economy context. Trading schemes are easier to get approval than new taxes. The argument holds both domestically and internationally. Internationally, tax harmonisation is incredibly difficult. Finance ministries guard their tax sovereignty jealously. This is the main reason why Europe has an emission trading scheme rather than an EU-wide carbon tax.

Setting up an international emissions trading scheme is not straightforward either. But the benefits from international cooperation are substantial, and the number of jurisdictions that are exploring linked systems is growing: eg. California and Quebec; Switzerland and the EU. Even the still-born Australian trading scheme was meant to link to the EU ETS.

Domestically, there is invariably opposition to new tax schemes. Voters tend to see them as a revenue raising exercise rather than environmental policy. And indeed that is often what they are. The UK's climate change levy and carbon price floor spring to mind.

Yet the British Columbia example shows that by hypothecating revenues or cutting taxes elsewhere these perceptions can be overcome. Switzerland's carbon tax revenues are also earmarked, in part, for low-carbon investment.

The point is that both mechanisms create assets (allowances) or revenues (tax returns) that can be used to create an outcome that is politically acceptable. If it is a secondary objective is to raise revenue, permit auctions are not much different from a straight carbon tax.

All this suggests that the differences between taxing and trading are perhaps exaggerated. Once all relevant concerns have been addressed – about price fluctuations, monitoring arrangements and political buy-in – the practical tax and trading schemes that emerge are no longer that dissimilar.

The main challenge is to put a price on carbon in the first place.

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(1) World Bank, 2015. State and Trends of Carbon Pricing, Washington DC, September. (2) Weitzman, M., 1974. "Prices vs. quantities". Review of Economic Studies, 41(4),.477-491. (3) Doda, B., 2016. How to price carbon in good times… and bad!. Wiley Interdisciplinary Reviews: Climate Change, 7(1), pp.135-144.

ANDREW HOWARD

COLLABORATIVE LEADERSHIP ON MARKETS

Last year in December, few people reckoned with the Paris Agreement entering into force within 12 months. But it has been pushed through by a wave of political expression that has seen countries all over the globe mobilising to give their formal consent.

This is unprecedented for an international treaty of this nature. Entry into force for the Kyoto Protocol – the last fortification of the mothership UNFCCC in 1997 – took over seven years to gather the required international backing.

The International Civil Aviation Organisation was reaching agreement on its global emissions market at the same time as the threshold for entry into force of the Paris Agreement was reached, extending an international framework of climate action to one of the last two gaps in its global coverage. The first phase of ICAO's new market-based measure is voluntary but the proportion of emissions growth beyond 2020 to be neutralised is expected to be around 80%[1].

JOINING THE DOTS

These are exceptionally positive headlines for climate action and signal a serious political commitment to lead. Can this now be turned into collaboration on an international carbon market?

Increasingly, the question of national implementation of carbon pricing is becoming "what" or "when", rather than "whether". Around 60 countries and other jurisdictions have implemented or have scheduled carbon pricing policies, covering around 13% of global emissions. Beneath these numbers, however, prices range from less than US$1/tCO2e to US$137/tCO2e and result from a patchwork of carbon taxes and mostly unconnected trading systems[2].

With over 90 countries signalling in their intended nationally determined contributions (INDCs) last year that they wish to make use of markets in some way, how much of a drive towards a common vision for markets will we see?

A number of initiatives have been set up in recent years to promote carbon markets. The International Carbon Action Partnership (ICAP) was established in 2007 by governments seeking to share best practices in emissions trading and discuss linking that could lead to a global trading market. It now includes 31 developed countries, regions and cities.

Another relative veteran is the Partnership for Market Readiness (PMR) supported by the World Bank. Eighteen primarily developing countries from all over the globe are working with the support of 13 contributing countries. The PMR is strongly focused on enabling countries to implement carbon pricing policies, and puts serious money and technical support behind these efforts.

AROUND 60 COUNTRIES AND OTHER JURISDICTIONS HAVE IMPLEMENTED OR HAVE SCHEDULED CARBON PRICING POLICIES, COVERING AROUND 13% OF GLOBAL EMISSIONS.

SETTING A POLITICAL VISION

These initiatives have filled a primarily technical space in the international collaboration on markets. They have greatly enhanced the understanding of how effective policies can be implemented and how they can link.

The shift toward political emphasis began in the lead-up to the Paris COP as several new initiatives formed as an articulation of cross-country political leadership in the markets space. When the G7 met in Germany on June 2015, it established what is now called the Carbon Market Platform as a home for political and strategic dialogue that can understand differences, close political and institutional gaps, and help facilitate the emergence of new cooperative approaches.

The idea is to keep the platform quite small, though it has been inviting in members beyond the original seven in a bid to include major emitters and developing countries with a clear interest in carbon markets.

Several factors make this platform unique. Being only open to governments, it concentrates on their perspectives. It also targets participation at the director-general level, that is, the highest official in a country's relevant ministry. These people are close to the political debate and understand the constraints in their countries, while also forming a bridge to the expert level.

If all goes to plan, this balance will allow the platform to generate a political vision

for how an international carbon market can emerge while also helping to create the political will to follow it.

COMMITTING TO INTEGRITY

Another initiative, led by New Zealand, saw 18 countries sign up to the Ministerial Declaration on Carbon Markets immediately after the Paris Agreement was adopted.

Originally prepared as a fallback if markets had not been part of the agreement, the Declaration instead found itself riding the Article 6 wave, and committing these countries to "environmental integrity, transparency and the avoidance of double-counting when market mechanisms are used".

The Declaration countries have already set to work in mapping out the nature of standards and guidelines that could apply across their market activities and perhaps also the international carbon market. The idea is not to substitute for rules to be agreed via the UNFCCC, but to complement them. The group is embracing the decentralised approach to future markets but wishes to tap into a collective interest in higher levels of integrity and market confidence.

GOING FOR SCALE

Also launched in Paris was the World Bank's Carbon Pricing Leadership Coalition (CPLC). This brings together 24 countries and more than 90 global companies and other partners. It aims to expand carbon pricing around the world by convening leadership dialogues and mobilising support from business and civil society.

The Carbon Pricing Panel, convened by the World Bank and the International Monetary Fund, is also weighing in. This group, made up primarily of heads of state, is calling for the emissions covered by carbon pricing policies to double to 25% by 2020 and double again to 50% within the decade beyond that.

PRIORITY NEEDS

These new leadership initiatives will have been very complementary if they can deliver both political vision and practical means to ensure the bar is left high for integrity.

There are a number of key facets to this political involvement that should be prioritised. Firstly, in a world where the benefits of carbon pricing are already widely accepted in climate policy circles, the need is now for an ambitious pathway and political rationale for the individual systems of countries to hook up in a truly international carbon market. Ultimately there may only be one global marketplace or there may be several major market hubs. But what the world needs to quickly get away from is the default option of each country doing its own thing with only sporadic linkages that we then welcome as an extra bonus.

Linking trading systems and setting up comparability across crediting programmes is hard work. But beyond the harmonisation of technicalities and balancing of interests, linking is a mindset that requires political readiness to make policy compromises for the sake of a collective benefit. The early work of the US Western Climate Initiative provides interesting lessons in the value of planning for such linking at the outset.

Secondly, there needs to be a clear understanding of how integrity underpins the long-term political and economic value of the market. It is in the interest of all countries to have confidence that what they buy really are genuine reductions in emissions that have not caused harm in a local community somewhere. This needs to find concrete expression in common principles, standards and guidelines that are meaningful when operationalised, and that enable countries to hold each other to account.

Thirdly, there is a need to define more tangibly how markets can strengthen mitigation ambition. We understand that more cost-effective reductions can enable greater action, but in practice stronger targets may not eventuate or the causality may not be clear. Political commitments on the use of markets can however be directly linked to announcements of increased mitigation.

Crediting mechanisms can also be used to reduce emissions beyond what countries have already said they will do under the Paris Agreement. However, crediting requires some portion of reductions to not be used as offsets, or it risks being little more than moving emissions around. How crediting should contribute to "overall mitigation" is controversial, but it is in urgent need of resolution. One way of helping could be to integrate results-based climate finance, which results in reductions that should not be used for offsetting, into the funding mix to leverage private capital.

Giving certainty to a long-term rise in ambition for mitigation is perhaps the greatest contribution to effective carbon markets that governments can make. It gives a solid basis for expectations to form regarding long-term carbon prices and emission paths, allowing serious investments and climate action to be unlocked.

Dealing with issues like these, focused political groupings of countries have the potential to achieve what is difficult to reach in the much broader and more diverse forum of the UNFCCC. They can build upon the minimum standards that the UNFCCC lays down by seeing where countries have a common incentive to raise the bar higher and quicken the progress to a well-functioning and well-connected international carbon market.

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(1) International Air Transport Association (2) World Bank, Carbon Pricing Watch 2016

ERIC BOONMAN AND DANIEL BARRY

REVISITING THE FIRST PRINCIPLE OF A DEEP AND LIQUID MARKET: WIDEST POSSIBLE COVERAGE

Tackling climate change requires urgent cuts to greenhouse gas emissions. The Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC) quantified the maximum amount of emissions humanity can produce and still have a break-even chance of staying below 2 degrees. Out of a total planetary "carbon budget" of about 3.5 trillion tonnes of carbon dioxide[1], we've already burned through more than half.

UNDERSTANDING THE TASK AT HAND:

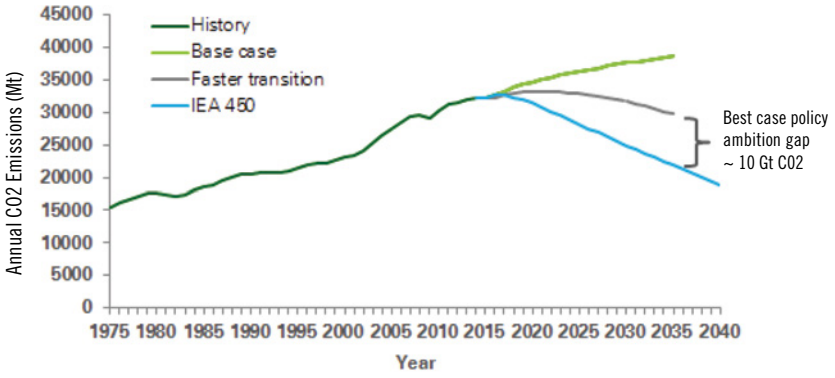
The Paris Agreement may create a new wave of global momentum towards achieving its stated aim of "holding the increase in the global average temperature to well below 2 °C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5 °C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change."

Despite this ambition, analysis by the UNFCCC and others suggests, a gap of nearly one gigatonne exists between the reductions implicit in the nationally determined contributions that were submitted prior to the Paris Agreement and the IPCC's estimated required ambition. The effort, speed and cost of achieving reductions to meet the trajectory set out in the International Energy Agency's 450 parts per million scenario (see Figure 1) may be significantly reduced if carbon pricing regulation and offsetting mechanisms were implemented to provide for wide-scale sectoral and gas coverage and enabling a robust price signal that reflects the lowest marginal abatement cost possible.

CARBON PRICING MECHANISMS

While some academics, carbon market enthusiasts and policy makers may assert that global carbon pricing is needed to assist in bridging the gap, the reality is that achieving a global price remains, at least for the near future, a distant prospect.

FIGURE 1: THE GLOBAL AMBITION GAP



Source: BP Energy Outlook 2015 & IEA World Energy Outlook 2015.
(Note: the IEA 450 scenario sets out an energy pathway consistent with the goal of limiting the global increase in temperature to 2°C by limiting concentration of greenhouse gases in the atmosphere to around 450 parts per million of CO2.)

Efforts to set a price through the "top-down" structure of the Kyoto Protocol stalled, and instead a "bottom-up" series of national or regional efforts has gained impetus.

To date the World Bank's 2015 State and Trends of Carbon Pricing highlights that about 40 national jurisdictions and over 20 cities, states and regions – representing almost a quarter of global greenhouse gas emissions - are placing a price on carbon. This patchwork of national and provincially led carbon pricing instruments looks set to grow; more than 90 governments indicated in their INDCs an interest in using international and domestic markets to fulfil their pledges.

While welcoming this growing interest in carbon pricing, its patchwork nature and the speed at which carbon pricing mechanisms are evolving, morphing and developing hybrids, needs careful monitoring. This is because a fragmented approach has the potential to provide a fertile ground for game theory and arbitrage, with potential risk for governments, industries, sectors and polluters alike exploiting this fragmentation to "free ride" on the mitigation efforts of others, taking advantage of a lack of knowledge, political appetite, or societal mandate to ensure programs are well and consistently regulated.

ENGAGING THE FULL POTENTIAL OF ABATEMENT

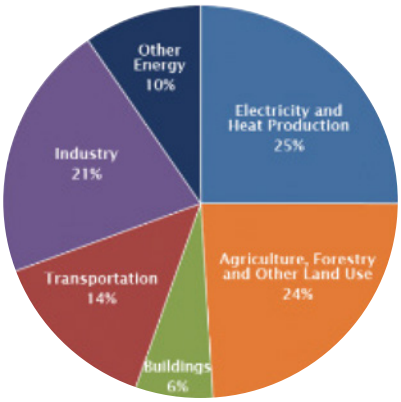
In such an environment, and acknowledging the near gigaton gap ambition, it is necessary to go back to the first principles, often overlooked, of a well-designed emissions trading programme. In a bottom-up climate world, bringing

in and keeping countries in "coalitions of the willing" is more important than ever. Demonstrating that the required reductions can be achieved through a robust price signal that reflects the real cost of abatement, at lowest cost, will be key to cementing these coalitions.

The nature of the task ahead necessitates partnership not only by governments, but also by industries, sectors and emitters. Carbon pricing programmes need to recognize and harness a collective effort in order to promote both the widest possible coverage and deep and liquid markets.

THE AGRICULTURE, FORESTRY AND OTHER LAND USE (AFOLU) SECTOR:
AFOLU is estimated by the IPCC to contribute around 24% of global greenhouse gas emissions. However, this estimate is a net figure and may underestimate the sector's total contribution. For example, it does not include the CO2 that ecosystems remove from the atmosphere by sequestering carbon in biomass, dead organic matter, and soils. The UN Food and Agriculture Organisation estimates this sequestration may offset approximately 20% of the sector's gross emissions.

GLOBAL GREENHOUSE GAS EMISSIONS BY ECONOMIC SECTOR



Source: IPCC (2014); Based on Global emissions from 2010.

Assessment of gross emissions is of more relevance when considering mitigation potential from this sector because it offers information on the full range of sources and sinks that policies may act upon. This potential is formally recognized in the Paris Agreement which states that all Parties should take action to conserve and enhance GHG sinks and reservoirs.

The IPCC estimates that as much as 24-30% of total mitigation potential could be provided by halting and reversing tropical deforestation.[2]

While many countries have referenced forests and land-use change in their Intended Nationally Determined Contributions (INDCs), the majority of INDCs fail to acknowledge the role that companies and financial institutions could play in helping to scale up mitigation contributions in this sector.

Harnessing an Emissions Mitigation Mechanism (EMM) that takes account of Article 5 of the Paris agreement to make performance-based payments that reward conservation and sequestration of forest carbon could potentially help governments make the difficult policy changes necessary to reverse deforestation and unlock a significant wedge of mitigation potential to meet the Paris objectives.

SHORT LIVED CLIMATE POLLUTANTS:
A wider view of the gases contributing to climate change could also be beneficial. Some short-lived climate pollutants not covered under the Kyoto Protocol (such as black carbon and hydrofluorocarbons, or HFCs) offer potentially the largest and fastest mitigation lever and are available today using current technologies.

Despite the success of the Montreal Protocol, it is estimated that increasing the recycling of HFCs from current levels of around 10% to 30% by 2040 could abate a further 10-18 gigatonnes of CO2e[3].

CONCLUSION

Understanding the reality of the substantial gap between global emissions growth and the trajectory required to prevent global temperature rises to less than 2°C is essential if governments, companies and society are to mobilize together to achieve the Paris objective.

The effort, speed and cost of bridging the gap to IEA450 scenario targets may be significantly reduced if carbon pricing regulation and offsetting mechanisms were implemented to provide for wider-scale sectoral and gas coverage, enabling a strong price signal to form, reflecting the lowest marginal abatement cost possible. Achieving this will be key to growing bottom-up carbon pricing coalitions and facilitating achievement of the enhanced ambition needed to limit global temperature rise.

Unlocking the mitigation potential of short-lived climate pollutants and the agriculture, forestry and land use sector is not without challenge. Sensitivity around agriculture, land use rights and "hot air" are all factors that explain why these mitigation opportunities, while achievable at relatively low cost, have not yet been exploited. However, the clear ambition gap necessitates that we revisit these sectors and incentivize their contributions.

A well-designed Emissions Mitigation Mechanism, providing widest possible coverage to engage these sectors and allowing a price signal to form, could help catalyze private sector investment to scale investment and achieve the required mitigation needed to bridge the gap.

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(1) "Sharing a quota on cumulative carbon emissions"; Nature Climate Change, Sep 21, 2014; http://www.nature.com/nclimate/journal/v4/n10/full/nclimate2384.html
(2) Halting tropical rainforest deforestation by 2050 ~ 5-10 Gt of CO2e by 2050 (Carbon Mitigation Initiative, 2015). (3) (Velders et al, 2014; EOS; 2014).

GED FARMER

THE DIFFERENT APPROACHES TO CARBON MARKETS

Since the start of carbon markets in 2002 with the UK Emissions Trading Scheme (ETS) – the first multi-industry carbon trading system – the carbon world has become a very diverse and complex place.

There are now 38 carbon pricing instruments operating or in their early implementation stages across the globe, with the share of emissions covered by those instruments having increased threefold over the last decade[1].

Driven largely by the Kyoto Protocol, and now with the Paris Agreement committing countries to hold the increase in global temperature to well below 2°C above pre-industrial levels, significant reductions in GHG emissions are needed, and these will require significant investment.

Governments and business increasingly agree that carbon pricing helps to mobilize the finance needed to support industry to achieve these goals.

Hence the complex carbon world will become more so. The EU ETS currently remains the largest international market, closely followed by the seven pilot schemes within China and the US with the Regional Greenhouse Gas Initiative (RGGI) and California's cap-and-trade programme.

Six jurisdictions implemented new carbon pricing instruments in the 2014–15 period[2]. In addition, Taiwan and Ontario announced that they would be adopting an ETS in the future, and Oregon, Ontario, and Washington State announced they are considering the implementation of an ETS.

With so many jurisdictions designing and developing carbon markets, and each government making decisions based on what is best for its circumstances and needs, it is important to consider the different approaches being taken and the effectiveness of some of the key design choices.

To effectively compare and contrast carbon markets we have chosen six key design elements to discuss, namely: the cap, allocation, cost containment, offsets, monitoring, reporting and verification (MRV) and oversight.

A primary issue for any carbon cap-and-trade program is the level of the cap. Jurisdictions have taken a variety of approaches to setting these targets. Some continue to base cap levels on the original Kyoto Protocol targets and therefore have a 1990 base year, but since the end of the Kyoto Protocol and the new Paris Agreement many jurisdictions have developed differing targets and base years submitted as their Intended Nationally Determined Contributions (INDCs). The base year chosen has little impact on the functioning of the carbon market itself, but the lack of commonality makes comparison of goals difficult.

An important consideration with the cap, which does impact on the market functioning, is ensuring it is set at an accurate level. The availability of accurate baseline data is essential to establishing an accurate and reasonable cap.

Overestimation of baseline emissions will lead to over-allocation of allowances which results in low allowance prices and thus a lack of incentive to reduce emissions. This was a key lesson for the EU ETS in its first phase, where poor quality baseline emissions data led to an over allocation of allowances, and prices fell to less than €1 in 2007.

SIGNIFICANT REDUCTIONS IN GHG EMISSIONS ARE NEEDED, AND THESE WILL REQUIRE SIGNIFICANT INVESTMENT.

Whereas underestimation of future emissions, as was the case in the South Korean ETS's first year, leads to significant rises in unit prices and places excessive financial burden on participants in the form of compliance costs and non-compliance penalty costs.

The question of allocation relates to whether to auction allowances, issue them for free or to define a proportional split of approaches. The majority of schemes issue a proportion of allowances for free and the remainder is auctioned, with the amount of free allocations reducing as the programmes' mature.

There are two important considerations with regard to free allocation. The first is whether to use grandfathering, where entities receive emission allowances according to their historical emissions, or benchmarking, where allowances are allocated based on defined performance indicators. The second is to restrict this to those sectors that cannot pass on the costs to the consumer, those that are exposed to foreign

competition and those that have less ability to reduce their emissions intensity.

Under the EU ETS in phase 1 most allowances were issued by grandfathering, which rewarded historically high emitters and resulted in some entities achieving windfall profits. More recently designed schemes have learned from these difficulties and utilise benchmarking approaches. California for example utilises a sector specific emissions intensity benchmark which rewards efficient facilities.

Due to uncertainty over the cost of abatement, mechanisms are generally included within the scheme design to ensure that the price of allowances does not exceed was is supportable, these are commonly referred to as 'cost containment' measures. Such mechanisms include price ceilings, price floors and banking and/or borrowing between compliance phases.

Price ceilings are used to prevent severe escalation of allowance prices by setting a maximum allowance price at which allowances can be bought directly from the government. For example in the California scheme, there is an Allowance Price Containment Reserve (APCR) from which allowances were released at prices of $40, $45, and $50/tonne in 2013, rising at 5% plus inflation thereafter. Allowances are sold from the APCR on a quarterly basis if there is demand.

Price floors set a minimum price at which allowances will not be entered into the market, to prevent prices slumping to a level which would negate action for emissions reduction. For example under RGGI there is an auction reserve price. Allowances not sold at auction are retained by the authorities and can be re-auctioned in future years or retired.

Banking enables allowances to be carried over from past compliance phases, thereby enabling flexibility in meeting emissions reduction targets over a greater period of time. Banking can be extremely important to manage price fluctuations, particularly where a scheme may be suffering from over-allocation.

The problems that the EU ETS suffered at the end of its first phase due to the over-allocation were worsened by the inability of operators to bank any allowances for use in future phases; hence the phase 1 allowances had no future value. As a result of this the rules of the EU ETS were revised for later phases and now allow banking for future compliance.

The use of offsets is another consideration. Whether they be international or domestic offsets, these offer the opportunity for purchasing emission reductions at a lower cost than to reduce emissions at a facility level.

All carbon markets currently allow the use of offsets. International credits from the Clean Development Mechanism (CDM) and Joint Implementation (JI) have played a very significant role in international emission reduction, particularly through EU ETS obligated installations.

However, domestic offsets are increasingly being specified as the scheme design choice, for example in the US and in China with Chinese Certified Emissions Reductions (CCERs). Domestic offsets have the advantage of ensuring that the investments required are being made to the benefit of the domestic economy.

Monitoring, Reporting and Verification (MRV) plays an important role in all carbon markets. To ensure that operators are monitoring and reporting their emissions in a consistent and comparable manner, rules for how that monitoring and reporting shall be undertaken are clearly defined.

This monitoring and reporting is supported by verification, either by government inspection or an independent, accredited verification body. Such external verification provides transparency and trust for the users of the information reported that it is accurate.

Finally, oversight of any carbon market is essential to ensure transparency and to prevent fraud or manipulation of the market. Measures are put in place to ensure that ownership of allowances, verification of offsets and cancellation of credits is securely managed, tracked and transparent for all market participants.

The EU ETS has been subject to a number of security problems where national registries have been hacked and allowances stolen. The introduction of the common EU registry has greatly improved security, however this has been constantly revised and upgraded in line with evolving security standards.

It is clear that our future international carbon market will be a patchwork of different domestic approaches; this is necessary to ensure that actions are appropriate to domestic situations and needs. However it is important that these schemes continue to learn from the lessons experienced to-date and continue to evolve.

The considerations of the cap, allocation methodologies, cost containment, use of offsets, MRV and market oversight are essential to ensure continually effective functioning carbon markets. Whilst a truly global carbon market now seems beyond reach, the correct consideration of these design elements may assist in future linkages between schemes to facilitate cross border trade and still achieve the benefits of a global market, namely: significant and sufficient scale to attract investment; improved stability of the carbon price; and cost efficiency.

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(1) State and Trends of Carbon Pricing 2015 - World Bank Group (2) Hubei, Chongqing, France, Mexico, South Korea, Portugal.


REACHING
OUT
TO NEW
PARTNERS
Bienvenue au
Parlement européen


REACH

JONATHAN Z. CANNON

SECTION 115, A NEXT STEP FORWARD IN U.S. CLIMATE POLICY

As the end of President Obama's term approaches, a key question is what climate policies the United States will pursue in 2017 and beyond. Hiding in plain sight is the international air pollution provision of the Clean Air Act (section 115), which could be the basis for an economy-wide, market-based approach to implementing the commitment the United States made in Paris last December. Use of section 115 deserves serious consideration by the next U.S. administration.

President Obama has made addressing climate change a priority and the results show it. Domestically, the Environmental Protection Agency has finalized two rounds of greenhouse gas tailpipe standards for light- and heavy-duty vehicles, promulgated the ground-breaking Clean Power Plan to reduce carbon dioxide emissions from the power sector, and issued the first standards limiting methane from oil and gas activities. Renewable energy sources have increased dramatically. Dozens of energy efficiency standards have been released. And rapid progress is being made in batteries and other forms of energy storage which are essential to increased reliance on renewable sources such as wind and solar.

Internationally, U.S. leadership was essential to reaching the landmark Paris Agreement in December 2015. The International Civil Aviation Organization passed a resolution in October 2016 to establish a Global Market-based Measure that will help the aviation sector meet its commitment to carbon-neutral growth starting in 2021. At the time of writing, a new international agreement sought by President Obama phasing down hydrofluorocarbons (HFCs) under the Montreal Protocol appears close at hand.

These actions have helped decouple economic growth and greenhouse gas emissions. In 2014, for example, total U.S. greenhouse gas emissions were 7% below 2005 levels, according to the most recent Inventory of U.S. Greenhouse Gas Emissions and Sinks prepared by EPA[1], while GDP has continued to increase.

But the next President will have to do more to meet the U.S. pledge under the Paris Agreement for 2025: a 26% to 28% reduction in emissions from 2005 levels. The State Department's 2016 Second Biennial Report[2] to the United Nations found that under policies in place by the fall of 2015, including the Clean Power Plan (which is currently stayed by the U.S. Supreme Court pending review by the D.C. Circuit), U.S. emissions would drop by only 12% to 16% below 2005 levels by 2025.

A January 2016 report[3] by the Rhodium Group examined the additional reductions that can be attained through the recent extension of renewable energy tax credits and planned administration initiatives, including the methane rules, the heavy-duty vehicle rule, and the U.S. proposal to phase down HFCs under the Montreal Protocol. These additional measures increase the projected emission reductions in 2025 to 19% below 2005 levels in the core scenario. A July 2016[4] report by the Center for Climate and Energy Solutions estimates that U.S. emissions could drop to 22% below 2005 levels by 2025 with additional measures.

While the numbers in each report differ, they all deliver the same message: the United States will face a sizeable emissions gap that the next President will need to close.

INTERNATIONALLY, U.S. LEADERSHIP WAS ESSENTIAL TO REACHING THE LANDMARK PARIS AGREEMENT IN DECEMBER 2015.

There are three main options for achieving additional U.S. emission reductions. Congress could surprise nearly everyone by enacting a comprehensive climate policy, perhaps centered on a carbon tax. EPA could issue a succession of industry-specific rules under section 111 of the Clean Air Act similar to the Clean Power Plan to secure reductions outside of the power sector. Alternately, the next administration could deploy its international air pollution authority under section 115.

Relying on section 115 is likely to be more politically realistic than seeking action by Congress and more economically efficient than issuing industry-specific rules. It could also set a durable policy framework that could be used to implement future U.S. commitments under the Paris Agreement and potentially even support future international carbon market integration.

There are two legal prerequisites to using section 115: EPA must find (1) that U.S. emissions are endangering other nations and (2) that if the United States acts to

reduce its emissions, other nations will act reciprocally. The endangerment finding should be straightforward, similar to findings that EPA has made and courts have upheld in other statutory contexts. A January 2016 analysis[5] by some of the nation's top environmental law professors, which I reviewed, found sound support for a reciprocity finding, especially after the Paris Agreement. When section 115 was enacted, the Senate report described its purpose as creating "a procedure whereby we can cooperate with foreign countries in cases involving endangerment of health or welfare." That is exactly what the United States would be doing if it used section 115 to meet its Paris targets.

With these prerequisites met, EPA could use section 115 to set a national emission reduction target and apportion the reduction requirements among the states. The states must then revise their clean air plans – called State Implementation Plans (SIPs) – to meet the EPA targets, taking into account all sources of emissions. The Clean Air Act expressly authorizes the states' plans to use market-based approaches like emission trading systems or carbon taxes. EPA can use a model plan to promote a nationwide emissions trading system, as the agency successfully did in making emissions trading the foundation of interstate efforts to curb ozone pollution. And if a state fails to act, EPA can adopt a Federal Implementation Plan (FIP) for the state using similar market-based authorities.

Section 115 would complement and backstop existing EPA regulations.

THE CLEAN AIR ACT EXPRESSLY AUTHORIZES THE STATES' PLANS TO USE MARKET-BASED APPROACHES LIKE EMISSION TRADING SYSTEMS OR CARBON TAXES.

States could get credit for the emission reductions they achieve under the Clean Power Plan and other EPA rules. If states implement the Clean Power Plan through a mass-based trading program, they will have a structure in place that they can extend to other large sources in complying with a section 115 rule. Should the courts invalidate the Clean Power Plan, section 115 would provide alternative legal authority for reducing power sector emissions. While legal challenges to the use of section 115 would be likely, section 115's flexible, open design and express focus on pollutants of international concern may make its use as a vehicle for climate change policy more resilient in the face of interpretational challenges and legal risks.

Section 115 also avoids the need to promulgate sector-specific rules under section 111 for oil refineries, steel mills, manufacturing facilities, chemical plants, pulp and paper mills, and other large emitters. These rules would be administratively burdensome for EPA and the states, and they would be more costly for the regulated sources because there is no precedent under section 111 for cross-sectoral trading. In comparison, a section 115 rule would require a single round of SIP revisions and could explicitly authorize the use of cost-saving market-based mechanisms.

There are other desirable features of section 115. Unlike other provisions of the Clean Air Act, section 115 could provide for the use of cost-saving offsets from agriculture and forestry if they meet EPA standards. Although it is premature to consider linking a U.S. emissions trading market with markets in other nations, section 115 could provide a pathway for doing so as the markets mature and demonstrate integrity. And perhaps most attractive, the market-based mechanisms used to achieve the 2025 Paris Agreement pledge could be readily adapted to meet the United States' 2030 and subsequent pledges.

At 300 words, section 115 is model of legislative brevity. This concision necessarily leaves key implementation issues to be developed by EPA through the regulatory process. Industries that favor economy-wide, market-based approaches to reducing emissions should look at this as an opportunity – likely their most promising one – for working with the next administration to establish a sensible and economically efficient climate policy for the United States.

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(1) Inventory of Greenhouse Gas Emissions and Sinks 1990-2004: EPA, https://www3.epa.gov/climatechange/Downloads/ghgemissions/US-GHG-Inventory-2016-Main-Text.pdf (2) Second Biennial Report of the US Under the United Nations Framework Convention on Climate Change, 2016, https://unfccc.int/files/national_reports/biennial_reports_and_iar/submitted_biennial_reports/application/pdf/2016_second_biennial_report_of_the_united_states_.pdf (3) Taking Stock: Progress Toward Meeting US Climate Goals: Rhodium Group, http://rhg.com/wp-content/uploads/2016/01/RHG_Taking_Stock_of_US_Climate_Goals_Jan28_2016.pdf (4) Achieving the United States' Intended Nationally Determined Contribution; C2ES, July 2016, http://www.c2es.org/docUploads/achieving-us-indc.pdf (5) Burger, M: Legal Pathways to Reducing Greenhouse Gas Emissions Under Section 115 of the Clean Air Act. Columbia Law School, January 2016, https://web.law.columbia.edu/sites/default/files/microsites/climate-change/legal_pathways_to_reducing_ghg_emissions_under_section_115_of_the_caa.pdf

RENATO ROLDAO

CHINA'S NATIONAL ETS: IT'S NOT HOW IT STARTS, BUT HOW IT ENDS

China has announced it intends to start a national emissions trading system, known as the China ETS (CETS), in 2017.

The entire country will embark on a fast-paced learning curve in the first phase, that is expected to produce a refined, improved and innovative ETS design towards the end of the decade (2019-2020), when preparations are finalised for the second phase.

CETS will also be a test of emissions trading on an unprecedented scale. China will bring together the relevant lessons and experiences learnt in the seven pilot markets that have operated since 2013, and will build on the series of "dos and don'ts" that have been learned.

This article will shed some light on some of the national ETS' design features and how they might evolve, noting that some of the final design elements are still being elaborated.

ROADMAP[1] FOR NATIONAL ETS

As the title of this article suggests, for CETS to be successful and achieve its purpose, it will rely on a clear vision, strong leadership and, critically, coordination by the climate change department of China's National Development and Reform Commission (NDRC). This body will work closely with 20 other ministries and government departments, representatives of over 18 industry sectors as well as other stakeholders.

In order to develop its top-down approach in good time, China began drafting its roadmap for a nationwide ETS at the same time as the seven pilot markets were being launched. Through this process the 31 provincial level authorities are already preparing their implementation plans that will guarantee the roll-out of CETS across the country in a consistent manner. The roadmap highlights different roles and responsibilities for the central government, local government and industries, among other key stakeholders, and it is in line with what is expected to emerge in legislation for the CETS, to be released soon by the State Council.

CETS WILL ALSO BE A TEST OF EMISSIONS TRADING ON AN UNPRECEDENTED SCALE.

The legislative framework for CETS should build upon the "Interim Management Rules on Emissions Trading"[2] published in December 2014 by (NDRC) and also the Notice #57 on "the Key Tasks for the Launch of the National Carbon Trading Market"[3] from January 11, 2016.

HARMONIZED COMPLIANCE RULES ACROSS THE COUNTRY

The CETS compliance process will be a two-level management system with the central government and provincial governments having different roles and responsibilities. Central government will be in charge of rule setting, coverage and scope, allocation approaches, monitoring and reporting guidelines and standards, verification standards, offsetting, transaction and market oversight rules.

Provincial-level government will be in charge of: implementation rules, identification and direct communication with covered entities, and assessment of compliance and approval of monitoring plans; this will be compulsory from the start of the national ETS. A set of comprehensive compliance rules should include financial penalties, restriction of access to credit and/or ineligibility for any preferential policies and incentives for those installations that default.

ALLOCATION AND CAP-SETTING

Of the several possible allocation approaches, CETS will start mainly with grandfathering, before moving gradually to benchmarking and an increased percentage of auctioning. This will evolve taking into account China's present and future economic situation. It is a balancing act where unified allocation rules are applied but also take into account the need to address regional disparities and to reduce excessive industrial capacity, while avoiding over-allocation.

Despite the unified rules, there will be some flexibility given to provinces that can extend coverage and scope or apply stricter allocation approaches that will allow them to achieve faster higher emission reduction targets.

To mitigate the risk of oversupply that has hampered the European Union's ETS for many years China will base its first allocation on "historic intensity", which combines actual production data with historical emissions intensity plus an annual reduction factor. In practice the allocation will be done in two steps: pre-allocation according to estimated production data, and an ex-post adjustment.

SECTORS	SUB-SECTORS
PETROCHEMICAL	Crude processing, Ethylene production
CHEMICAL	Chemical raw material / Fertilizer / Pesticide production / Synthetic material
BUILDING MATERIAL	Cement clinker production, Plate glass production
IRON AND STEEL	Crude steel production / Steel rolling
NONFERROUS METAL	Electrolytic Aluminum, Copper smelting
PAPER MAKING	Pulp production, Paper making
POWER	Generation, Cogeneration, Grid
AVIATION	Passenger air transport, Air cargo transport, Airports

Source: NDRC

This can also be combined with some additional flexibility mechanisms, similar to the EU ETS' Market Stability Reserve (MSR), that might be embedded in the CETS design.

The nationwide ETS cap will be determined mainly by the same approach as for allocation, by collecting and aggregating emissions data. First, local Development and Reform Commissions (DRCs) collect data, that are then reported to NDRC. NDRC will then set the national cap, which will then be broken down into provincial level caps and lead to the final allocation to installations.

SECTORAL COVERAGE REVISITED

Over the past several months the NDRC has been refining and reviewing its approach for CETS sectoral coverage. From an initial announcement listing six sectors, the plan has evolved to cover eight sectors and 20 sub-sectors, including companies emitting more than 25,000 metric tons of CO2 equivalent in any year between 2013 and 2015.

Other sectors will be considered by default as non-ETS sectors though it might be possible that they will eventually be subject to a price on carbon through other measures such as a carbon tax.

As has been the experienced in other carbon markets, the sectoral coverage of an ETS is subject to change, with sectors being added or taken away over time. It is naturally important that the future inclusion or exclusion of any given sector is communicated in a way that makes the new regulatory framework predictable.

MONITORING, REPORTING, VERIFICATION AND ACCREDITATION

The monitoring, reporting verification and accreditation (MRVA) system is quickly evolving from the piecemeal approach of the 7 pilot markets into a harmonized system that builds upon 24 sectoral guidelines for monitoring and reporting and national verification guidelines.

The system will be based on international standards and best practises and will have accreditation rules for independent verifiers. Until now, provincial DRCs selected qualified verifiers and organized reporting and verifications according to their own rules, but as a next step NDRC will announce a list of nationally accredited verifiers that can operate in the market from 2017. At the start, the costs of contracting independent verifiers are expected to be covered by the local DRCs.

USE OF OFFSETS

The national China Certified Emissions Reductions (CCER) system builds on the experience accumulated in China with the UNFCCC's Clean Development Mechanism (CDM). The CCER system has been operating for more than three years, supporting the offset markets of the pilot systems. It is the only type of offset that will be eligible at the start of CETS. Wind power, solar PV, hydropower and household biogas are the most popular project types. The regulatory system for the Chinese offset market is being upgraded in order to avoid an excess of offsets harming the national market.

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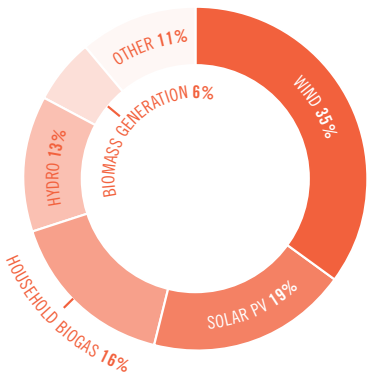
ISSUED CCER BY PROJECT NUMBERS



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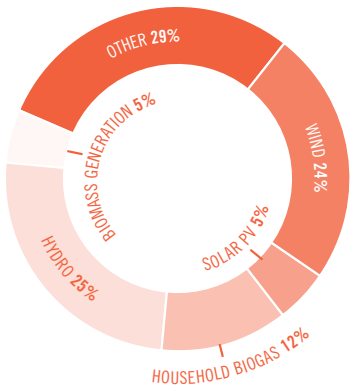


Source: NDRC.

(1) Maosheng, Duan, From Carbon Emissions Trading Pilots to National System: The Road Map for China, Carbon & Climate Law Review, Volume 9 (2015), Issue 3, Pages 231 – 242, viewed 6th October, 2016, http://cclr.lexxion.eu/article/CCLR/2015/3/7 (2) Chinese version available here http://qhs.ndrc.gov.cn/gzdt/201412/t20141212_652035.html (3) Chinese version available here http://www.gov.cn/xinwen/2016-01/22/content_5035432.htm

JAN AHRENS & PHILIPP RUF

WHAT THE GLOBAL CAP-AND-TRADE COMMUNITY CAN LEARN FROM THE EU ETS

The EU Emissions Trading Scheme (EU ETS) is the world's largest cap-and-trade system, and despite some design issues, it has successfully met its primary environmental objectives. Additionally, its participants have gathered a wealth of experience over the last years that can be applied to the EU ETS and other, evolving carbon trading systems.

We have learned that not everything that works in theory proves to be practical, but we have also learned that emission reductions can come even at low prices. And, the EU ETS has offered lessons about both the benefits and shortcomings of emissions trading.

From a theoretical standpoint, it is remarkable that politicians and commentators recently claimed that the EU ETS is a failure because allowance prices are so low. This contradicts the very purpose of a cap-and-trade scheme: to reduce emissions below a fixed target at lowest costs. From this perspective, the EU ETS is a great success: the emission reduction targets set by the regulator are being met, and the cost burden for compliance companies is low – even considered as too low.

When simply considering this core target of an emissions trading scheme we can stop our reflections here, pat ourselves on the back and tell the world: just do as the Europeans!

Unfortunately it's not that easy. To sing the EU ETS' praises would be true if the target had been set in line with the long-term ambition of the EU to reduce emissions by 80-95% below 1990 levels by 2050. However, that is not the case. The EU decided to aim for 20% reduction in the first 30 years (1990-2020), and 60-75% in the next 30 years (2021-2050) – on the basis that the economy could not afford to reduce more in the short-term.

In retrospect, as the EU went through an economic downturn, companies could have afforded a more ambitious target – but the cap was fixed. This resulted in only very limited emissions abatement triggered by the EU ETS over the last years. Thus, the EU will need to reduce emissions much more in the years to come. Although the EU ETS worked as it was envisaged—and met the emissions cap—a change in its design to have more flexibility in supply could have triggered more carbon abatement.

THE CHALLENGE OF THE EU ETS

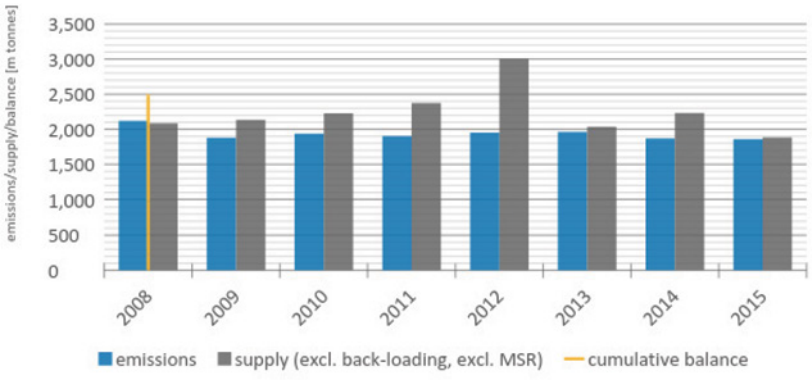
The idea of an emissions trading scheme is to set a cap, which determines the supply of that market, in order to achieve emission reductions according to a predefined target. In the EU ETS the legislators decided to fix this cap or the supply for five years for the second trading period (2008-2012), eight years for the third (2013-2020) and ten years for the fourth (2021-2030).

THE EU ETS HAS OFFERED LESSONS ABOUT BOTH THE BENEFITS AND SHORTCOMINGS OF EMISSIONS TRADING.

This makes the EU ETS a rather special commodity market as supply is not able to react to market developments, such as energy market shocks or other external factors. In the wake of the economic turmoil Europe has faced since 2008, an inflexible system was doomed to face challenges – if not solid problems.

In the case of the EU ETS the challenge came in the form of over-supply. As the economic and sovereign debt crisis hit European economies, emissions dropped as less cement was produced, less ore smelted, less oil refined and less power

FIGURE 1:
FUNDAMENTAL BALANCE AND CUMULATIVE OVER-SUPPLY OF THE EU ETS (EXCL. BACK-LOADING, EXCL. MSR)



Source: ICIS Tschach Solutions

produced throughout Europe. This amounted to a drastic reduction in demand for emission allowances, which was magnified by the faster-than-anticipated rollout of renewable power generation in some member states, which displaced carbon-emitting energy sources such as gas and coal and dragged emissions further down. On the other hand, supply of allowances remained unchanged as auctioned volumes were set in advance and companies received their predetermined free allocations in spite of lower production. – Figure 1 summarises the numbers.

This resulted in an over-supply higher than one year's emission covered in the scheme in 2013 and price trading down to below €3.00/tCO2e in 2013.

HOW TO MAKE A SYSTEM FLEXIBLE IN THREE STEPS

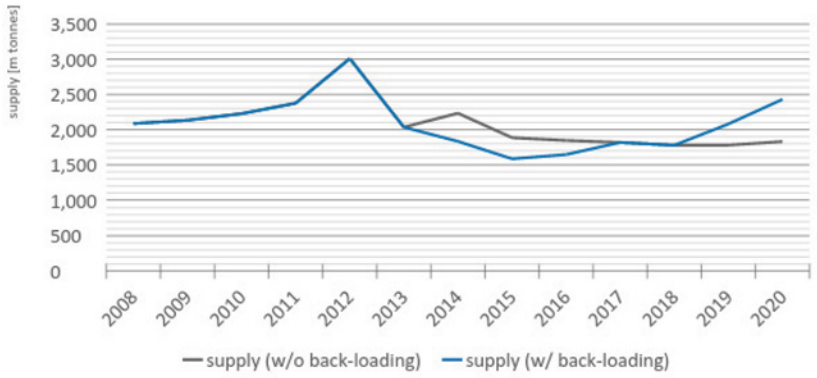
Already in the second trading period the falling EU Allowance (EUA) price and analyst forecasts made it clear that the EU ETS cap could have been more ambitious. However, cap changes are very difficult to implement in the European Union – as 28 member states who normally have at least 10 opinions on any change, would have to agree – making the simplest and most direct method to tackle the oversupply of allowances politically impractical. Consequently, the European Commission and the legislators started to think outside the box to reform the system's mechanism without touching the predetermined cap.

STEP 1 – BACK-LOADING

The first reform was called back-loading. In 2014, after over two years of intensive and sometimes very heated discussions, back-loading was enacted by the EU. The idea was to make supply more flexible by not auctioning any allowances between 2014 and 2016, and reinstating them towards the end of the third trading period (2019-2020).

Eventually, the European Parliament agreed to delay the auctioning of 900 million allowances: 400 million in 2014, 300 million in 2015 and 200 million in 2016. These volumes were set to be reintroduced to the market in 2019 (300 million) and 2020 (600 million), and the impact is visualised in Figure 2.

FIGURE 2:
SUPPLY OF THE EU ETS (EXCL. MSR) WITH AND WITHOUT BACK-LOADING



Source: ICIS Tschach Solutions

The idea of back-loading was deemed to be a quick fix, as supply was reduced in the short-term, but the market would be flooded with allowances in 2019-2020. Politicians hoped that the reduced supply would lift up prices and thus trigger emission reductions early – but the looming additional supply towards the end of the decade was a challenge. So, already during the back-loading discussions it was clear that another, more substantial reform was needed to make the EU ETS more flexible and prepare it for the future.

STEP 2 – THE MARKET STABILITY RESERVE

When the European Commission proposed this substantial reform, another acronym was born into the carbon world: MSR – Market Stability Reserve.

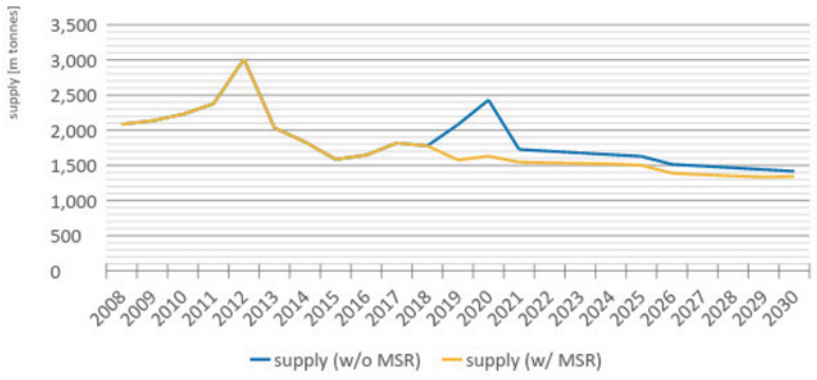
The MSR is a tool that adjusts the supply in the EU ETS based on the cumulative oversupply in the system. The MSR works in a non-discretionary way, meaning it is based on a set of predefined thresholds and rules without any interference from policy makers or officials. The MSR aims to keep the surplus of allowances within a certain range to allow for hedging and stock building, but at the same time keeping supply tight enough to incentivise emission reductions.

After being proposed and introduced to the legislative process by the European Commission in early 2014, it took the co-legislators roughly 1½ years to conclude the negotiations and adopt the MSR in legislation. The start date and the destiny of the back-loaded auction volumes, left-over allocation volumes and left-over NER (New Entrants Reserve) were the most controversially discussed features. Finally, it was concluded that the MSR should start in 2019 and all volumes (backloading, left-over allocation, leftover NER) should enter the reserve.

The legislators fixed two problems with the implementation of the MSR: the flooding of the market in 2019-2020 and the fixed supply of the EU ETS. As of 2019, the supply is subject to the available oversupply in the market – meaning if a

THE MSR AIMS TO KEEP THE SURPLUS OF ALLOWANCES WITHIN A CERTAIN RANGE TO ALLOW FOR HEDGING AND STOCK BUILDING,

FIGURE 3:
SUPPLY OF THE EU ETS (INCL. BACK-LOADING) WITH AND WITHOUT MSR



Source: ICIS Tschach Solutions

lot of length from the past is available, the MSR cuts the auctions of the next year and transfers allowances to the reserve – the impact can be seen in Figure 3.

This mechanism makes one part of the supply equation permanently flexible: the auction volumes. The MSR consequently enables the EU ETS to react to external changes like a tumbling economy or overlapping policies.

However, the other part of the supply equation – the free allocation – is still left almost completely inflexible. In the past, especially in the second trading period, this had resulted in significant over-allocation for energy intensive industry. Ironically, some of the EU largest emitters of CO2 earned significant profits through the EU ETS. This becomes apparent when looking in detail into the financial reports (2008-2012) of big emitters. By aggregating results from just eight large cement companies[1] and five big metals producers[2], we were able to track €2,800 million income derived from sales related to carbon allowances. While we can attribute €2,200 million to the cement companies, the five metals companies are associated with the significant smaller share.

STEP 3 – THE POST-2020 REFORM

In the third trading period, the free allowances given to industrials were generally fixed for the entire trading period before the period started. The only exception was that the free allocation for installations who produce less than 50% of their historic production baseline is cut by 50% and below this threshold, two more thresholds apply – see Figure 4.

This rule leaves an installation with 100% of their free allocation even when producing only 51% of their historic baseline emissions. The second challenge is that companies who produce above their historic production baseline have no chance to top-up their free allocation, so the system is tilted to the downside with very limited flexibility.

Therefore, the allocation rules are central to the current discussion in Brussels and the European capitals as politicians, officials and other stakeholders are scratching their heads about the future of the EU ETS. The overall question at hand is how to organise the EU ETS post-2020 to achieve the emission reduction target of -40% the EU pledged in Paris, with a fair contribution of each sector.

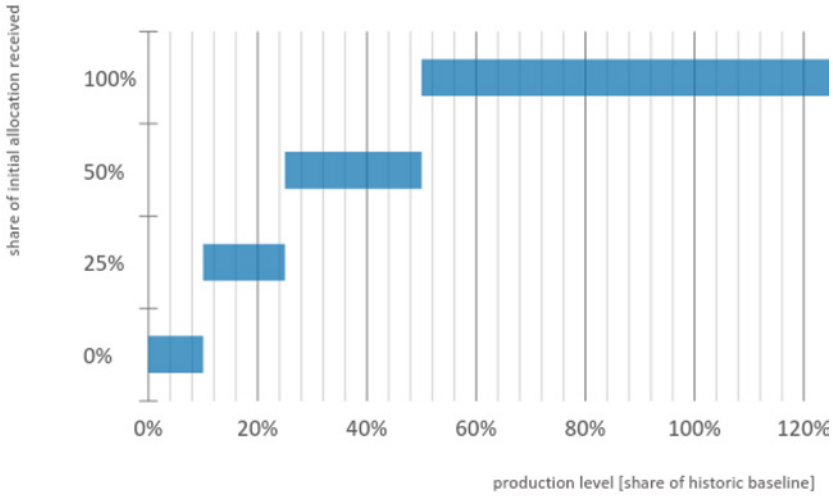
While there are many aspects to the current discussion, we decided to put flexibility in the centre of our reflections, so we will focus on flexibility in the post-2020 reform.

One key lesson learned over the second and the third trading periods – and probably in the centuries before – is that economic conditions can change and consequently free allocation volumes based on historic production levels can be greatly disconnected from the reality when they are actually issued.

The European Commission in its post-2020 legislative proposal set out two approaches to tackle this problem:

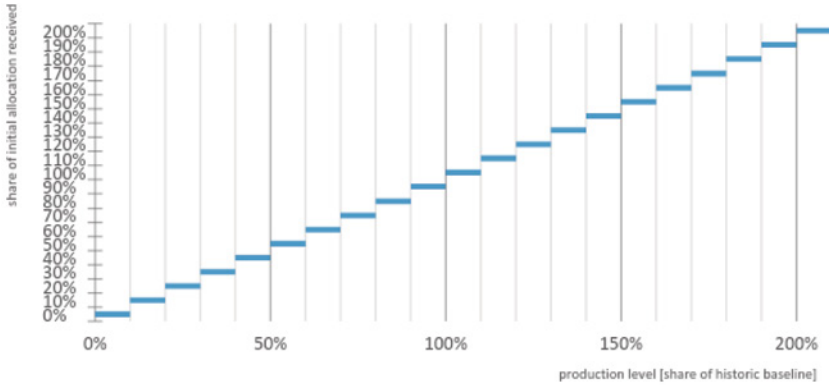
1. Reduce the allocation calculation intervals and move the actual allocation years closer to the production baseline years – the

FIGURE 4:
FREE ALLOCATION ADJUSTMENT (THIRD TRADING PERIOD RULES)



Source: ICIS Tschach Solutions

FIGURE 5:
FREE ALLOCATION ADJUSTMENT (BASED ON 10% INTERVALS)



Source: ICIS Tschach Solutions

Commission proposes to use 2013-2017 numbers for the period 2021-2025 and 2018-2022 number for the period 2026-2030

2. A yearly adjustment of allocation numbers in both directions based on production levels of the previous years

A cynic would argue that the first part still means that in the extreme case the production levels used to determine the free allocation are 12 years old and that the second part was already implemented in the third trading period, but in our view the proposed second approach would result in an actual flexibilisation of free allocation.

It is true that the European Commission has not proposed any new thresholds regarding at which reduction of production the allocation volumes would be adjusted, but that is something which was always regulated in secondary legislation. The novelty in the Commission proposal is that the adjustment of free allocation volumes would go to the up- and downside and that the intention is to reality-check the allocation on a yearly basis.

THE PROPOSED SECOND APPROACH WOULD RESULT IN AN ACTUAL FLEXIBILISATION OF FREE ALLOCATION.

Now that the legislation is in the court of the European Parliament, some Parliamentarians (MEPs), proposed intervals for the adjustment – namely 10% (proposed by some Liberals, Socialists, and Conservatives) and 15% (proposed by the Greens). As can be seen in Figure 5 this would change the free allocation system severely by allowing for more frequent adjustments. This would also cope with the ageing production baseline challenge, as most recent numbers would be incorporated on a yearly basis.

LESSONS LEARNED

The EU ETS has come a long way and it is approaching its teenage years quite quickly. While it has always achieved its environmental objectives, all stakeholders have also learned valuable lessons during the 11 years of its existence. Additionally, the system has been constantly improved by parliamentarians, officials, ministers and other stakeholders, balancing the necessary long-term certainty with policy flexibility.

In our view the system has indeed improved significantly over the years and other existing or upcoming global emission trading schemes can draw conclusions in order to avoid making the same mistakes.

We think the key lesson learned is that a commodity market with fixed supply coupled with flexible demand is basically a time bomb. Simply put, neither analysts, officials, parliamentarians nor lobbyists will ever be able to predict future demand accurately. An emissions trading system needs to be able to react to external factors in an ever-changing market environment, while maintaining long-term certainty of policies and price signals.

We've also learned that finding compromises in the European Union can be difficult, controversial, and sometime emotional – the best example being the discussion around back-loading. Legislators consequently need to disempower themselves sometimes in order to allow for a functioning market and quick decisions which don't allow for the ever present Brussels horse-trading.

Third, we've learned that such an ETS needs constant scrutiny and rules have to be adopted to align the system to reality.

The EU ETS has undergone significant changes over the years regarding its supply function. First, back-loading saved the system from a complete collapse and second, the MSR introduced a non-discretionary measure to render auction supply flexible. The third part - creating a more flexible free allocation system - has yet to be implemented.

Jan Ahrens *is co-founder, and* ***Philipp Ruf*** *is lead EU analyst at ICIS Tschach Solutions.*

(1) Buzzi Unicem, CEMEX, Cimpor, CRH, HeidelbergCement, Holcim, Italcementi, and Lafarge (2) ArcelorMittal, Outokumpu, Ruukki, SSAB, US Steel

SANDRA GREINER, ANDREW HOWARD, EL HADJI MBAYE DIAGNE, GIZA GASPAR MARTINS

WILL CARBON PRICING EMERGE IN AFRICA AS WELL?

Many African countries are considering how carbon pricing and carbon markets can benefit their continent and foster their participation in climate action.

This interest in moving forward exists despite Africa's mixed history with the Kyoto Protocol's Clean Development Mechanism (CDM), from which many countries in Africa missed the opportunity to benefit. The signals are now more positive, however, with Africa's share of CDM Programmes of Activities (PoAs) surging to a third of the global total, the political embrace of international carbon markets as an important means of accessing climate finance, and the emphasis on markets in Africa's national plans under the Paris Agreement.

African leaders are committed to international markets that display high environmental integrity, contribute to sustainable development and build on the achievements of the CDM[1]. African countries were keen supporters of markets in the Paris Agreement and have been a driving force behind many recent reforms to the CDM. While details are still evolving, many countries in Africa appear supportive of carbon pricing and interested in participating in international carbon markets.

AFRICA IS ENGAGING

The "intended" Nationally Determined Contributions (NDCs) under the Paris Agreement demonstrate that a majority of African governments desire to use international markets in some form to help finance their mitigation (see Table 1). Most African countries are positioning themselves, unsurprisingly, as sellers of carbon credits.

Fourteen intended NDCs from Africa referenced the CDM, and this signals a desire for continuity in the approaches underlying the CDM. However, there is also a clear wish to move beyond today's CDM. Many African countries are interested in moving to sectoral approaches through standardized baselines and streamlined monitoring. Some countries, for example Morocco and Tunisia, wish to go further by implementing their own sectoral crediting schemes for high emission-intensity industries.

TABLE 1:
CARBON PRICING REFERENCES IN AFRICAN INTENDED NDCS

TYPE OF CARBON PRICING	REFERRED TO IN THE INDCS OF
Emission trading	2 COUNTRIES: Côte d'Ivoire, Egypt
Carbon tax	2 COUNTRIES: Côte d'Ivoire, South Africa
International market mechanisms (general references)	34 COUNTRIES: Angola, Botswana, Burkina Faso, Burundi, Cabo Verde, Cameroon, Central African Republic, Chad, Côte d'Ivoire, Equatorial Guinea, Ethiopia, Ghana, Guinea, Guinea-Bissau, Kenya, Lesotho, Liberia, Morocco, Mozambique, Namibia, Niger, Nigeria, Rwanda, Sao Tome and Principe, Senegal, Sierra Leone, South Sudan, Sudan, The Gambia, Togo, Tunisia, Uganda, Zambia, Zimbabwe
Fossil fuel subsidy reform	7 COUNTRIES: Burkina Faso, Egypt, Ethiopia, Ghana, Morocco, Senegal, Sierra Leone,

Source: IETA INDC Tracker and individual submissions
Note: Of 54 countries in Africa, one has not submitted an intended INDC (Libya).

Uncertainties still remain of course. It is not clear how countries will use markets, in particular whether they will be used for existing commitments on climate action or only to enable further action – in UNFCCC-speak whether they will be used towards the non-conditional or conditional targets of African NDCs. It is also not clear if Africa will only be a supplier of offset credits or will also create its own demand or use other carbon pricing mechanisms. We can expect the formal NDCs, which will be submitted upon ratification of the Paris Agreement, to further define what action Africa will undertake and how this will be financed.

Several African countries are implementing domestic carbon pricing mechanisms. South Africa is the clear front runner with its proposed carbon tax. As an integral policy instrument for reaching South Africa's goal of reducing emissions by 34 percent below business-as-usual (BAU) by 2020 and by 42 percent below BAU by 2025, the tax will start at 120 Rand (approximately US $8.80) per tonne of CO2 equivalent in January 2017 and increase over time. The tax will promote crediting mechanisms by allowing covered entities to reduce their carbon tax liability by purchasing credits generated by South African projects that are verified under international standards.

The draft South African Carbon Offsets Regulation indicates carbon offsets verified under the CDM, the Verified Carbon Standard and the Gold Standard will be eligible for use in the program.

Egypt is also considering a national market for carbon trading, which it says could later grow to serve the Arab and African regions. Côte d'Ivoire is exploring carbon taxes and emission trading for energy and agriculture. Some countries also list measures to raise carbon prices through reducing fossil fuel subsidies, of which Egypt's plans are the most detailed.

African countries have signed up to a number of international initiatives. Morocco, Ethiopia and Côte d'Ivoire have joined the Carbon Pricing Leadership Coalition, an initiative of the World Bank to expand the use of carbon pricing globally, while Senegal and Ethiopia have joined the Carbon Market Platform initiated by the G7. Morocco, Tunisia and South Africa receive technical assistance through the World Bank's Partnership for Market Readiness. Senegal was part of the Ministerial Declaration on Carbon Markets initiated by New Zealand, under which 17 countries made a political commitment to carbon markets in the wake of the Paris Agreement. Finally, Ethiopia and Kenya have signed partnership agreements with Japan to develop projects under its Joint Crediting Scheme.

AFRICAN COUNTRIES HAVE SIGNED UP TO A NUMBER OF INTERNATIONAL INITIATIVES.

CARBON PRICING AT DIFFERENT SPEEDS

There is no one-size-fits-all approach to carbon markets in Africa. But it is fair to expect that most African countries in the near and medium terms will focus on supplying credits to the international market, driven by their emission profiles, industrialization levels and institutional capacities.

Technologies well-suited to a widely-distributed rural poor, such as improved cookstoves, biogas digesters and solar home systems, will remain appropriate for large areas of Africa for some time. These technologies can be effectively targeted by crediting systems, especially with greater standardization and aggregation through PoA-type structures. Such crediting is also amenable to climate finance, which can help leverage private investment and create a proportion of reductions that will not be later used as offsets.

As Africa's development continues to raise emissions from energy and industry, opportunities for other forms of carbon pricing will emerge. Opportunities for carbon pricing at a regional level may arise, especially in integrated sectors such as energy. Overall, African countries are expected to announce a wider range of carbon pricing policies in their NDCs for 2025 or 2030 onwards.

BRINGING THE PROGRESS WITHIN ARTICLE 6

Article 6 of the Paris Agreement envisages both UNFCCC-wide market mechanisms and bottom-up, country-driven market systems. It will be important that Article 6 caters to the range of African development realities.

Space is needed for countries with the least capacity to access global carbon markets through crediting mechanisms that are simple to work with and that operate under global standards. Africa has much to gain from the quick operationalization of the UNFCCC crediting mechanism under Article 6.4, especially if the new mechanism retains and extends some key elements of the CDM such as PoAs, standardized baselines and micro-scale additionality.

But Africa may also gain from creating its own approaches, especially as the Article 6.4 mechanism has not yet been developed. Many developed countries are looking to secure credit supplies as soon as possible and will look for international crediting partnerships under Article 6.2. If Africa can manage to harmonize standards under its Article 6.2 activities, this will help governments and market participants alike, and may contribute to their expansion regionally or across the African continent. Maybe such standards could one day be incorporated into the Article 6.4 mechanism itself. A proliferation of too many cooperative approaches would necessitate building capacity to manage several sets of standards and procedures.

The extent to which African countries will utilize carbon markets remains mostly speculation for now. Most African states are still in the early days of developing their intentions for markets on the continent and beyond. The place to watch will be the submission of formal NDCs by African countries as ratification instruments are prepared and their implementation plans are finalized.

Sandra Greiner *is lead consultant at Climate Focus;* ***Andrew Howard*** *is director of Koru Climate;* ***El hadji Mbaye M. Diagne*** *is a Senegalese representative at the UNFCCC;* ***Giza Gaspar-Martins*** *is an Angolan delegate to the UNFCCC.*

(1) Marrakesh Call for Climate Action, as adopted by African Ministers during the 2015 Africa Carbon Forum (http://newsroom.unfccc.int/unfccc-newsroom/african-ministers-marrakesh-conclusions).

MAJA MURISIC

PARIS AND BEYOND: ENSURING EFFECTIVE CLIMATE ACTION THROUGH COORDINATED EFFORTS

The Paris Agreement, reached in December 2015, provided a long-term vision for keeping the increase in global average temperatures to well below 2°C above pre-industrial levels, with the aim of limiting it to 1.5°C.

In addition, the Paris Agreement recognized voluntary cooperative approaches, including "internationally transferred mitigation outcomes" (ITMOs) and a UNFCCC-governed mechanism that will support mitigation and sustainable development post-2020, thereby reaffirming carbon markets as an instrument to achieve climate mitigation goals nationally and globally.

The Paris Agreement also reinforced the principle of bottom-up approaches, as exemplified in the establishment of an official process in which countries need to regularly propose, review and resubmit existing contributions – known as Nationally Determined Contributions (NDCs). And even though the collective NDCs' ambition is not yet sufficient to keep global warming below 2°C target, the Agreement itself outlined the pathways for achieving it.

The bottom-up nature of the Agreement leaves countries with a choice regarding the policy instruments and measures to be taken, as stipulated by their NDCs and overall development and strategic priorities. To this end, around 90 of them indicated that carbon pricing and carbon markets would have a role to play in achieving their mid- and long-term mitigation goals and, thereby, in meeting the objectives of the Paris Agreement.

STRENGTHENING DOMESTIC CLIMATE ACTIONS

In the year following COP21, many countries are accelerating their domestic climate action to ensure that GHG emission reductions targets or ambitions outlined in their NDCs are achieved. These on-the-ground efforts, many of which are supported by the World Bank's Partnership for Market Readiness (PMR), are considered to be critical to achieving the collective ambition of the Paris Agreement.

As an illustration the Partnership for Market Readiness (PMR), an initiative of the World Bank, supports China's National Development Reform Commission in developing its national ETS with an $8 million grant, and by carrying out analytical work and consultations on several essential components of the ETS design, including the role of state-owned enterprises and the power sector.

THE PMR IS ONE OF THE PRIME INITIATIVES TO SUPPORT COUNTRIES IN UNDERSTANDING AND TESTING THE USE OF CARBON PRICING TO ACHIEVE THEIR CLIMATE CHANGE MITIGATION OBJECTIVES, THEREFORE HELPING CREATE THE FOUNDATION FOR CARBON MARKETS.

China's national ETS will be one of the most important means to achieving its mitigation targets put forward in the country's NDC. Since many aspects of the national carbon market design – such as cap setting or interactions with government policies and development objectives – are closely linked with the country's mid- and long-term mitigation targets, the PMR also provides analytical support that contributed to the development of the country's NDC and facilitated the process of presenting and disclosing the key indicators, components and assumptions that are used for the mid- and long-term scenarios.

Similarly, the PMR is supporting South Africa's efforts to strengthen the readiness for the preparation and implementation of an economy-wide carbon tax by refining its design features, supporting the implementation of the related carbon offset scheme and building capacity to enhance data management and MRV systems. To reach its GHG reduction objectives, South Africa has proposed a package of policies and economic instruments (in addition to the carbon tax), including Desired Emission Reduction Outcomes (DEROs) and carbon budgets. To complement its support, the PMR is also helping South Africa review the principles used in approaching GHG reduction in the country, as well as examines the interactions between the proposed carbon budget and carbon tax.

SCALING-UP COORDINATED EFFORTS INTERNATIONALLY

In addition to these and other numerous examples of domestic climate action around the world, it is also encouraging to see that a number of bottom-up initiatives for fostering the international cooperation on carbon pricing and market-based instruments have already taken root. And even more so, day by day, new examples of cooperative approaches are emerging at the international level – ranging from the initiatives demonstrating political will and commitment to a number of technical and knowledge exchange platforms.

The PMR is one of the prime initiatives to support countries in understanding and testing the use of carbon pricing to achieve their climate change mitigation objectives, therefore helping create the foundation for carbon markets. The PMR has been delivering results on the ground since 2011; Post-Paris, the PMR is committed to scaling up its efforts to help countries design and implement innovative approaches to reduce GHG emissions. Another example of initiatives includes the G7 Carbon Market Platform, which provides a platform for a strategic dialogue on how to move from a variety of domestic approaches that are being implemented in a fragmented manner, to new cooperative and common approaches related to international carbon markets.

There are also a number of initiatives which complement ongoing technical discussions – such as the Carbon Pricing Leadership Coalition (CPLC) – which builds high-level political buy-in and support for carbon pricing. Likewise, at the Paris climate change negotiations, New Zealand led a Ministerial Declaration on Carbon Markets that sent a clear signal that carbon markets will have an important role to play in post-2020 regime.

And there is more to come. Recently announced and soon to be officially launched, the NDC Partnership which is a joint initiative of several agencies and governments, will also assist countries transform their NDC targets into specific strategies and measures by merging existing climate and development goals, and achieving greater harmonization among the various initiatives.

GOING FORWARD

While the Paris Agreement clearly signals the international commitment to reduce global emissions, there are a number of challenges that the countries will face when translating such international commitment into their low carbon and climate resilient development plans. Through various platforms and initiatives to help advance these goals, policymakers have an opportunity to leverage political momentum and share valuable knowledge on technical and policy challenges faced during the design and implementation of carbon pricing and market-based instruments. Against this backdrop, there will be steady demand for supporting countries to translate the internationally agreed commitments into their low carbon and climate resilient development plans. What will be important is to build on the existing experience, leverage synergies and reveal new opportunities for cooperation among existing and forthcoming partnerships and initiatives. The Paris Agreement provided a solid basis. Now it is upon us to act on it.

THE PARIS AGREEMENT PROVIDED A SOLID BASIS. NOW IT IS UPON US TO ACT ON IT.

Maja Murisic *works for the World Bank's Partnership for Market Readiness (PMR)*

EMILY J. SPEARS AND LOH HAO MING

NEW ZEALAND'S EMISSIONS TRADING SYSTEM: THE THIRD REVIEW

The New Zealand Emissions Trading Scheme (ETS) has been fully operational since July 2010. Since its inception, the NZ ETS has seen its share of highs and lows, but it is widely acknowledged that despite accounting for just 0.15% of global emissions, New Zealand continues to exhibit true leadership internationally with respect to the development of carbon markets.

After reaching lows of NZ$1.55 in 2013, New Zealand Unit (NZU) prices have well-and-truly rebounded, rising from around NZ$8.50 at the end of 2015 to nearly NZ$19 at the end of September 2016.

With an increased price comes a renewed interest from foresters (who can generate NZUs) and liable entities, however regulatory uncertainty and key fundamental traits still warrant caution. And, while some recent announcements have created more optimism in the market, some uncertainties still exist.

BACKGROUND

The third New Zealand Government review of the ETS is currently underway and is split into two stages. Broadly speaking, these two stages could be considered to be split into demand side reform (stage one) and supply side reform (stage two).

In initiating the scheduled review, Ministry for the Environment officials were quite candid about the ETS' impact to date, reporting that "research for this evaluation, and evidence from the interviews, found no sector other than forestry made emissions reductions over the first Kyoto Protocol Commitment Period One (2008-12) that were directly caused by NZ ETS obligations". This was further enforced by Climate Change Minister Paula Bennett's repeated comments "it is abundantly clear that if the ETS is going to work, carbon must cost more than it does right now" (February 2, 2016) and "it is clear that if this ETS is going to seriously change behaviour, the price of carbon needs to be higher than it is now" (April 26, 2016).

TABLE 1:
GOVERNMENT REVIEW OF THE ETS

STAGE 1: PRIORITY ISSUES	Stage one addressed two linked priority issues that were considered candidates for legislative change in 2016: 1. Moving to full surrender obligations: potentially removing the 'two-for-one' measure which enables compliance entities to only submit one unit for every two tonnes of CO2 equivalent emitted. 2. Managing the costs of moving to full surrender obligations: whether the current price cap of NZ$25 should be changed (lifted or lowered) or removed. Note: Both the two-for-one and the price cap were initially introduced as transitional measures. They were widely expected to be removed in the 2011 ETS review but were instead extended indefinitely.
STAGE 2: OTHER ISSUES	Stage two considered other less urgent matters to help frame the future direction of the NZ ETS including free allocation, managing unit supply, issues related to forestry, international units, selling NZUs by auction and managing price stability.

UNDERSTANDING THE CONTEXT

While the objective of the Government to increase the carbon price signal appears clear, understanding its motives to do this yields insights into the deeper intricacies of this market.

It is important to note that a legacy from unlimited access to relatively cheaper international units remains. Until May 2015 ETS participants could utilise international units - whose prices fell to as low as approximately NZ $0.10 – and bank their domestic NZUs that were allocated either freely or for sequestration activities during that same compliance period.

The arbitrage resulted in significant accumulation of NZUs, with Government estimates of current NZU holdings at around 140 million units, some seven times the total market size of today. However, understanding the exact volume of these holdings available to market is difficult, as the decision factors for these holders, for example if they are required for future harvest, are not necessarily known to the Government or market participants.

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DEMAND-SIDE REFORM

The stage one priority consultation on demand-side reform has already been concluded. On 26 May 2016, the New Zealand Federal Budget was released, confirming that the two-for-one measure would be phased out over the next three compliance years.

TABLE 2:
NZ ETS MARKET SIZE

	2016	2017	2018	2019
Estimated Market Size (~mt)	19.6	26	33	40

NEW ZEALAND CONTINUES TO EXHIBIT TRUE LEADERSHIP INTERNATIONALLY WITH RESPECT TO THE DEVELOPMENT OF CARBON MARKETS.

This means compliance obligations will increase from 50% in 2016 to 67% in 2017, 83% in 2018 and from 2019 full one-for-one surrender obligation will be restored. The fixed price compliance option of NZ$25 was retained. Using the most recent ETS 'Facts and Figures' report (2014) market size (excluding forestry) is expected to grow as shown in Table 2.

The phase-out of the two-for-one compliance obligation was largely expected by the market, and the additional 60 million tonnes of compliance demand over the period 2018 to 2020 should, in theory, amount to a much tighter market than before. However, while industrial obligations will double over the next three years, so too will the free allocations made to industry, so while the excess supply of NZUs will reduce, it will likely be by a slower rate than the increase in demand shown in Table 2.

In the absence of clarity on exact timelines and specifics of phase two and the associated supply-side outlook, the market remains supported with onlookers forced to question whether this is due to an actual tightness of supply in the market or a lack of immediate incentives for sellers to rush to match buyers. The truth is most likely somewhere in the middle, as the volume of NZU's held in registry accounts that are required by foresters to meet their post-2020 harvest liabilities are unknown.

SUPPLY-SIDE REFORM

The timing and degree of supply-side reform through auctioning, international units or accounting rule changes are less well-anticipated but will have a major influence over the next five to ten year market outlook. The Government itself stated within the consultation document that "these issues require further analysis before potential solutions or approaches can be identified and considered… [and]…may need to take into account developments connected with the new [Paris] climate change agreement".

The following provides an overview of some of the elements that could stand to significantly change the long-term structure of the ETS.

AUCTIONING

The ability for the Government to offer further supply into the market via auctioning already exists in legislation, and the current review has confirmed that the Government remains interested in its ability to "maximise the fiscal benefits of the ETS by selling NZUs at auction".

To be effective the Government will need to be clear on the current supply and demand balance. The new demand settings will help the Government to gain a better handle on this, but it still remains a difficult task considering that the supply and demand of the forestry sector is relatively unknown.

Just as balancing the pH in a small fish tank presents its challenges, so too is determining the amount of units to auction in a market the size of New Zealand. In any case, the potential threat of auctioning and associated supply competition to existing holders of NZUs may be one tool the Government could use to help reduce the current balance of NZUs before 2020.

ACCESS TO INTERNATIONAL UNITS

New Zealand has consistently acknowledged the important role that international market mechanisms can play in enhancing mitigation ambition and facilitating the delivery of mitigation contributions under the Paris Agreement. Evidence of their leadership can be seen in the New Zealand-led Ministerial Declaration on Carbon Markets which highlighted the "important role for markets in the post-2020 period".

Governments everywhere are likely to face pressure to ensure that costs faced by business and society as a whole are not out of step with those faced by other countries. The World Bank's 2015 'State of the Carbon Market' noted that while existing carbon prices vary significantly—from less than US$1 per tonne of CO2e to US$130/tCO2e, the majority of emissions (85%) are priced at less than US$10/tCO2e With current prices of near NZ$19 (US$13.50) already placing Kiwi carbon in the top echelon of global carbon prices, it's not surprising that New Zealand's self-claimed 'ambitious' target of 30% below 2005 levels by 2030 remains, as stated within its Intended Nationally Determined Contribution (INDC) under the Paris Agreement, conditional on access to international markets.

Following the Paris Agreement, when considering the avenues that New Zealand could take with respect to linkage, there are two broad paths it could follow (and of course, many variations):

1. Enabling decentralised 'clubs' of markets to form, taking lessons from the Clean Development Mechanism (CDM) and Joint Initiative (JI) markets of the past.

UNDER ARTICLE 5, GOVERNMENTS ARE ENCOURAGED TO "TAKE ACTION TO CONSERVE AND ENHANCE, AS APPROPRIATE, SINKS… INCLUDING FORESTS".

In this path, markets could expand gradually through a broadening of existing markets such as EU ETS or California-Québec through the Western Climate Initiative, or other new clubs could emerge such as a one between those countries who signed the New Zealand Declaration on carbon markets. Eventually, these decentralised clubs could find linkages through common recognition of offsets or direct connections of registries.

2. Establishing a 'hub' for carbon markets at UN level and drawing together a reformed project offsetting system with an international registry.

Under Article 5, governments are encouraged to "take action to conserve and enhance, as appropriate, sinks… including forests". Accessing a hub of international offsets may be appealing, modelled off, for example, the Verified Carbon Standards Reduced Emissions from Deforestation and Degradation (REDD+) which places a heavy emphasis on sustainable management of forests, maintaining current forests to foster conservation, and enhancing forest carbon stocks. This would potentially support a more level playing field allowing domestic generators of NZUs to compete with offsets from a similar sector.

Either approach would need standards and rules to provide transparency and to guard against double-counting. The New Zealand Declaration on Carbon Markets demonstrates that the market need not wait on UNFCCC processes to determine the rules and guidelines of which timelines may be drawn out. Under a decentralised model, these carbon clubs may form their own rules and trading mechanisms irrespective of what happens with the implementation of Article 6.

CONCLUSION

While the more than 220% price increase for NZUs since the start of the year, and the recent two-for-one announcement have certainly led to increased optimism for NZU generators as investment in carbon forestry once again become a credible prospect, uncertainties still exist.

The current registry stockpile and the potential for auctioning and international linkage signal that the recent price rise may not equate to a permanent price recovery. Regardless of where you sit on the supply or demand fence, the end goal is the same, and the New Zealand Government's resolve for supporting international carbon markets warrants optimism.

Despite accounting for just 0.15% of global emissions, New Zealand continues to exhibit true leadership in the emissions trading space. Through linked systems, greater emissions reductions can be achieved faster and at lower cost than if each country acts in isolation. In turn more ambitious targets can be put forward to support action at a scale equal to the 2°C challenge.

Emily J. Spears *is emissions strategy lead, and* ***Loh Hao Ming*** *is emissions trader at BP Energy Asia.*

ICROA International Carbon Reduction & Offset Alliance

Quality Assurance in the Carbon Market

The voluntary carbon market has become an established and important component of climate change mitigation.

Today, it functions reliably, with clear rules and standards to ensure quality, and a global client base of companies committed to leading action on reducing carbon emissions while delivering value to their business. Due to the ever-important need for market integrity and the expectations of buyers, it is essential that carbon management firms prove they are capable of delivering a high quality, reputable service.

The International Carbon Reduction and Offset Alliance (ICROA) enables its members to demonstrate the quality, integrity and credibility that is essential to creating successful carbon offset programmes.

ICROA - Who we are

Founded in 2008, ICROA is an international non-profit organisation made up of the leading carbon reduction and offset providers in the voluntary carbon market.

The primary aim of ICROA is to deliver quality assurance in carbon management and offsetting, through adherence to the ICROA Code of Best Practice. This Code is compulsory for all ICROA members and contains quality standards for providing services in the categories of carbon footprinting, GHG emission reductions, carbon offsetting and communication.

Corporate clients choose to work with ICROA members because they know they will receive the highest standards of quality and support for their offset programmes.

Our members

bp targetneutral
carbonclear
carbon sink
climate friendly
Climate Neutral Group
climatecare
co2balance.com
Eneco
ecoact
ELEMENT MARKETS
firstclimate
NATURAL CAPITAL PARTNERS
NATURE BANK
Nexus
south pole group


POWERING
AMBITION
WITH
COOPERATION


POWER

DAVID HONE

ARTICLE 6 OF THE PARIS AGREEMENT: REVISITING GLOBAL EMISSIONS ACCOUNTING

The design of the Kyoto Protocol resulted in a particular emissions accounting architecture that has seen widespread adoption, even within jurisdictions not covered by the Protocol itself. That architecture is a mixture of allowance allocation as seen in cap-and-trade systems, but combined with a provision for project based credits originating outside the cap. These effectively raise the cap as they are imported into the covered cap-and-trade system.

Within the Kyoto Protocol, allowance allocation is handled through the Assigned Amount Unit (AAU) and the most widespread crediting or offset system is the Clean Development Mechanism (CDM) which operates on a project by project basis in developing countries. Similarly in California, which is not covered by the Kyoto Protocol, allocation is handled through the distribution or sale of California Greenhouse Gas Allowances and external projects through the ARB Compliance Offset Protocol and issuance of ARB Offset Credits.

A feature of these systems is that the accounting normally handles the entities within the cap and the project outside the cap, but no attempt is made to account for the total greenhouse gas impact on the atmosphere or against a global goal to reduce overall greenhouse gas emissions. There is an implicit assumption that the sum of the various parts adds up such that the overall outcome is better than not having conducted the exercise at all. This happens because only a small percentage of the global economy sits under a cap, so there is no mechanism available to account for the total impact.

A further issue related to the current structure is the macro accounting of the external credit. Projects vary in type, ranging from clearly measurable emission reductions (e.g. capturing landfill methane) to notional reductions (e.g. a wind turbine is built, but the alternative might have been more coal). Particularly in the case of the latter example which is an energy mix question, there is normally no resolution between the local project and the overall energy mix direction of the host country. A key question is typically left unanswered; if the import of credits into a cap-and-trade system raises the cap, has there been an equivalent, albeit probably notional, decline elsewhere.

THERE IS NO MECHANISM AVAILABLE TO ACCOUNT FOR THE TOTAL IMPACT.

But as the Paris Agreement starts to take hold, this will likely change.

The Agreement is built on the concept of Nationally Determined Contributions (NDC). These are set at national level and offer a direction of travel for a given economy in terms of its energy mix and/or greenhouse gas emissions. Although the first set of NDCs offered in the run-up to COP21 were varied in nature and in some cases only covered specific activities within the economy, over time they will likely converge in style and, for the Paris Agreement to deliver, must expand to cover all anthropogenic greenhouse gas sources.

The NDCs also lead us down another path – that of quantification. The first assessment of NDCs conducted by the UNFCCC in October 2015 and then refreshed in May 2016 required the quantification of all NDCs in terms of annual emissions and cumulative emissions through to 2030. This was necessary to establish an equivalent level of warming of the climate system, which is driven largely by the cumulative emissions of carbon dioxide over time. Without such an assessment, the UN cannot advise the Parties on progress towards the aim of the Paris Agreement, i.e.;

Holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels,

The UNFCCC didn't have a full emissions inventory on which to base this calculation, so they established one from the best data available. But Article 13 of the Paris Agreement introduces a transparency framework and calls on Parties to regularly provide;

A. *A national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases, prepared using good practice methodologies accepted by the Intergovernmental Panel on Climate Change and agreed upon by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement;*

B. *Information necessary to track progress made in implementing and achieving its nationally determined contribution under Article 4.*

ACCOUNTING FOR INTERNATIONAL TRANSFERS UNDER THE PARIS AGREEMENT

Example:
A transfer to Canada from Kenya.

Canada NDC - Canada intends to achieve an economy-wide target to reduce its greenhouse gas emissions by 30% below 2005 levels by 2030. This equates to an effective cumulative emissions cap of 5650 Mt over the period 2020 to 2030 for all GHGs.

Kenya NDC - Kenya seeks to abate its GHG emissions by 30% by 2030 relative to the BAU scenario of 143 MtCO2eq. This equates to a notional emissions cap of 1000 Mt over the period 2020 to 2030 for all GHGs.

Kenya plans to expand tree cover to 10% of land area within its NDC. If it does this through Canadian sourced funding in exchange for a nature based transfer using the mitigation mechanism (EMM based ITMO) of 50 million tonnes CO2 over the ten year period, the following happens;

- Canada cap rises to 5700 Mt
- Kenya NDC shifts to 37% by 2030 to account for the 50 million tonne transfer
- An ITMO to the effect of 50 million tonnes shifts from Kenya to Canada.

The foundation for transparency is measurement and reporting, which further implies that emissions quantification is a foundation element of the Paris Agreement. Although nationally determined and always voluntary, the Agreement effectively establishes a cap, albeit notional in many cases, on national emissions in every country. The caps are also set to effectively decline over time, even for countries with emissions still rising as development drives industrialization.

Article 6 introduces the prospect of carbon unit trading through its internationally transferred mitigation outcome (ITMO) and emissions mitigation mechanism (EMM). Text in paragraphs 6.2 and 6.5 is included to avoid any possibility of double counting;

. . . internationally transferred mitigation outcomes towards nationally determined contributions. . . . . shall apply robust accounting to ensure, inter alia, the avoidance of double counting, Emission reductions resulting from the mechanism referred to in paragraph 4 of this Article shall not be used to demonstrate achievement of the host Party's nationally determined contribution if used by another Party to demonstrate achievement of its nationally determined contribution.

These provisions, in combination with the progressive shift towards quantification of all emission sinks and sources, means that full national accounting for offset crediting must take place for both the recipient and the source of the units. For the recipient, there will be no change in that the introduction of units will raise the effective national cap on emissions. But the source country will be required to make an equivalent reduction from their stated NDC, therefore tightening their contribution. This was a feature of the Joint Implementation (JI) mechanism under the Kyoto Protocol, but was not the required practice in the CDM.

The example shown in the box illustrates this through a hypothetical case for a nature based transfer (NBT) from Kenya to Canada, utilising the EMM as a means to acquire the necessary funding. The impact on the Kenya NDC implies a shift from a stated reduction of 30% from Business as Usual (BAU) in 2030, to some 37% below BAU. This ensures there is no double counting of the transferred amount and maintains the full integrity of the overall NDC approach such that the implied global cumulative emissions goal of the NDCs is maintained. However, Kenya will need to find further reductions in its economy as a result. One implication of this is that the price of carbon units may rise due to the additional demand that an overall emissions cap, even a notional one, places on the global economy.

Article 6 of the Paris Agreement offers great potential for carbon market development and emissions trading, therefore driving a lowest cost mitigation outcome and directing funding and financing to low emission technologies. But it will also introduce an accounting rigour that has only featured in some quarters to date. This will likely change the supply demand balance, leading to a more robust and enduring carbon market.

David Hone *is the Chief Climate Change Advisor to Shell, and a member of the board of IETA*

STIG SCHJOLSET

FROM PARIS TO MONTREAL: A VOLUNTARY APPROACH TO SAVING THE WORLD

The ambition to have carbon neutral growth for international aviation will be confirmed at the International Civil Aviation Organization (ICAO) summit in Montreal from 27 September to 7 October 2016. The deal will likely include a global market-based measure (GMBM) that should offset any growth in the sector's emissions after 2020.

According to leaked drafts, the GMBM will be based on voluntary participation, a feature that has been criticized for making it impossible to guarantee that carbon neutrality can be achieved. However, the ICAO agreement will be built exactly on the same principles and mechanisms as the Paris Agreement that has been widely praised as the peak achievement of international climate diplomacy so far. The alignment with the Paris Agreement could suggest that concerns about the soft nature of the emerging aviation framework might be unwarranted.

DON'T TELL ME WHAT TO DO

Nobody likes being told what to do. That goes for most people, and not surprisingly, also for most governments. A global framework based on legally binding targets, mandatory participation and a strong compliance regime was for decades the ultimate objective of the international climate negotiations.

Until the Paris Agreement, that is. After Paris, nations have a framework based on voluntary participation, self-determined reduction targets and no compliance regime. It has been a long and painful process, but most countries and stakeholders now realize that this is the best way forward for international climate cooperation – and probably the only approach that can work in a complex world of sovereign states.

The same countries that designed the Paris Agreement have now agreed on a deal under ICAO. It should thus not be very surprising that the ICAO agreement will be based on voluntary participation. Until 2026 it will likely be up to each government to decide whether airline operators under their jurisdiction should participate. It will even include an opt-out provision, enabling countries to pull out if they change their mind. Only from 2027 will the GMBM switch to a mandatory scheme.

By then, however, the major emitters may have already joined on a voluntary basis. Repeating the dynamics of the Paris process where almost all countries have submitted their reduction pledges, it seems like the voluntary nature of the ICAO deal will facilitate broad coverage.

While the staged approach outlined in previous drafts of the Agreement would have given a coverage of some 69 percent, it now seems possible that countries representing some 86 percent of global aviation emissions will opt into the GMBM from 2021. In other words, more countries will likely be willing to accept reduction commitments if they can choose to do so, rather than being told to do so. Few parents would be surprised by such an outcome.

US AND CHINA SEALING THE DEAL

The main reason why ICAO's GMBM likely will have broad coverage is that both the

NOBODY LIKES BEING TOLD WHAT TO DO. THAT GOES FOR MOST PEOPLE, AND NOT SURPRISINGLY, ALSO FOR MOST GOVERNMENTS.

US and China have indicated that they will join from the start. In fact, the bilateral cooperation between the two countries is probably a main reason why nations have both the Paris Agreement and an emerging ICAO deal.

If there is a turning point in recent international climate diplomacy, it is likely 12 November 2014, when the US and China announced their post-2020 climate targets in a bilateral agreement. By mutually recognizing each other's targets as sufficiently strong, the two giants dramatically increased the prospects of reaching a global agreement. This was the "wow moment" when the world realized that there was actually a deal to be made in Paris.

In a similar way, the US and China in a joint declaration on 3 September 2016 announced that both countries intended to join the ICAO agreement at the outset. With the world's two major emitters on board, pressure was inevitably increasing on other countries and in the weeks following the

US-China announcement countries like Mexico, Canada and Singapore have also indicated that they will join the voluntary phases of the GMBM.

FAILING TO MEET AMBITION

The main weakness of the Paris Agreement is the lack of consistency between the very ambitious global targets (limit global warming to well below 2°C) and the sum of the individual country targets. They simply don't add up to the required effort. It will likely be impossible to avoid a similar gap in the ICAO framework. The overall goal is to cap the emissions from the aviation sector at the 2020 level.

Internal abatement in the sector, like operational improvements, alternative fuels and new technologies should ideally comprise most of the needed reductions, while any actual emission growth after 2020 should be offset by carbon credits. However, in order to ensure carbon neutral growth in the next decade, universal participation in the GMBM would be required from the start of the scheme.

But, in spite of the "race to the top" dynamics that have been triggered by the voluntary nature of the GMBM, it is clear that not all countries will join from the start. It is also unlikely that the exempted emissions will be redistributed among the participating countries. Thus, the design of the GMBM will effectively mean that the overall aspiration to have climate neutral growth cannot be met.

CARBON CREDITS YET TO BE DEFINED

Another issue that will impact whether the aviation sector can move towards climate neutrality is the quality of carbon credits after 2020. Again, in a parallel to the Paris Agreement, where the rules on new market mechanisms will be decided at later climate summits, the eligibility criteria defining which offsets to use under ICAO's GMBM will be decided at a later stage, probably in 2018.

In order to actually offset aviation emissions with carbon credits, the eligible credits under the GMBM will have to represent real and credible emission reductions. Moreover, there cannot be any double-counting of reductions already capped by the national targets under the Paris Agreement. Assuming a coverage of 86 percent and an emissions growth in the sector in line with the historic trend, the airline operators might need to buy some 750 million carbon credits in the next decade.

THE DESIGN OF THE GMBM WILL EFFECTIVELY MEAN THAT THE OVERALL ASPIRATION TO HAVE CLIMATE NEUTRAL GROWTH CANNOT BE MET.

Should supply come from existing UN mechanisms such as the CDM? If so, should already issued credits be accepted - giving airlines the possibility to eat into the huge oversupply of CERs - or should only new projects be eligible? And, will other credits like REDD and those to emerge from the new mechanism under the Paris Agreement be accepted?

In short, until the eligibility rules under the GMBM are clear, and issues related to double counting under the Paris framework are solved, it is not possible to assess whether the ambition to have climate neutral growth after 2020 is credible.

CONCLUSION

The agreement will not be perfect in any way, and it will not be able to guarantee climate neutral growth in the aviation sector. But, it will likely be better than the alternative, which is to prolong the current situation with no climate regulation for international aviation.

Building on Paris, the ICAO deal will also include review cycles to create pressure towards better regulation and higher ambition over time. So, even though the deal will inevitably be seen as too little and too late, the ICAO summit in 2016 could actually be remembered as the turning point when the international community finally got serious about limiting the climate impact of the aviation sector.

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EDIT KISS AND LISA WALKER

FOREST CARBON PROJECTS: A STEPPING-STONE TO A LOWER CARBON ECONOMY AND A SUSTAINABLE FUTURE

In Paris governments agreed the ambitious goal of "holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels". Meeting these climate change goals agreed between governments, however, necessitate a complete re-wiring of the economy and long-term global cooperation.

It is the cumulative build-up in the atmosphere of GHGs that matters most because of their long lifetime; even if emissions are stopped immediately, temperatures will remain high for centuries. So the sooner action is taken to reduce or avoid emissions, the better.

The Intergovernmental Panel on Climate Change's 5th Assessment report showed that in order to achieve such a temperature increase limit, not only a complete overhaul of the energy and industrialised sectors would be necessary over the coming decades but we would also need to deploy negative emissions technologies[1] on a global scale.

This becomes even more important when considering the uncertain pace of the energy transition, with most oil and gas companies predicting that fossil fuels will be the predominant source of energy for the next fifty years.

One of the oldest technologies in the world, with huge potential for negative emissions is biological carbon storage or natural sequestration. And it is available today without the need for years of expensive research or engineering experimentation; it just needs the right focus.

While today the land use sector is a net emitter (24% of the global total of emissions, according to the IPCC), it actually offers a great part of the solution, alongside the necessary changes in the industrial and energy sectors.

Sustainable land-use could deliver about one third of the required near-term reductions, and it will be impossible to reach a sustainable net-emissions pathway without stopping the deforestation and degradation of tropical forests as well as transforming unsustainable forestry and agricultural practices, in particular in the tropics.

In light of the scientific evidence and increasing urgency for emissions reductions one might consider surprising the relatively slow takeoff of the forest carbon markets as the obvious way to incentivize the buildup of biological carbon stocks and reverse unsustainable land-use practices.

Indeed, progress and focus on terrestrial carbon generally has certainly lagged the attention that the energy sector, for example, has received from stakeholders, investors and policy-makers. The land-use sector must also be considered an important part of the puzzle.

One explanation is that to date a lot of the momentum for forests has been top-down; with seed funding from governments and high-level public sector commitments. But it is naïve to assume that this alone will deliver the transformational reductions we so badly need. This is because we need the private sector to be fully engaged to turn this potential into reality. It is businesses that can do that best through the recognition of market-based incentives.

Looking at other markets around the world, whether equities or commodities, none of them have been developed through top-down command and control, or a UN edict. They have been developed bottom-up, and often led by the private sector.

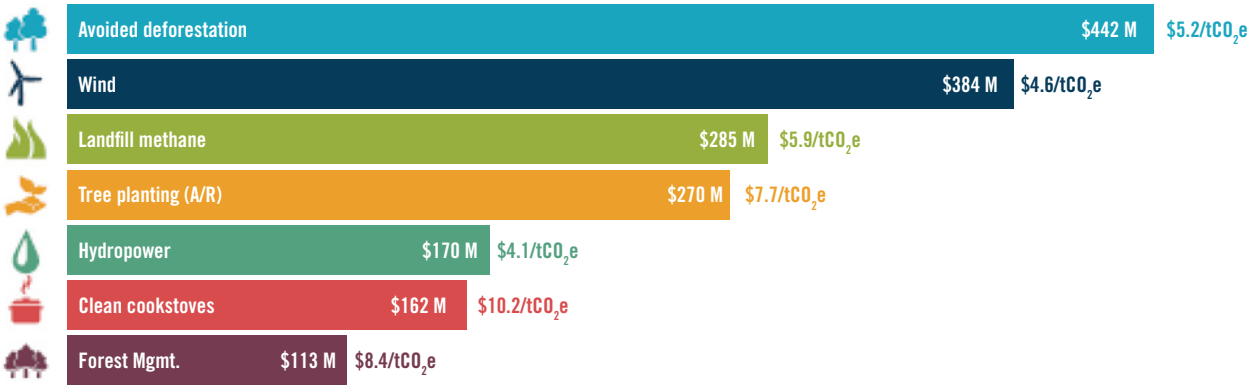
The Paris Agreement seems to reflect this, in a paradigm shift away from the top-down approach of Kyoto, as it enables bottom-up networked markets and systems to develop and connect over time. This opens the door for the private sector to take the government signals and begin to shape their own responses, which can be adopted into the long-term climate policies that are required to solve this multi-generational issue.

And we are beginning to see a response. A voluntary carbon market exists and has established a role for the land-use and forestry sector, which enjoys a cost of abatement that is significantly lower than in other sectors alongside major volume potential.

In terms of the forest carbon market, Forest Trends' Ecosystem Marketplace reported in their recent "State of the Voluntary Carbon Markets" that in 2015 alone,

THERE ARE OVER 800 FOREST AND LAND-USE CARBON PROJECTS CURRENTLY OPERATIONAL OR UNDER DEVELOPMENT AROUND THE WORLD.

FIGURE 1: CUMULATIVE VALUE AND AVERAGE PRICE OF TOP 7 PROJECT TYPES



Source: Forest Trend's Ecosystem Marketplace. State of Forest Finance 2015.

$917 million of new finance was committed for forest carbon, of which $762 million was contracted to pay for offsets in the context of carbon markets. The remaining $153 million was committed to Brazil through agreements to pay for emissions reductions outside of carbon markets – specifically through the Amazon Fund and a bilateral agreement between the German government and the Brazilian state of Acre.

There are over 800 forest and land-use carbon projects currently operational or under development around the world. Over three-quarters of those are located in California and Australia where the pre-compliance signals have spurred a rapid rise in the number of projects demonstrating clearly that carbon market signals work. Many compliance-based carbon markets envision a major role for land-use related reductions.

Eleven current and future compliance markets that include an offsetting mechanism have developed protocols for land-use and forestry and the International Civil Aviation Organisation's new carbon market may prove to be a major source of demand. Even the EU has agreed an effort-sharing mechanism to account for the creation of biological sinks.

To truly reach scale, the current project-by-project approach will need to evolve, especially since over 75% of countries submitting Nationally Determined Contributions included land-use and forestry. National and local governments around the world are busy developing national and jurisdictional REDD+ systems that will eventually lead to projects being fully nested.

These top-down systems will be sparse before 2020, but this should not be seen as a barrier to early action but as just the opposite. A bottom-up, project-based forest carbon market provides access to environmental assets from high-quality projects and programmes that retain the ability to nest in national and jurisdictional systems as they develop and that are essential to demonstrate the potential of the land use sector.

Continued growth in the project-based voluntary market is an important stepping-stone for the forestry and land-use sector to begin to deliver critical global net-emissions benefits and develop local and national policies that work for all stakeholders.

Beyond carbon benefits, forest and sustainable land use projects are also delivering a range of co-benefits, especially when compared to straight carbon reductions in other sectors. These co-benefits include conserving biodiversity-rich primary forest, providing climate resilience to sustainably produced crops, dignified livelihoods for some of the poorest communities as well as a range of other ecosystem services which makes this asset type one of the most popular on the voluntary carbon markets as Figure 1 illustrates.

The next four years, prior to the implementation of the Paris Agreement, will be a crucial period and probably the last chance for companies to actively shape the policies that will define economies going forward. It is in businesses' best interest to ensure that they have access to the most cost-effective solution through forest carbon assets, and to demonstrate the positive power of the private sector to effect change. It is also important for investors and all stakeholders that all effective climate risk reduction strategies are successfully deployed.

The later deforestation is halted and large-scale restoration is carried out, the less chance there will be to achieve the safe 2°C pathway. Therefore, early action through the voluntary and emerging compliance forest carbon markets is essential. Regulatory compliance systems typically take many years for governments to implement.

If businesses wait for more of these to come into force before getting involved it might be too late for preserving endangered tropical forests and species and accessing a critical climate risk reduction strategy. The forest carbon market is a win–win for companies, investors, society and the planet.

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Lisa Walker *is CEO of Ecosphere+, an Althelia venture.*

(1) Negative emission technologies are activities that remove carbon from the atmosphere.

SARAH LEUGERS AND SIMON HENRY

USING MARKETS TO DELIVER CLIMATE AND DEVELOPMENT TARGETS

The achievements of the Voluntary Carbon Market

In 2015, the cumulative value from all years of trading in the voluntary carbon market topped $4.6 billion[1]. This investment has generated nearly 330 million carbon credits, each representing a tonne of CO2 savings. Carbon offset projects from standards with sustainable development requirements have also brought enormous benefits to the host communities of carbon offset projects, which include:

- Social benefits: poverty alleviation, female empowerment and improved public health
- Economic benefits: job creation, technology transfer and market development
- Environmental benefits: improved air quality, conservation and biodiversity protection

Imperial College research, commissioned by ICROA (the International Carbon Reduction and Offset Alliance) in 2014, found that for every 1 tonne of CO2 emission removed from the atmosphere through a carbon offset programme – a further value of US$664 dollars is delivered in economic, social and environmental benefits for local communities around the world[2]. Carbon offsets are therefore an efficient tool to deliver both carbon emission reductions and sustainable development targets at least cost.

THE PARIS AGREEMENT AND THE SUSTAINABLE DEVELOPMENT GOALS

2015 was a significant year for both climate and sustainable development policy, with the adoption of the Paris Agreement and the UN Sustainable Development Goals (SDGs). The interlinked nature of these two issues has been recognised in both documents. For instance, the Paris Agreement makes specific reference to sustainable development and efforts to eradicate poverty, and the SDGs have a strong climate change narrative throughout and include a specific climate change goal.

But despite the ambition of the Paris Agreement and the SDGs, there's a way to go. Analysis carried out by the UNFCCC[3] states that "global aggregate emission levels in 2025 and 2030 resulting from the implementation of the communicated Nationally Determined Contributions (NDCs) do not fall within the scope of 2°C or 1.5°C scenarios". In the meantime, the planet has continued to warm at an increasing speed, with 15 of the 16 warmest years on record occurring since 2000[4]. Government policies alone are not expected to deliver the goals and targets set under the global agreements, there is also a critical role for business.

LOOKING TO THE FUTURE

Given the current situation, there is clearly an increasing urgency to do more. But how can we use the experience of carbon markets to make them work even more effectively and equitably post-2020? And can we leverage markets for not only climate security, but also for sustainable development?

INCREASE AMBITION: SCIENCE BASED TARGET SETTING

Science Based Targets provide guidance for companies to align their GHG emission

FOR SOME PROJECT DEVELOPERS, THE MARKET PRICES DO NOT REFLECT THE VALUE OF THE BENEFITS THAT THEIR PROJECTS ARE DELIVERING, OR THE TRUE SOCIAL COST OF CARBON.

reduction targets with climate science to keep global warming well below 2 degrees. The initiative is important in setting the bar for the minimum a business should do in order to demonstrate it is taking responsible action on climate change. But going beyond a science-based target can provide even greater reputational, supply chain and operational benefits. By setting a carbon neutral target companies give a clear, straightforward statement of climate leadership, and carbon finance programmes aligned with supply chain regions can deliver a range of benefits to reduce risk and build resilience. For business to contribute to the global climate change goals a 'reduce within, finance beyond' approach must become best practice for corporate climate action and a license to operate for a responsible business.

With such a framework and increased participation, the voluntary market can serve as a powerful tool to finance the global emissions reductions needed according to science to ensure climate security while helping countries develop on a sustainable, low-carbon pathway.

IMPROVE TRUST: INFORMATION AND SAFEGUARDS

As the voluntary carbon market develops to match this new ambition, a key success factor will be improved market information – to build confidence, trust, and therefore liquidity. A number of initiatives are underway to provide regular market data such as the supply-demand balance, and information on how voluntary carbon credits are valued. These initiatives are working towards building more trust in market mechanisms for buyers looking to enter the market.

For some project developers, the market prices do not reflect the value of the benefits that their projects are delivering, or the true social cost of carbon. This is why organisations like Gold Standard are advocating on behalf of project developers for more sustainable pricing.

DRIVE FINANCE TO SUSTAINABLE DEVELOPMENT

Evidence from the IPCC shows that every one of the 17 UN Sustainable Development Goals (SDGs) can be affected by climate change—directly or indirectly. Standards such as Gold Standard, Plan Vivo, and CCB, who work with the Verified Carbon Standard (VCS), report on how their projects contribute to sustainable development. Gold Standard is also launching a new version of its standard that aligns with the SDG targets and will set the foundation for results-based payments for a broad set of SDG outcomes. Funders will be able to support gender equality, poverty alleviation, better health, biodiversity conservation, or other impacts depending on their priorities – with the same confidence as the climate impacts quantified today in carbon credits.

As the voluntary market continues to evolve, these new developments ensure it is perfectly placed to enable business to bridge the gap between globally agreed targets and national climate and development commitments. The power of markets can therefore deliver the transformational impacts that are needed in the most effective way to help the world meet its most ambitious agenda.

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Sarah Leugers *is director of marketing and communications at the Gold Standard Foundation*

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(2) Unlocking the hidden value of Carbon Offsetting: Imperial College London, 2014 http://tinyurl.com/jly4ke4
(3) Synthesis report on the aggregate effect of intended nationally determined contributions. UNFCC, May 2016
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CASPAR CHIQUET

OFFSETS UNDER THE PARIS AGREEMENT

Caspar Chiquet considers how offsets and their accounting treatment may be handled under the Paris Agreement.

The adoption of the Paris Agreement in December 2015 marked a major breakthrough in international action against climate change. It significantly improves on its predecessor, the Kyoto Protocol, in uniting developing and developed countries, basing the Agreement on national planning and policymaking in the form of nationally determined contributions (NDCs). With a universally agreed on ambition to limit global warming to below 2 degrees, the Agreement sends a clear signal to policymakers, the private sector, and the public, that the transition to a low-carbon economy is unavoidable.

The Paris Agreement includes an article on cooperative approaches, transfer of mitigation outcomes, and a new offset mechanism. Given that pre-Paris negotiations on market mechanisms stalled, it was a great success that the issue was taken forward in the Agreement, allowing space for Parties to advance conversations around cooperative approaches to implementation.[1] This article summarizes the main features of this article, and how it will enable international transfer of mitigation outcomes, including (but not limited to) offsets originating from a newly created mitigation mechanism under the Paris Agreement.

BILATERAL TRANSFERS BETWEEN PARTIES

Article 6.2 and 6.3 of the Paris Agreement lay the foundation for collaboration on mitigation between parties in recognizing the fact that parties can transfer Internationally Transferable Mitigation Outcomes (ITMOs) between them. These ITMOs can be transferred between parties without approval from the Conference of the Parties Serving as the Meeting of the Parties to the Pari Agreement (CMA), provided they observe requirements on sustainable development, environmental integrity and transparency, and apply accounting consistent with guidance developed by the UNFCCC's Subsidiary Body on Scientific and Technical Advice (SBSTA), especially to avoid any occurrence of double-counting.

Interestingly, these two articles do not limit the exact form or nature of such collaboration and the transferred "outcomes", nor do they require such transfers to be unit-based. Nevertheless, the ITMO provision enables the concept of bilateral offsets between parties, and constitutes the infrastructure for exchanging mitigation outcomes of any kind, including unit-based offsets under the new offset mechanism of the Paris Agreement, or any other offset mechanisms put in place by parties to the agreement.

One of the key elements of the ITMO provision is the requirement of consistent accounting and observation of transparency standards. The specifics of these accounting and transparency rules need to be worked out by SBSTA, but have to be seen in the context of the work done by the Ad Hoc Working Group on the Paris Agreement (APA)[2], which is in charge of designing the overarching rules and guidelines governing reporting and accounting of NDCs. Furthermore, accounting and transparency is also cross-cutting into other Articles, such as the mechanism under Article 6.4 (see below). Since ITMOs support the implementation of a party's NDC, APA and SBSTA need to work together on the design of accounting rules for both NDCs and ITMOs. APA and SBSTA should aim to follow a common timeframe in order to adopt accounting guidance at the same time.[3]

THE ADOPTION OF THE PARIS AGREEMENT IN DECEMBER 2015 MARKED A MAJOR BREAKTHROUGH IN INTERNATIONAL ACTION AGAINST CLIMATE CHANGE.

Another important element that needs to be further clarified is the question of compliance. There is no specific reference to any compliance provisions regarding the accounting guidance developed by the SBSTA, raising the question of what will happen if parties do not follow the guidance.[4] The Paris Agreement contains general transparency and compliance provisions (Articles 13 and 15), but it is not clear if the CMA (or another body) will have to authority to oversee compliance with the requirements in the ITMO provisions.

ACCOUNTING CHALLENGES LINKING ITMOS TO NDCS

A considerate amount of research has been done already on the many challenges brought by the heterogeneous nature of different NDCs. A study by the Wuppertal Institute on NDCs provides an overview over the different forms of pledges in

NDCs: out of 105 NDCs containing GHG emission targets, 33 are absolute targets (but with vastly different base years), 5 are fixed level targets, 7 are emission intensity targets, and 76 are reductions compared to a baseline scenario.[5]

It is highly likely that different accounting treatments will be required, depending on the type of NDC. These could eventually resemble the two tracks of the Kyoto Protocol's Joint Implementation mechanism.[6] Other approaches, such as work done by the World Bank[7] and the Networked Carbon Markets Initiative, try to establish the mitigation value of specific outcomes, based on which adjustments could be made when transacting ITMOs from parties with different forms of NDCs.[8] Johannes Heister of the World Bank proposes a matrix of bilateral exchange rates between different parties based on their share in the global carbon budget vis-a-vis their mitigation ambitions in their NDCs.[9]

Alternatively, it is conceivable that market forces, following eligibility restrictions from individual parties, will determine the ultimate value of an ITMO originating from a particular party, as was the case under the Kyoto Protocol where market participants applied price discounts to CERs from certain project types, completely outside of the UNFCCC process.

These accounting challenges will need to be solved to enable international transfers of offsets and mitigation outcomes. Potentially regulated border-adjustments between parties with different types of NDCs, based on concepts such as mitigation value, market forces, or a combination of both, will determine the individual value of a particular ITMO, as well as any offsets that might originate from the new mechanism which was introduced by Article 6.4 of the Paris Agreement.

ANOTHER IMPORTANT ELEMENT THAT NEEDS TO BE FURTHER CLARIFIED IS THE QUESTION OF COMPLIANCE.

OFFSETS UNDER THE NEW MECHANISM OF THE PARIS AGREEMENT

The Paris agreement creates a new mechanism with the aim to "contribute to mitigation… and support sustainable development." Articles 6.4.-6.7 define this new article, which has not yet been given an official name, but already received a few different nicknames, all with their respective three-letter acronym.[10] For the purpose of this article, simply "mechanism" will be used.

The mechanism will be under the authority of the CMA, and a body designated by the CMA, all but certain the UNFCCC, will supervise it. It is possible that the form of governance significantly differs from the way the UNFCCC supervised the CDM in the past, with split responsibilities between the UNFCCC as a central body, and the host country to coordinate issuance of units under the mechanism with accounting against the host country's NDC, more akin to the way JI worked under the Kyoto Protocol.

Another important difference to the CDM is the fact that the mechanism is open to participation from all parties to the Paris Agreement. In the negotiations leading up to Paris, the concept of "CDM+" was brought forward in submissions by Brazil and the EU, which still differentiated between Annex 1 and non-Annex 1 countries.[11] The mechanism under the Paris Agreement puts no such limitation on participation. It also explicitly encourages participation of private sector entities.

Finally, the mechanism under the Paris Agreement has the goal to deliver "overall mitigation in global emissions". How this article 6.4(d) is interpreted by different parties and operationalised by the SBSTA will have a major impact on the utility and adoption of offsets under the new mechanism.

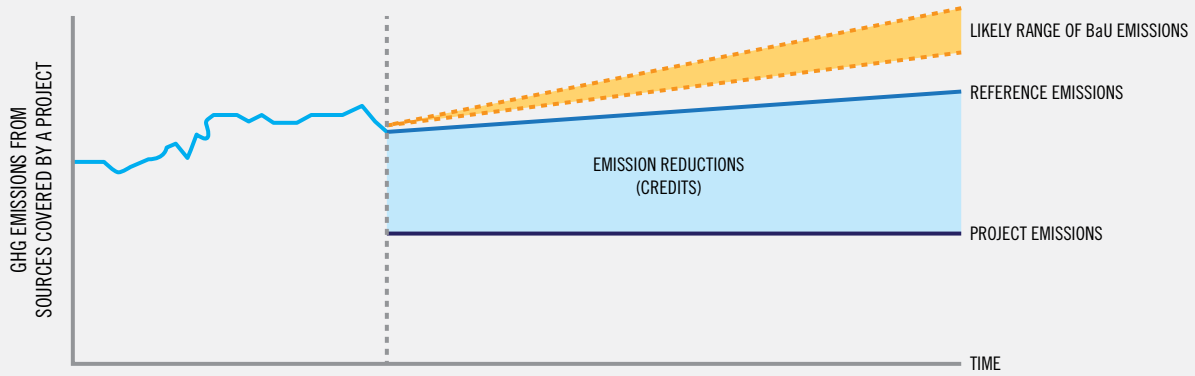
THE PARIS AGREEMENT CREATES A NEW MECHANISM WITH THE AIM TO "CONTRIBUTE TO MITIGATION… AND SUPPORT SUSTAINABLE DEVELOPMENT."

NET ZERO EMISSIONS AND OVERALL MITIGATION

At present, the concept of "overall mitigation in global emissions" is ill-defined, and the concept has found its way into negotiations at rather late stage, but was at one point more explicit, mentioning the "cancellation of a share of units generated, transferred, or acquired".[12] As it stands now, however, the SBSTA is left with the challenge of working out the details of how the ambition of the long-term net zero emission target and overall mitigation can be operationalised under the mechanism.

In a sense, this is a reopened additionality discussion, which was a major concern with the CDM. Under perfect conditions, an additional CER used against a Kyoto target meant that there was zero benefit for the global atmosphere beyond that target itself. If the new mechanism wants to achieve overall mitigation, then somewhere along the process of issuing, transferring and applying offsets against an NDC, a voluntary contribution has to be undertaken by one, or several parties to the transaction.

One potential approach to solve this problem is directly at the baseline level, in setting extra conservative baselines and thus guaranteeing overall mitigation. Apart from the considerable technical challenges in defining standardised



Source: Ministry of Economy, Trade and Industry, Japan (METIJ) and Ministry of the Environment, Japan (MOEJ).

ONE POTENTIAL APPROACH TO SOLVE THIS PROBLEM IS DIRECTLY AT THE BASELINE LEVEL, IN SETTING EXTRA CONSERVATIVE BASELINES AND THUS GUARANTEEING OVERALL MITIGATION.

baselines for the new mechanism, taking into account its intended broader scope with sustainable development co-benefits, as well as the many implications of vastly different NDCs from host country to host country, this would also put the burden of contributing to overall mitigation on the host, more likely than not a LDC, SIDS or a developing country.[13]

Although still in its early stages, Japan's Joint Crediting Mechanism (JCM) might prove a pragmatic example of how the concept of overall mitigation may be put into practice under the mechanism. The JCM introduces the concept of "reference emissions", which are set below business as usual and thus ensure the "additionality" of a JCM project. Furthermore, to alleviate the scenario described above, where the cost of the contribution is borne by the host country due to a reduced output of offsets, the JCM credits 20% of issued credits back to the host country of a project activity.

Whether the approach under the JCM proves workable within the context of the Paris Agreement and the negotiations under the SBSTA remains to be seen. What is certain however, the concept of overall mitigation needs to be addressed in a fair, transparent and simple manner to ensure uptake of the mechanism.

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KAREN HAUGEN-KOZYRA

ALBERTA CLIMATE LEADERSHIP: BUILDING THE BIOLOGICAL BRIDGE

Karen Haugen-Kozyra explains how Alberta's model for agriculture and land-use offsets offers a model for other jurisdictions around the world.

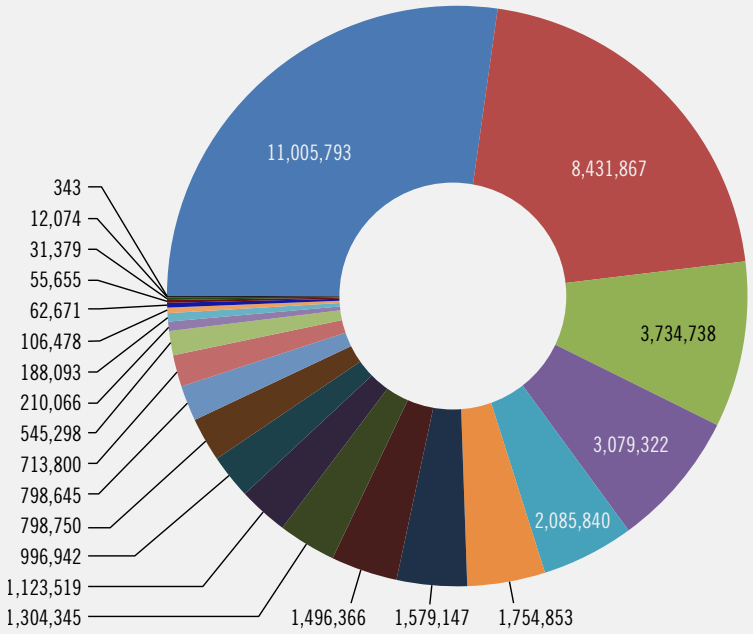
Alberta's new Climate Leadership Plan sets out strategic directions to achieve significant greenhouse gas (GHG) reductions in Alberta by 2030. The province's early action on climate change – as a first mover on an economy-wide carbon pricing framework - has resulted in it being recognized as a global leader in many aspects of GHG management, policy, verification and quantification.

Alberta's investments have developed a highly educated and skilled workforce and have developed world class research and training capacity. Alberta is well positioned to make significant contributions towards meeting low-carbon goals and diversifying the economy by capitalizing on these previous investments, and strategically investing in the low carbon development of its abundant natural resources in the energy, agriculture, forest and municipal waste sectors, securing its position as a global leader into the future.

Beginning in 2007, Alberta's GHG regulatory framework allowed companies the flexibility of using offsets to achieve regulatory compliance. By extending the carbon price signal beyond the regulated sectors, companies (both domestically and abroad) have been drawn to Alberta by the opportunity to test and commercialize innovative, low carbon technologies. They have also been able to implement and adopt innovative approaches to emission reductions/offsets activities to achieve significant impact[1].

Alberta's carbon pricing mechanism and robust offset system have enabled the carbon market to make significant emission reductions and in so doing have developed a tremendous resource in credible, transparent and consistent measurement, monitoring, reporting and verification (MRV) methods within the bio-based sectors.

FIGURE 1: TONNES REGISTERED (ALL VINTAGES, ALL YEARS)



Tillage System Management (11,005,793), Wind-Powered Electricity Generation (8,431,867), Nitrous Oxide Abatement from Nitric Acid Production (3,734,738), Diversion of Biomass to Energy from Biomass Combustion Facilities (3,079,322), Acid Gas Injection (2,085,840), Conservation Cropping (1,754,853), Energy Efficiency Projects(1,579,147), Landfill Gas Capture and Combustion (1,496,366), Enhanced Oil Recovery (1,304,345), Aerobic Composting Projects (1,123,519), Anaerobic Treatment of Wastewater Projects (996,942), Low-Retention, Water-Powered Electricity Generation as Run-of-the-River or an Existing Reservoir (989,750), Direct Reductions in Greenhouse Gas Emissions Arising from Changes in Forest Harvest Practices (798,645), Enhanced Oil Recovery (streamlined) (713,800), Engine Fuel Management and Vent Gas Capture Projects (545,298), Biofuel Production and Usage (210,066), Energy Efficiency for Commercial and Institutional Buildings (188,093), Energy Generation From the Combustion of Biomass Waste (124,074), Waste Heat Recovery Projects (106,478), Instrument Gas Conversion to Instrument Air Conversion in Process Control Systems (62,671), Waste Heat Recovery (streamlined) (55,655), Anaerobic Decomposition of Agricultural Materials (31,379), Substitution of Bitumen Binder in Hot Mix Asphalt Production and Usage (343), Waste Heat Recovery Project (-)

In the run-up to the Paris COP last year, more than 90% of nations that submitted Intended Nationally Determined Contributions identified the biological sector as a significant contributor towards achievement of those targets.

This level of commitment ensures that there will be a huge demand for robust MRV systems in the future.

Alberta's regulatory carbon market has a number of protocols applicable to the agriculture sector as well as a wide variety of other sectors. Some protocols have seen good uptake, facilitated by offset aggregators combining reductions across many farms, while others have not. Some protocols have yet to be reviewed or approved.

Of the over 40 million tonnes of registered, verified reductions that have been listed on the Alberta Offset Registry, more than half come from biological sources. To date, the number of offsets generated under the Conservation Cropping Protocol (CCP) – the most widely adopted protocol – is more than 12.76 million tonnes (see Figure 1).[2] This effort occurred when Alberta's technology fund price for carbon was C$15 per tonne of CO2e, but from January 2017 the price rises to C$30 per tonne and more opportunities are expected to emerge as the higher price renders previously marginal projects financially feasible[3].

Numerous protocols have undergone significant testing and revisions and although many are currently being implemented, awareness of the potential is limited. As a result there has been significant interest in exploring the concept of "offset stacking", where multiple, distinct and separate emission reduction opportunities could occur within one operation. Viresco Solutions completed a recent study that explored the benefits of participation in offset protocol stacking on a provincial and farm level, as well as gaps and recommendations for moving forward.

OF THE OVER 40 MILLION TONNES OF REGISTERED, VERIFIED REDUCTIONS THAT HAVE BEEN LISTED ON THE ALBERTA OFFSET REGISTRY, MORE THAN HALF COME FROM BIOLOGICAL SOURCES.

TABLE 1: UNDISCOUNTED VALUE OF GROSS REVENUES (AT C$30 PER TONNE) FROM CASE STUDIES[4]

CASE STUDY	Average annual revenue (C$)	Average annual tonnes(mt)	Revenue over the 10-year period (C$)
1 – Black Soil Zone– CCP, NERP and Wetlands	$20,280	676	$203,610
2 – Dk. Brown Soil Zone – CCP, NERP, Fed Cattle and Low RFI	$68,490	2,283	$684,900
3 – Brown Soil Zone – CCP, NERP, Dairy and Energy Efficiency	$103,470	3,449	$1,034,700

PROVINCIAL LEVEL ADOPTION

The study provided an analysis of the annual offset value at the provincial level based on wide adoption of specific protocols by Alberta farms and ranches. The estimates rely on previously published research into both nationwide and Alberta-based carbon reduction potentials. The analysis shows that emission reductions of up to 4.14 million tonnes CO2e a year could be achieved through wide-scale adoption of approved, and yet-to-be approved protocols. The anticipated value of these offsets at C$30/tonne is C$90,000,000 a year.

FARM LEVEL CASE STUDIES

Three case studies of representative farms, selected by soil zone, were used to assess the value of stacking protocols: agricultural nitrous oxide emission reductions (NERP); conservation cropping (CCP), reducing greenhouse gas emissions from fed cattle; selection for low residual feed intake (RFI), markers in beef cattle; emissions reductions from dairy cattle; and energy efficiency. The draft wetlands restoration protocol was also modeled. Table 1 summarizes the undiscounted value of the amount of gross revenues estimated at C$30 per tonne for each of the Case Studies.

Many of the practices outlined in the protocols result in significant co-benefits and the study assessed efficiency gains and co-benefits for the stacked offset opportunities. Conservation cropping, NERP and the fed cattle protocol have the potential to generate significant emissions reductions, but even on the largest farm case (Case 3) stacking still did not generate enough tonnes for a single operation to be economically viable in the carbon market.[5]

These projects must therefore be aggregated into a larger project so credits can be transacted in an economically viable manner. This is an area where Alberta has demonstrated innovation in best practices. The other protocols explored generate limited tonnes and require significant additional work in order to attract investment.

SUMMARY

Crossing the biological bridge requires MRV practices that have been developed, tested and commercialized in Alberta's offset market. Alberta is well positioned to engage and partner beyond its borders, and the world is ready and anxious to benefit from the investments made to date in knowledge creation, innovation and technology development.

While significant, the theoretical potential of Alberta's biological sector cannot be fully realized as there are many barriers and constraints preventing broad uptake. Challenges exist because most of the

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opportunities for these land- and activity-based protocols are characterized by small tonnage, geographically-dispersed projects requiring coordination and aggregation, with solid verification systems, to realize the potentials.

International focus on the goal of a deeply decarbonized future[6] will need to mobilize the "biological bridge" as we transition our energy sources. This suggests that immediate opportunities for partnering and alignment exist in the area of carbon offset technologies and strategies, including MRV infrastructure, modelling platforms and data capture systems.

As a leader, Alberta is positioned to share science-based knowledge, and generate further Investment in identifying additional immediate and future opportunities to expand science-based emission reductions and technological opportunities related to keeping produced carbon out of the atmosphere (through value-added carbon use, sequestration or emissions avoidance).

Agricultural offsets represent an important "bio-bridge", generating reductions today while future technologies are developed to reduce emissions. The bio-bridge improves agricultural production efficiencies and adaptation to a changing climate and is vital to stimulating reductions worldwide.

Failure to capitalize on the potential means that 20-30% of the world's reduction potential that lies in the biological sector is stranded. Climate-smart agriculture has the potential to advance environmental goods and services long-term which is critical to protecting and enhancing water, habitat, farmer economics and other societal goals.

Now more than ever, the role of the agriculture, forestry and land use sector will be critical to realizing a decarbonized economy globally. Therefore, investment is needed to bridge the knowledge gaps for new emission reduction opportunities, data and management platforms, education and information sharing, measurement and modelling, offset protocol development/ refinement, low cost validation and verification systems.

Karen Haugen-Kozyra *is President of Viresco Solutions*

(1) Examples include Australia's Carbon Farming Initiative methodologies; Best practice guidance references for protocols/methodologies on the American Carbon Registry and Verified Carbon Standard's proposed protocols; Integration of the Nitrous Oxide Emission Reduction Protocol's (NERP) MRV approaches into supply chain metrics through Field to Market; Fertilizer Canada $3M investment on furthering 4R Nutrient Stewardship science in the NERP; Royal DSM's clean cow compound investment for large scale field trials in Alberta; Shell Canada investment in researching grazing practices to biologically sequester carbon; the Climate Change and Emissions Corporation's Bio-Fund call interest. (2) Tonnes from the practice of reduced till include tonnes from the Conservation Cropping Protocol as well as the Tillage System Management Protocol (3) Alberta's technology fund is a compliance option under the regulatory framework and is administered by the Climate Change and Emissions Management Corporation (CCEMC) (4) The three representative farms include a cropping operation in central Alberta (3000 acres); a vertically integrated mixed beef and crop operation in S. Central (3500 acres; 25,000 head feedlot); and and a large cooperative-based farm consisting of dairy, poultry, hogs and cropping (10,000 acres, two thirds under irrigation). (5) To be economically viable, a project typically consists at a minimum of 10,000 tonnes to cover a buyer's due diligence and administrative costs. (6) Of the 188 countries who submitted their targets (Intended Nationally Determined Contributions or INDCs) to the UN for the Paris Agreements in December 2015, over 95% included the agricultural sector as having a significant mitigation/adaptation contribution to their national targets.

NOTES

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