

Networked Carbon Markets

Networking Carbon Markets— Key Elements of the Process

July 2016

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This Discussion Paper was prepared by the author for the World Bank Group's Networked Carbon Markets (NCM) initiative. It describes the rationale, objectives and key elements of the NCM initiative.

It is expected that the proposed concepts and components outlined in this Paper will evolve based on discussions with stakeholders, further technical work, and negotiations under the United Nations Framework Convention on Climate Change.

This is the second iteration of the Paper, which is 'live' and will continue to be updated to capture the evolution of the NCM initiative.

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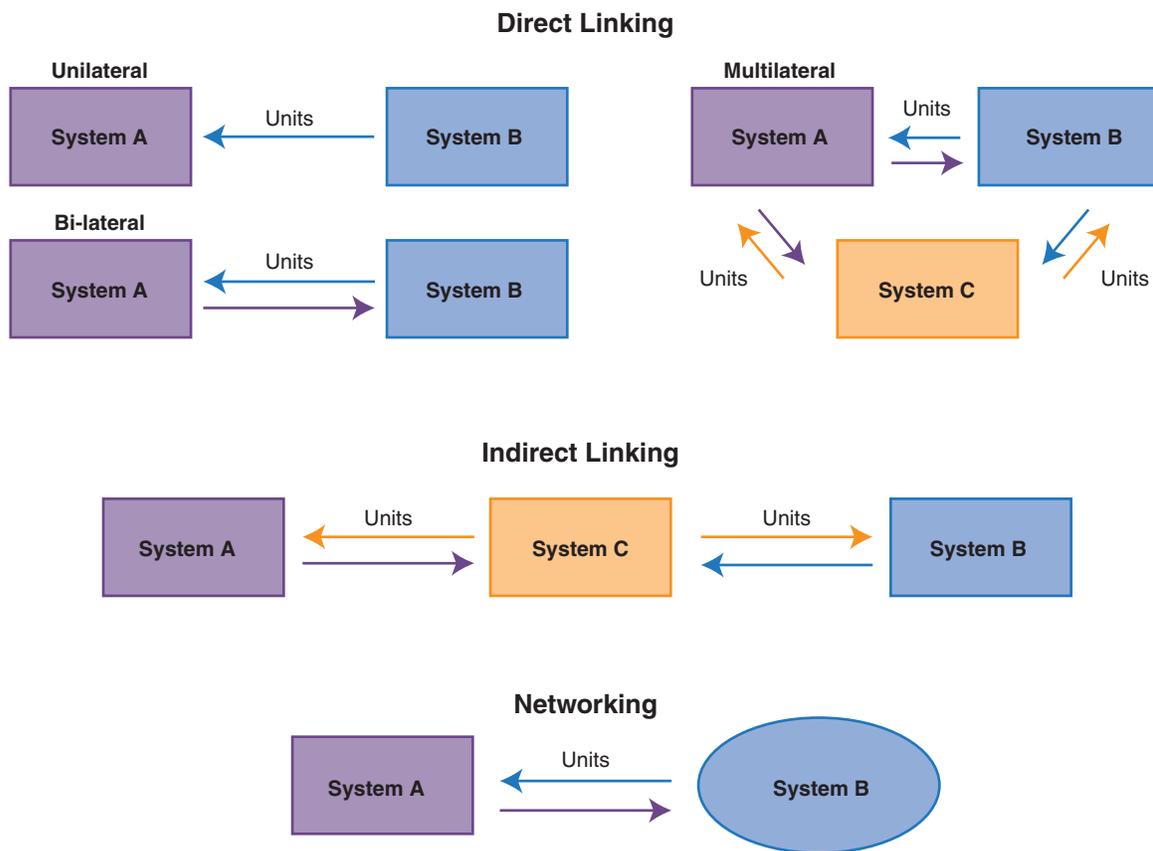
1. Introduction

The World Bank's Networked Carbon Markets (NCM) initiative is collaboratively exploring the post-2020 tools, services and institutions needed to enhance the transparency, comparability, and fungibility of heterogeneous climate actions, for a connected international carbon market. The cost and efficiency benefits of linking will be important for engendering more climate action and supporting the global developmental goal to limit global warming to 2°C and aim to limit it to 1.5°C. The NCM initiative aims to enable comparison of different mitigation actions and trade across different mitigation outcomes in a way that is: inclusive; transparent; efficient; and has environmental integrity. It is founded on the assumptions that firstly, the linking of diverse and heterogeneous mitigation actions is desirable; secondly, that governments and market participants need information about the schemes with which they enter transactions and the assets they acquire through those

transactions; and thirdly, that governments should retain the sovereignty to act on the information about those other mitigation actions and assets as they see fit.

Generally, the form of any linking arrangement will range from a very loose alignment (soft link) to a very tight alignment of key elements (a hard link)—see Figure 1 below. Hard linking requires aligning the design features of mitigation actions—some of these design features may be easily reconcilable among the linking partners, while others may not. Recognizing that aligning mitigation actions can be a lengthy and costly process, especially once a mitigation action has already been implemented, “networking” is one form of ‘soft’ linking that can offer an alternative solution. Rather than seeking to align mitigation actions, networking is about facilitating trade of the outcomes of those actions by recognizing differences and placing a value on these differences.

Figure 1: Types of Linking



Source: International Bank for Reconstruction and Development/The World Bank (2016).

The effectiveness of any type of linking arrangement (direct linking, indirect linking, networking) is contingent upon the transparency of the process and accountability of relevant institutions and governance frameworks. If countries and market participants lack information about the environmental integrity of the actions that they are linked to, there will be very little interest in linking and little interest in trading. The services and institutions developed through the NCM initiative are intended to provide governments and market participants with the information that they might need in order to link.

The services and institutions developed through the NCM initiative might be introduced in a phased manner, initially supporting countries to design robust mitigation actions and facilitating comparability and linkage within countries. It is intended that these services and institutions could help to facilitate linkage bilaterally, before being extended to markets on a regional basis—perhaps through ‘carbon clubs’—and in the long term helping markets to link on a global basis.

A key element of the NCM initiative is a risk-based approach to assessing climate change mitigation value of heterogeneous mitigation actions. The need to assess mitigation value (MV) rests upon the assumption that many different actions have mitigation outcomes, but that they don’t necessarily have the same mitigation outcomes. MV is intended to provide a way to differentiate between assets that are generated from mitigation actions that vary in their design, implementation and impact.

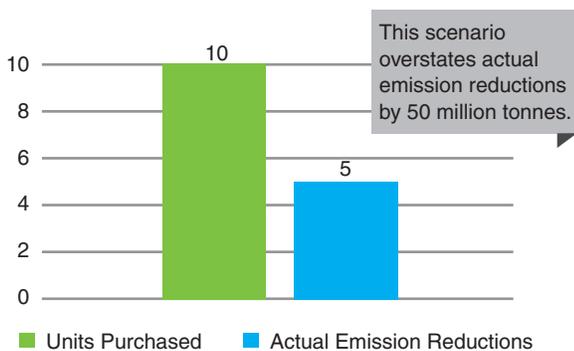
Differentiating actions based on their MV was less important under the Kyoto Protocol since most tradable actions followed similar rules and procedures, as prescribed and verified under the Clean Development Mechanism (CDM) or Joint Implementation (JI) mechanism. The Paris Agreement, reached in December 2015, is much less prescriptive and leaves the rules open to the discretion of national governments. Assessing MV responds to the demands of a new Paris Agreement regime to better understand the bespoke rules and procedures that different domestic mitigation actions rest upon, and the resulting mitigation impact of the outcomes that they produce. MV seeks to provide assurance of the environmental integrity of the asset, in accordance with rules and procedures that are recognized by regulations, a regulatory body and/or participating jurisdictions, as illustrated in Figure 2.

In preparing this paper, informal discussions have occurred and feedback has been obtained from a series of partners also working on various elements of the NCM initiative or who have expressed interest in it. In particular, account has been taken of the concepts and ideas set out by Andrei Marcu in the paper ‘NCM and the Post-2020 Global Climate Change Regime’, the relevant sections of which are copied in Annex A, and also a paper on Article 6, Paris Agreement. Others include: Jennifer Austin, consultant on NCM; Clayton Munnings, consultant on NCM; Climate Markets & Investment Association (CMIA—Adrian Rimmer, Fenella Aouane); European Energy

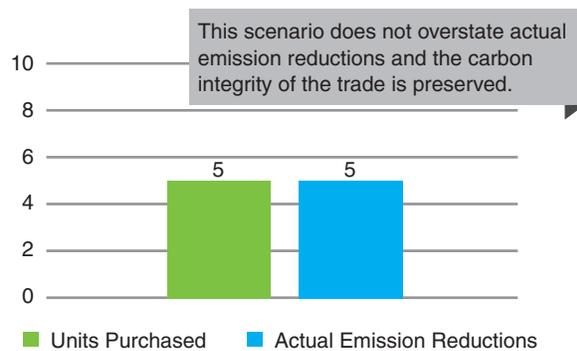
Figure 2: How MV Protects the Environmental Integrity of Trade of Mitigation Outcomes

Scene: 10 million × ‘Country A’ carbon allowances are purchased by Country B. The actual mitigation value of each ‘Country A’ asset is 0.5 tonnes.

Scenario 1: The actual mitigation of Country A’s carbon assets are not accounted for in the trade



Scenario 2: The actual mitigation of Country A’s carbon assets are accounted for in the trade



Mitigation Value is intended to preserve the environmental integrity of the trade.

Source: World Bank.

Exchange: EEX/Eurex (Manuel Möller, Steffen Löbner); London Stock Exchange Group, FTSE Group (Kevin Bourne, Gordon Morrison) and Mike Wilkins of S&P.

Account has been taken also of papers by: International Institute for Sustainable Development (IISD)/New Climate Institute (Frédéric Gagnon-Lebrun, Seton Stiebert) 'Scorecard to Assess Carbon Integrity Risks'; Grantham Research Institute on Climate Change and the Environment (Luca Taschini and Corina Comendant): 'A Comparative Assessment of Design Options for an International Carbon Asset Reserve'; Climate Transparency Initiative: 'A Guide to Climate Performance Assessments for the G20'; INFRAS (Fuessler and Wunderlich) and GRI (Taschini): 'International Carbon Asset Reserve—Prototyping for instruments reducing risks and linking carbon markets'; Reed Smith (Peter Zaman and Adam Hedley) 'The regulatory framework to support carbon market linkage—a concept paper'; and concepts developed in the World Bank (Mitigation Action Assessment Protocol (MAAP) and the assessment approach proposed by Johannes Heister).

This paper builds on the findings of an earlier version published on the World Bank website (link: <http://www.worldbank.org/en/topic/climatechange/brief/globally-networked-carbon-markets>) in 2015, the objective of which was to describe key elements of the mitigation value assessment process. This paper, updating the earlier version based on stakeholder feedback received, will inform a model for the NCM initiative, to be prepared at a later date.

Section 2 looks at the situation on the ground in the wake of the 21st Conference of Parties to the United Nations Framework Convention on Climate Change (UNFCCC COP21) and the Paris Agreement. It provides a brief analysis of the Paris Agreement as it relates to markets, taking account of work by Marcu.¹ It also acknowledges the subject matter of the NCM initiative, that relates to the diverse and heterogeneous mitigation actions that are being put in place by jurisdictions around the globe, both those included in the Nationally Determined Contributions (NDCs) lodged by Parties to the UNFCCC and those that operate outside the scope of NDCs.

Section 3 considers the conceptual framework of the NCM initiative, post-COP21, with the aim of providing a background against which key elements of the NCM

initiative may be considered. Section 4 and Section 5 elaborate on these elements and Annex C provides a glossary of terms. These sections consider how a commonality that facilitates fungibility might be achieved and how trading might result. The role of a generic 'international transaction unit' and supporting infrastructure is also introduced in these sections.

Section 6 turns attention to the types of institutions that might be required, including ones suitable to participate in the MV assessment process, providing practical examples, and considering the types of expertise and tools those institutions might leverage. It also considers options for regulatory supervision of the MV assessment process. Other institutions involved will include those participating in any exchange rate or trading coefficient setting processes, registries, the ISP (international settlement platform), and ICAR (international carbon asset reserve). This section also examines the approach that might be taken to determining an appropriate institution to exercise overarching regulatory supervision, noting that under Article 6 (the Cooperative Approaches mechanism) of the Paris Agreement, the Conference of the Parties (CMA) will provide guidance and not governance.

Section 7 looks at questions of market design and the essential infrastructural elements that might be necessary: hardware and software. Consideration is given to possible market architecture—the institutions and their relationships to each other; and this section also briefly touches upon the information technology 'plumbing'—the ways in which institutions are actually linked, that is, the mechanics of how information passes between them, including the potential application of new concepts such as distributed ledger technology.

Section 8 asks the critical question: what is the market? Where will demand come from, how and why will it grow? Section 9 concludes the paper by putting forward recommendations for next steps, noting that the emphasis is on the institutions within potentially interested jurisdictions, including China, India, Chile, Mexico and others through the World Bank Group's Program for Market Readiness, to develop the model as it stands as it might suit their domestic circumstances and to engage relevant stakeholders locally. The NCM work plan for 2016 has a country focus, exploring opportunities and conducting stakeholder consultations.

¹ Marcu, Andréi (2016): Mitigation value, networked carbon markets and the Paris climate change agreement.



2. Situation on the Ground Post the 21st Conference of the Parties (COP21)—The Requirements and Opportunities of a Heterogeneous Environment

2.1. The Decision as It Relates to Mitigation Actions, Especially Markets

The Paris Agreement, reached in December 2015, includes provisions that recognize transfers of mitigation outcomes, resulting from mitigation actions, between jurisdictions. Parties may engage on a voluntary basis in cooperative approaches that involve the use of ‘internationally transferred mitigation outcomes’ towards nationally determined contributions.² These should promote sustainable development and ensure environmental integrity and transparency, including in governance, and apply robust accounting to ensure, inter alia, avoidance of double counting consistent with the guidance developed and recommended by the Subsidiary Body for Scientific and Technological Advice (SBSTA) pursuant to the decision in paragraph 36.³

The use of internationally transferred mitigation outcomes to achieve NDCs under the Paris Agreement shall be voluntary and authorised by the participating Parties.⁴

A mechanism to contribute to mitigation of greenhouse gases (GHGs) and support sustainable development is also established for use by Parties on a voluntary basis.⁵ Again, the SBSTA is charged with the task of developing and recommending rules, modalities and procedures for this mechanism.⁶ These are to be adopted by the Conference of Parties serving as the Meeting of the Parties to the Paris Agreement (CMA) on the basis of:

- voluntary participation authorised by each Party involved;
- real, measurable and long-term mitigation benefits;

- specific scopes of activities;
- emission reductions that are additional to what would otherwise occur;
- verification and certification of emission reductions by designated operational entities (DOEs);
- experience gained from existing mechanisms under the UNFCCC and its related legal instruments.⁷

The internationally transferred mitigation outcomes (ITMOs) introduced under Article 6 can be used towards NDCs, if they follow the guidance of the CMA. Similarly, the ‘mechanism’ introduced under Article 6 is for the purpose of contributing to mitigation of GHGs and sustainable development. The guidance in the case of ITMOs is expressed only in terms of accounting and the rules, modalities and procedures for the mechanism are to be in the terms listed above in the preceding paragraph. It can be concluded that the ITMOs and mechanism contributions are to be taken into account only for inclusion in domestic calculations of NDCs.

It is noted that (at the time of writing) discussions and negotiations continue between the Parties as to interpretation and implementation of these and other provisions of the Paris Agreement. As such, and as the focus of this paper is on the networking of mitigation actions, especially markets, discussion will be confined for the most part in this paper to the ITMO element of the Cooperative Approaches mechanism.⁸

Importantly, under the Cooperative Approaches mechanism, ITMOs can be generated from any mechanism, procedure or protocol: the Paris Agreement does not specify that ITMOs need to be generated

² Paris Agreement, Article 6, paragraph 2.

³ Ibid.

⁴ Paris Agreement, Article 6, paragraph 3.

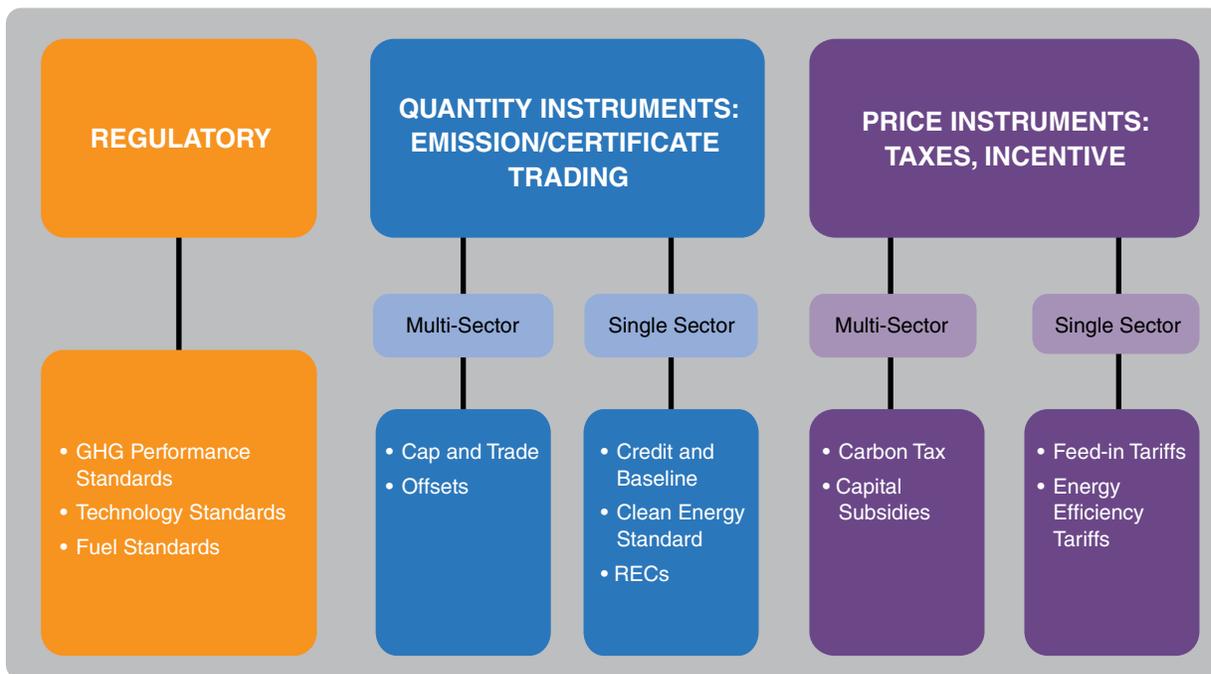
⁵ Paris Agreement, Article 6, paragraphs 4–7.

⁶ Decision 1/21, paragraph 38.

⁷ Decision/21, paragraph 37.

⁸ The mitigation mechanism supporting sustainable development elaborated in Article 6, paragraphs 4–7, will be picked up in a later version of this paper, once there is greater clarity around its rules, procedures and modalities.

Figure 3: Some of the Actions That Countries Are Designing and Implementing under the Cooperative Measures Mechanism



only from emissions trading schemes (ETs) and/or carbon taxes. This breadth in scope of the Cooperative Approaches mechanism means that it will accommodate a patchwork of different mitigation actions. Figure 3 illustrates some possible mitigation actions and outcomes that could be delivered under this new Paris Agreement regime.

Furthermore, the Paris Agreement indicates that the CMA will provide guidance (not governance) in relation to the Cooperative Approaches mechanism. In the overall context of voluntary commitments by Parties through their NDCs, and the greater emphasis placed on transparency in the Paris Agreement, it is logical that governance frameworks will need to be established outside of this mechanism. These governance frameworks will ensure that mitigation outcomes are transferred in a way that is transparent and efficient. In the absence of top-down governance, it seems clear also that countries will need to establish independent processes to provide assurance of the environmental integrity of ITMOs, in accordance with rules and procedures that are recognized by all participating jurisdictions and stakeholders.

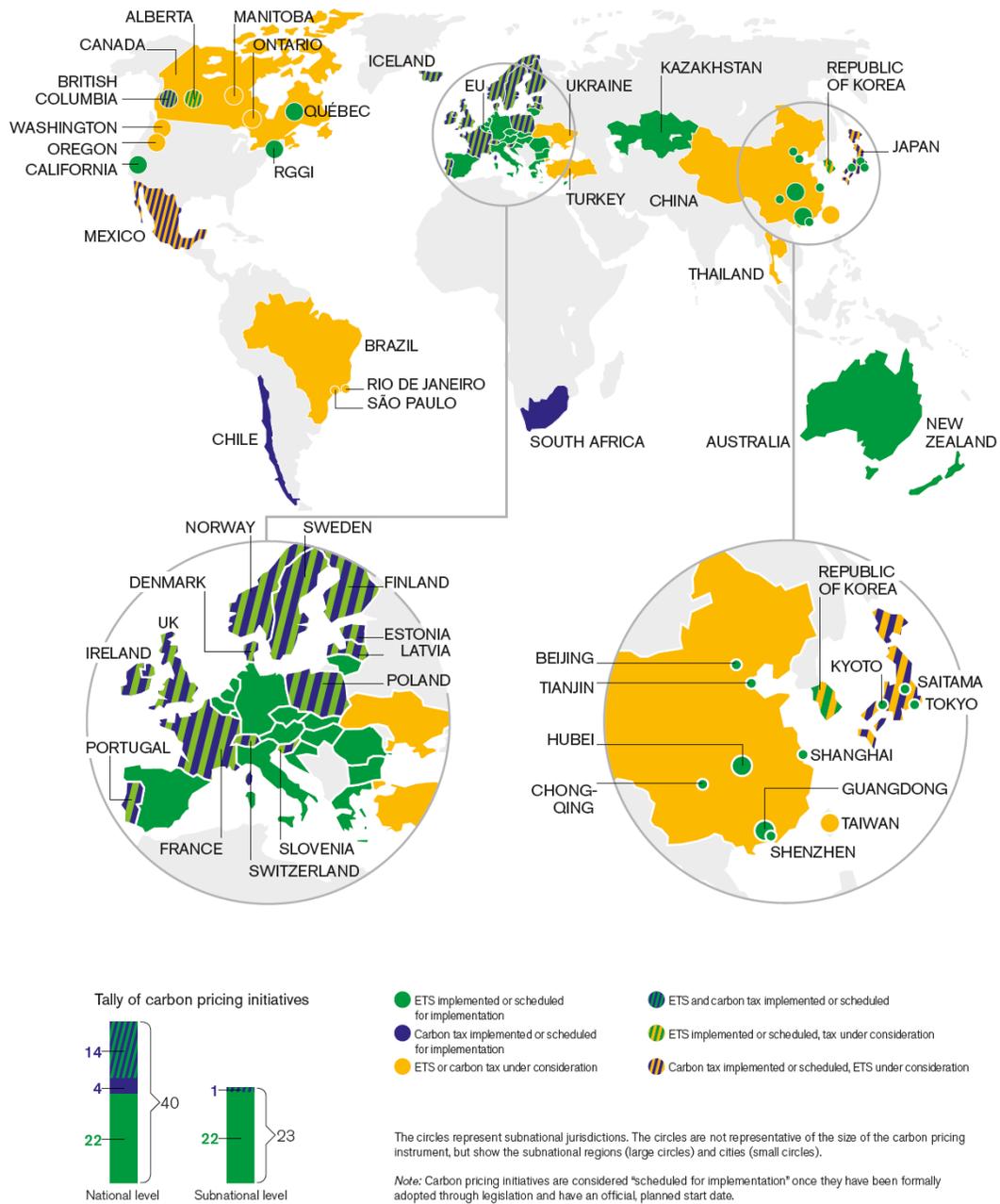
2.2. Existing Heterogeneous Mitigation Actions

It is important not to lose sight of the reason for, and subject of, the NCM initiative, namely the diverse and heterogeneous mitigation actions that are being put in place by jurisdictions around the globe, as is illustrated in Figure 4.

It can be seen that mitigation actions being implemented in diverse jurisdictions around the world are not limited simply to carbon pricing mechanisms. Nevertheless, as of 2015, there were nearly 40 countries and 23 sub-national jurisdictions designing or implementing different carbon pricing policies such as emissions trading systems or carbon taxes.⁹ These included in Canada, schemes in Alberta and Québec; in the United States, the California Cap-and-Trade Program and the Regional Greenhouse Gas Initiative amongst nine north-eastern states; planned or existing emission trading schemes, at a national level, in New Zealand, Switzerland, Korea and Kazakhstan; and, at a sub-national level, in seven city-regions of China; in Japan, three regional ETS, as well as various other voluntary crediting or offsetting instruments,

⁹ World Bank, 2015, State and Trends of Carbon Pricing 2015, Washington, DC: World Bank, chapter 4.

Figure 4: Evidence of the Heterogeneity of Responses Occurring in Jurisdictions around the World



with a national ETS under consideration; and a carbon price mechanism in Australia.¹⁰ In addition, there were at least a dozen national and sub-national jurisdictions where a carbon tax applied, with others considering the introduction of such instruments.¹¹

Equally importantly, in the case of the emissions trading schemes, they differ in many key design aspects, including in areas such as:

- the nature of the asset traded, and base unit of its measurement;
- jurisdictional level of implementation;
- number of compliance entities under the scheme;
- banking and borrowing rights of compliance entities;
- distribution of assets—grandfathering, auctioning;
- lifespan of asset, surrender obligations of compliance entities;
- use of offsets/credits within the scheme, permitted sources of those credits/offsets.

These schemes are mentioned here solely to help keep them in mind while consideration is given to the issues and proposals described in this paper. It is noted that in the lead up to COP 21, 119 NDCs, covering 147 Parties to the UNFCCC, had been communicated by 1 October 2015. Of these, nearly half of the Parties indicated an intention to use market-based mechanisms. Some Parties identified those instruments as a condition for the implementation of their NDCs. While almost no quantitative data was included on the degree of use expected, some Parties did indicate that the use of market-based mechanisms would be to achieve only part of their mitigation targets.¹² Nevertheless, this does give an indication of the level of support for such mechanisms.¹³

¹⁰ Ibid.

¹¹ Note 9 *supra*, chapter 5.

¹² UNFCCC Synthesis Report on the aggregate effect of the intended nationally determined contributions, FCCC/CP/2015/7, unfccc.int/resource/docs/2015/cop21/eng/07.pdf, accessed 14 April 2016, p. 38, paragraphs 180–182.

¹³ See also Section 8.



3. The Foundations—Background Framework Concepts Post-COP21

This section aims to provide a framework within which the mitigation value assessment process might be considered. In so doing, the aim is not only to reach some level of consistency of understanding of the concepts and terms, but also to flag some of the areas that could benefit from further investigation.

A. *Carbon markets as a creation of policy—compliance drives demand*

- (i) The UNFCCC and Intergovernmental Panel on Climate Change (IPCC) position, that is, the generally accepted position of most governments globally, based on scientific research, is that GHG emissions must be reduced to avoid dangerous anthropogenic climate change.
- (ii) To achieve these reductions requires fundamental changes in the structure of the way in which economies are organised, away from activities that generate such emissions or in the way those activities are carried out.
- (iii) Pricing mechanisms and, in particular, markets, were introduced to facilitate an economically efficient transition to a low carbon emission economy—carbon trading is only a tool for achieving the policy objective of reduced emissions.
- (iv) There is no natural market for avoided/reduced/sequestered GHG emissions, that is, no natural demand. Demand is generated by the imposition of obligations on the economic actors responsible for the emissions—these obligations take the form of requirements on emitters to reduce their emissions profile over time.
- (v) Hence demand in the carbon market is primarily compliance driven.

B. *Top-down model*

- (i) The Kyoto Protocol includes an attempt by the signatory Parties—national governments of sovereign states—to put in place such a compliance driven market.
- (ii) Parties listed in Annex B made quantified emission limitation and reduction commitments (QELRCs) to reduce their emissions by the stated percentage amounts over a fixed five

year period (First Commitment Period 2008–2012), with the intention that there would be subsequent commitment periods.

- (iii) Some states and the European Union (EU) gave further application to the market concept by creating corresponding obligations on domestic economic actors and establishing schemes for trading between these entities (e.g., as in the European Union Emission Trading Scheme (EUETS)).
- (iv) While the EUETS has had success in reducing emissions of the entities on which it places compliance obligations, the top down model has shortcomings, inter alia, because:
 - a. the idea of a top down, compliance-driven model is limited due to the inability to impose and enforce compliance commitments on sovereign states (in a regulatory command and control sense), keeping in mind that compliance is the underlying driver of demand in this market; and
 - b. politically and economically, national governments of sovereign states will always act to protect the national self-interest, hence voluntary commitment is not an adequate substitute for the ability to enforce compliance.

C. *Bottom-up model*

- (i) A response to the shortcomings of the top down model has been the growth of implementation or development by individual jurisdictions, both at the sovereign state and sub-national levels, of their own mitigation actions, including trading mechanisms.
- (ii) Differences in the design and other elements of these mechanisms, while reflecting local preferences and circumstances, have resulted in fragmentation and heterogeneity.
- (iii) In order to improve the liquidity and depth of these markets, and help them leverage new low carbon financing and investment, ways are being

explored to facilitate fungibility of the diverse assets traded in these heterogeneous markets.

- (iv) Fungibility of the assets being traded presumes either (i) the assets are all the same, which cannot be the case here unless all the heterogeneous trading schemes are made the same; or (ii) that there is a way of evaluating and comparing the relative values of the diverse assets being traded, for example, by applying exchange rates or ratios.
- (v) An evaluation and comparison of the various diverse assets might be made by assessing the MV of the jurisdictional environments within which the assets are being generated: the MV assessment process might then inform trading coefficients, or rates of exchange, or ratios, at which assets can be traded between schemes, whether that trading is between schemes in a single jurisdiction, or across two or more jurisdictions.

D. Bottom-up framework in the context of the Paris Agreement, post-COP21

- (i) The Paris Agreement offers a hybrid framework, drawing on the strengths of the top-down approach by providing guidance to support bottom-up mitigation actions. In a number of ways, the Paris Agreement can be seen as providing a hook for markets and linking.¹⁴
- (ii) The emphasis is on how mitigation actions contribute to Parties' NDCs in mitigating GHGs. However, the Parties' NDCs themselves are non-binding commitments. Hence, compliance as the driver of demand in carbon markets applies up to the national level of a sovereign state, but no higher, that is, not at an international level.
- (iii) Under the Paris Agreement regime, there is no compliance obligation on a Party, such as there was under the Kyoto Protocol to surrender Assigned Amount Units (AAUs) against its quantified emission limitation and reduction commitment (QELRC). While procedural aspects of the Paris Agreement are legally binding, substantive aspects—such as the undertakings by Parties in their NDCs—are not. It might be

asked what, if any, significance this has for the definition of an ITMO, or of a 'mitigation contribution' in the Article 6 mechanism?¹⁵

- (iv) The Paris Agreement emphasis is on the public availability of NDCs and the five-year cycles of review and resetting of NDCs. Each cycle is to be more ambitious than the last and through these cycles, Parties are to 'ratchet up' efforts to keep global temperature increase well below 2°C above pre-industrial levels and pursue efforts to limit the increase to 1.5°C above pre-industrial levels.¹⁶
- (v) Greater emphasis is also placed on transparency. Article 13 provides that "an enhanced transparency framework for action and support, with built-in flexibility which takes into account Parties' different capacities and builds upon collective experience, is hereby established."¹⁷
- (vi) These elements accord with fundamental underlying assumptions of the NCM, namely, that:

- governments will likely need information about the jurisdictions and mitigation actions with which they link and the mitigation outcomes, which may be purchased;
- the effectiveness of mitigation actions and the assets generated may change over time, as might the economic or emissions profile of a jurisdiction and, therefore, this information would need to be collected and monitored on an ongoing basis;
- similarly, market participants will also need access to such information to make informed investment decisions;
- some governments and market participants will have the resources to do their own due diligence on an ongoing basis, others may not: for those governments and market participants that do not have access to these resources, an independent source of information would be important. Imagining a linked international carbon market that accommodates over sixty national and

¹⁴ For example, Decision 1/21, paragraphs 31, 36–38, 107, 133–136 and Paris Agreement, Article 6.

¹⁵ This question is considered further in Section 4.

¹⁶ Earth Negotiations Bulletin, Vol. 12, No. 663, "Summary of the Paris Climate Change Conference: 29 November–13 December 2015, International Institute for Sustainable Development (IISD), 15 December 2015, at p. 43.

¹⁷ Paris Agreement, Article 13, paragraph 1.

sub-national jurisdictions, would suggest that *not* relying on an independent due diligence process would impose an immense resource burden, particularly if due diligence were needed to be conducted on an ongoing basis; and

- further, it is implicit that governments retain the sovereignty to act on this information however they please—as long as it is responsible and in accordance with transparent rules that are made available to other market participants.

(vii) By assessing the MV of the jurisdictional environments within which assets are generated, not only will it be possible to derive trading coefficients, or ratios, between schemes or with other participating jurisdictions, but also a valuable informational tool will be available to enhance market transparency and facilitate benchmarking by governments both internally and externally.

E. What is 'mitigation' and how is a value attached to it?

- (i) Mitigation means stabilising GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, which is the ultimate objective of the UNFCCC (Article 2).
- (ii) According to the IPCC, this means keeping average global temperature increase to less than 2°C above pre-industrial levels. The Paris Agreement aims to strengthen the global response to the threat of climate change by not only holding the temperature increase to well below that level but also by pursuing efforts to limit that increase to 1.5°C above pre-industrial levels.¹⁸
- (iii) Mitigation can be achieved in two ways:
 - (i) limiting or reducing anthropogenic GHG emissions by sources to the atmosphere, or
 - (ii) preserving or enhancing sinks or reservoirs of GHGs.
- (iv) The commitments of Parties under the UNFCCC to mitigate are qualified in terms of (Article 4.1) "common but differentiated responsibilities and

their specific national and regional development priorities, objectives and circumstances" and in terms of (Article 4.2) "the differences . . . in starting points and approaches, economic structures and resource bases, the need to maintain strong and sustainable economic growth, available technologies and other individual circumstances." The Paris Agreement is to be implemented to reflect equity and reframes Parties' commitments in terms of three elements as "the principle of common but differentiated responsibilities and respective capabilities, in the light of different national circumstances."¹⁹

(v) Hence, mitigation relates to the actions (in the context of the UNFCCC, taken by a Party (sovereign state), but in broader terms, taken by any economic actor), to limit or reduce its GHG emissions by sources to the atmosphere or to enhance removals of GHG emissions by sinks from the atmosphere.

F. Mitigation information that might be useful for enabling comparability and linkage

- (i) In developing technical and analytical foundations for a framework to assess and compare different climate change mitigation efforts (the aim of the NCM initiative), it is important to consider what mitigation information might be useful for policymakers and market participants.
- (ii) For the purposes of this paper, MV is defined as a measure of the effectiveness of mitigation efforts, or put another way, the mitigation impact—intended to provide necessary third party due diligence information about different mitigation outcomes, in accordance with recognized rules and procedures.
- (iii) In the context of the Paris Agreement, this information would need to be framed to take account of the common but differentiated responsibilities and respective capabilities, in the light of different national circumstances,²⁰ in which the mitigation efforts are made, in considering those efforts relative to each other. Furthermore, successive NDCs will represent a progression beyond the then current NDC and reflect the Party's highest possible ambition,

¹⁸ Paris Agreement, Article 2, paragraph 1.

¹⁹ Paris Agreement, Article 2, paragraph 2.

²⁰ Article 2, paragraph 2, Paris Agreement.

again reflecting its common but differentiated responsibilities and respective capabilities, in the light of different national circumstances.²¹

- (iv) Hence it could be envisaged that information useful to policymakers and market participants might include not only a scheme's impact, or the impact of a jurisdiction's collective low-carbon policies—but also the impact of a scheme's target, or what that jurisdiction has stated it would achieve in that respect: that is, its relative contribution to the global emission reduction target.
- (v) In the case of Parties to the Paris Agreement, this relative contribution would be as expressed through their NDCs and it is conceivable that it might provide a focal point around which countries with similar levels of ambition coalesce, in much the same way trading blocs develop around shared, common goals and objectives in commerce more generally. Relative GHG contribution might become a principle by which Parties organise themselves for linking or networking, and consequently information as to levels of ambition would constitute an important component in their decision making processes.
- (vi) In theory, a jurisdiction's 'relative contribution' might be compared, also, against a 'view' as to what the relative contribution for that jurisdiction *should* be (taking account of its circumstances) in the context of achieving the ultimate objective of the UNFCCC (that is, keeping average global temperature increase to less than 2° above pre-industrial levels) or Paris Agreement (e.g., not only holding the temperature increase to well below that level but also by pursuing efforts to limit that increase to 1.5° above pre-industrial levels). However, while this might be valuable information to have, how this 'level of expectation' could be derived would not be without controversy. For example, it might be made by an independent, unbiased, expert group, but how such a group could be constituted and the basis on which it formed

its views might be very difficult to determine consensually.

- (vii) The process of operationalizing a framework to assess relative GHG contribution is beyond the scope of this paper. Nevertheless having, as part of the MV assessment, an estimate of the jurisdiction's relative contribution to the global emission reduction target, could tie a jurisdiction's MV back to the ultimate objective of the UNFCCC. While theoretically any jurisdictional level (i.e., national, provincial, local) can state a level of ambition for its mitigation actions, it is unlikely that all jurisdictions will have done so. Furthermore, it is impracticable to consider trying to gather all the data necessary to make valid assessments of whether a jurisdiction's level of ambition is adequate, in global terms, for sub-national jurisdictions (i.e., for provincial, city or local level jurisdictions).²²
- (viii) All the same, in developing an MV assessment process, the relationship between a jurisdiction's MV relative to other jurisdictions, and its MV when compared to (a) its level of ambition and (b) the level of expectation as to its ambition, will need to be explored and considered, as well as the level of jurisdiction at which (a) and (b) should be taken into account.²³

G. How is mitigation value measured?

- (i) The most common standard unit for measurement of GHG emissions is a metric tonne of CO₂-equivalent gas, pursuant to the conventions adopted under the UNFCCC and IPCC Guidelines.
- (ii) While the heterogeneous mitigation actions that are springing up in jurisdictions may vary in the basic unit of measurement they provide for, most of the differences (at least between the trading schemes) seem to be between metric tonnes or US short tons, or as to the types of gas emissions, e.g., CO₂ only, or a number of GHGs. As such, there should not be any difficulty in reducing all of these to a common unit of

²¹ Article 4, paragraph 3, Paris Agreement.

²² Furthermore, it is noted that for transfers of carbon assets between schemes across the boundaries of national jurisdictions, those jurisdictions will need to be Parties to the Paris Agreement and have authorized the transaction for the assets to come within the terms that apply to ITMOs.

²³ NB: if comparing one jurisdiction with another, they need to be assessed in the same way: so if one is a city or province (i.e., sub-national), and the other is a sovereign state (i.e., national), the same criteria must be applied to each in arriving at their respective MVs; cannot look at the level of ambition for the sovereign state, but not for the province, especially if they both operate a trading scheme generating mitigation outcome assets they wish to be fungible.

measurement. Similarly, mitigation by schemes based on energy intensity, fuel substitution, or ratios per unit of production (or similar), or other such measures, should (in most cases) also be capable of being reduced to a unit of measurement common to other schemes, e.g., metric tonnes CO₂-equivalent gas.

- (iii) However, physical measurement of GHG emissions, reductions, avoidance or removals is impractical at best, and possible for only a limited suite of point sources: for example, the USEPA Acid Rain program, in providing for trading in SO₂ emission allowances, benefitted from continuous monitoring of stack emissions of regulated sources: this sort of approach is simply not possible across the board in the case of broader, economy-wide schemes that provide for GHG emissions and reductions, etc., from diverse sources, more generally.
- (iv) Hence both volume of emissions and the extent of their mitigation often will need to be derived as estimates, or indirectly through measurement of proxies. There are well-developed methodologies and a considerable body of data and experience in making such estimations: for example, since 1996, UNFCCC Annex I Parties have been required to submit to the secretariat an annual inventory of their emissions by sources and removals by sinks of all GHGs not controlled by the Montreal Protocol (non-Annex I Parties also have to submit National Communications); both the IPCC and the UNFCCC have issued guidelines; methodologies have been approved also by the Clean Development Mechanism (CDM) Executive Board; and there is also the GHG Protocol (World Resources Institute (WRI)/World Business Council for Sustainable Development (WBCSD)) and International Standards Organisation standard ISO 14064, for GHG accounting and reporting principles and methodologies.²⁴
- (v) A jurisdiction's collective mitigation effort will be a function of the programs, policies and pledges ('mitigation actions') that it has in place to limit or reduce its GHG emissions by sources to the atmosphere or to enhance removals of GHG emissions by sinks from the atmosphere. The

process for determining the effectiveness of a particular mitigation action depends on whether the units are allocated:

- a. *In anticipation* of mitigation outcomes happening (e.g., in the case of an ETS where the number of allowances are announced at the *start* of a commitment period). As with any forecast, there is likely to be a difference between expected and actual mitigation outcomes. The difference explains why caps tend to achieve less (and, perhaps, in more rare circumstances, more) abatement than intended via its objective. This would usually involve measurements/estimations with respect to a forecasted business-as-usual ("BAU") scenario.
- b. *After* mitigation outcomes have been achieved (e.g., in the case of an offset scheme, where credits are issued *after* emissions have been reduced below a baseline). In this case, the effectiveness of the action will be a function of whether the mitigation outcomes that have been claimed, are real. This would usually involve measurements/estimations of the emissions below a stated baseline. There are also other considerations, for instance, how well the mitigation action has been set up: see the IISD risk categories such as: program boundaries/leakage; funding to fully implement; enforcement; accounting, monitoring, reporting, etc.²⁵

Mitigation actions where units are allocated in anticipation of mitigation outcomes (e.g., for an ETS)

- (vi) This process involves understanding why there is likely to be a difference between expected and actual mitigation outcomes. There could be a number of reasons for this including:
 - a. Endogenous or exogenous reasons. Endogenous reasons are those that are related to the impact of the mitigation action. Exogenous reasons are those that arise from actions or events outside of the mitigation action (e.g., economic factors, or decline in production of carbon intensive goods due to lower demand).

²⁴ See also, for example, Climate Action Tracker methodology: <http://climateactiontracker.org/>.

²⁵ Frédéric Gagnon-Lebrun, Seton Stiebert: 'Carbon Integrity Assessment at the Program Level—Scorecard to Assess Carbon Integrity Risks, Supplementary Note', IISD/New Climate Institute, July 2015.

- b. Continuous or discrete reasons. Continuous reasons are regular events that cause outcomes to differ from forecasts. These can be readily incorporated into the cap setting process by adopting conservative assumptions at the outset. Discrete risks, on the other hand, are those that occur irregularly (e.g., tsunami destroying nuclear power plants in Japan). Discrete risks can be further categorized into those that are probable and those that are possible (that is, in terms of likelihood).
- (vii) Given the number of factors that can affect whether expected mitigation outcomes actually eventuate, it would seem impossible to achieve anticipated outcomes equal to actual outcomes. As such, it would seem equally the responsibility of policymakers not to attempt the impossibility of forecasting the future, but rather to:
- be transparent about how actual mitigation outcomes are tracking relative to expected outcomes; and
 - adjust for differences between actual and expected mitigation outcomes, where there may be adverse environmental implications (in this context, refer to Figure 2).
- (viii) Herein is evidenced the essential role of MV in reflecting the extent to which exported units are backed by actual mitigation outcomes. This involves considering the extent to which:
- the BAU has a factual basis;
 - actual emissions are tracking the BAU scenario;
 - emission reductions are a function of exogenous or endogenous factors; and
 - there have been adjustments for differences between actual and expected mitigation outcomes.
- (ix) If a jurisdiction has a number of mitigation actions in place, it is worth also considering how the mitigation actions fit and work together (Do they complement each other? Are there gaps? Overlaps? Inconsistencies? Conflicting elements?).
- (x) The extent to which estimates, indirect measurement through proxies, or direct measurement, are applicable, will vary depending on the size and nature of emissions, the mitigation action and the jurisdiction.
- (xi) Account will also need to be taken of the level of government: is the jurisdiction regional (e.g., EU), national, sub-national, provincial, local—are the emissions and their mitigation particular to the jurisdiction; what degree of independence is there from the next higher level of government (principle of subsidiarity)²⁶—this may dictate the applicability of any of the factors listed in the preceding point in the case of any particular sub-national jurisdiction; and the operation of internationally binding commitments and principles (e.g., principle of supplementarity).²⁷
- H. Additional import restrictions*
- While the concept of MV can provide a valuable informational tool to governments, policymakers and other stakeholders for a range of purposes from internal benchmarking through to international trading in mitigation outcomes, ultimately the administrator of the importing jurisdiction/scheme will decide whether to place restrictions on different types of imports, and what value will be placed on them when they are.
 - Such 'import restrictions' might take the form of quotas, or technical specifications,²⁸ or relate to the value that will be accorded to those imported assets—for example, the level of compliance obligation accepted as being acquitted by surrender of the imported asset. The degree to

²⁶The general aim of the principle of subsidiarity is to guarantee a degree of independence for a lower authority in relation to a higher body or for a local authority in relation to central government. It therefore involves the sharing of powers between several levels of authority, a principle which forms the institutional basis for federal States: http://www.europarl.europa.eu/aboutparliament/en/displayFtu.html?ftuld=FTU_1.2.2.html, accessed 3 August 2015.

²⁷'... the use of the mechanisms [International Emissions Trading, CDM, JI] shall be supplemental to domestic action and that domestic action shall thus constitute a significant effort made by each Party included in Annex I to meet its quantified emission limitation and reduction commitments under Article 3, Paragraph 1' (Article 1 Draft Decision-/CMP.1 (Mechanisms) contained in Decision 15/CP.7, Marrakech Accords).

²⁸For instance, the EUETS specifications excluding or limiting certified emission reductions (CERs) from certain types of projects.

which these import restrictions are imposed and the levels at which they might be set will always be a matter for the prerogative of the receiving or purchasing jurisdiction, or domestically the administrator of the receiving scheme.

I. *What determines financial value ('FV') of a traded asset?*

- (i) The financial value ('FV') of a mitigation outcome is the price a buyer is willing to pay for it. As such, FV will depend on a number of market factors, including demand and supply, market liquidity, and depth of the market, as well as marginal cost in a jurisdiction of mitigating emissions as opposed to buying mitigation outcomes in order to acquit compliance obligations (marginal abatement cost).
- (ii) Whatever level of significance attaches to the MV and additional regulatory restrictions on imports

imposed by the administrator/regulator, market factors such as demand and supply, liquidity, and depth of the market, will remain important in determining the FV of the carbon asset traded. It will always be up to the buyer to decide what price they are willing to pay, in the overall circumstances.

It is important to note that there will be a range of ways in which MV can be applied. Nevertheless, elements of the concept, by whom the assessment process might be carried out and how they might be regulated can all be considered and are, in this paper. In doing so, it is important to keep in mind that for there to be any value in the process these elements seek to inform, the design must ensure that environmental integrity is maintained and that it promotes the objectives of the UNFCCC, but equally, that design should afford certainty, clarity and operational efficiency such that the market can perform the role for which it is intended.



4. A Common Language

This section begins to explore how heterogeneous mitigation actions might be compared, to facilitate trading between them. It looks in greater detail at the mitigation outcome asset, the application of additional import restrictions to it, its financial value, and the relationship between these elements. It looks into MV in more detail also, both the development and refinement of the concept itself and developing a process for its assessment. A glossary of proposed key definitions is set out at Annex C.

4.1. Mitigation Outcomes and Their Values

What Is a Mitigation Outcome Asset?

A mitigation outcome asset is an instrument generated as part of a scheme, project or program that has a mitigation impact. In some jurisdictions, the legal system may classify such an asset as a 'chose in action', meaning that it confers a right enforceable at law. The nature of any property rights (i.e., the right to own, hold and sell) in the assets and in whom those rights are vested may vary from one jurisdiction to another, depending on the legal system in place. The asset may be classified also as a 'financial instrument', depending on the application of financial regulations in any particular jurisdiction.

While the measurement unit used might vary from one scheme to another, mitigation outcome assets are usually measured in base units of a metric tonne of carbon dioxide equivalent greenhouse gas ('CO₂-eq GHG'), whereby Global Warming Potentials (GWP) of other GHGs are used to give the equivalent number of tonnes of CO₂, and GWP CO₂ = 1.

Mitigation outcome assets can take a variety of forms:

- Allowances:
 - are usually issued (either free or by auction) by a compliance scheme (ETS) administrator to scheme participants (compliance entities)—entities emitting GHGs who have obligations under the scheme to mitigate their emissions;
 - compliance entities will be required to surrender allowances equivalent to their GHG emissions for the compliance periods determined under the scheme (e.g., annually);

- Credits/offsets:
 - are generated by projects which avoid or reduce emissions that would otherwise occur, or which sequester GHGs from the atmosphere, in both cases, compared to a baseline;
 - need to be real, measurable and verifiable, as well as additional to BAU;
 - can be surrendered on a voluntary basis, by entities that do not have compliance obligations;
 - depending on the rules of the relevant compliance scheme, may also be able to be surrendered in respect of compliance obligations;
- Other forms of asset might include any sort of units issued pursuant to an NDC, for example, energy intensity units, tax credits, etc., under other schemes or pricing mechanisms.

Design Differences and Fungibility

Mitigation actions have differences in design aspects, which mean that the mitigation outcome assets issued under them will differ from one jurisdiction (or scheme) to another. There are also important similarities, such as the fact that the schemes under which the assets are issued all have the same purpose, namely mitigation of GHG emissions; and that the assets are intended to be or are capable of being traded, and are surrendered against compliance obligations, under the respective schemes.

The fact that these schemes have a common purpose, namely mitigation, provides the means to evaluate the differences between them and, thereby, to arrive at a relative measure of their effectiveness in achieving that purpose.

The NCM initiative aims to enable comparison of different mitigation actions and trade across different mitigation outcome assets by providing for their fungibility. To be 'fungible', means that a thing is mutually interchangeable with another thing that is, for all intents and purposes, identical to it. The comparison of assets across schemes and jurisdictions will be a function of the extent to which differences in the schemes can be reduced to relative values in terms of mitigation. The actual mitigation outcome assets themselves will retain their differences (due to scheme designs) and, not being identical, will

not be interchangeable with, or able to be substituted for, each other, *per se*: that is, they are not ‘fungible’, in the fullest meaning of that concept.²⁹ Rather it will be their relative value—in mitigation terms—that will be capable of being traded into another scheme. This will be achieved by deriving a trading coefficient, or exchange rate, or ratio, for the assets issued under the different schemes or in the different jurisdictions, based on the respective mitigation value assessment outcomes for those jurisdictions (or schemes).

Mitigation Outcomes Generating a Financial Instrument

Another question about the nature of a mitigation outcome asset is whether it is a financial instrument. This will depend on the financial regulations of the particular jurisdiction. For example, in the EU, Directive 2014/65/EU,³⁰ defines ‘financial instrument’ to include emission allowances, consisting of any units recognised for compliance with requirements of Directive 2003/87/EC (Emissions Trading Scheme).³¹ This means that EUAs and some, but not all, CERs will be financial instruments for the purposes of European financial regulations (that is, under MiFID II).³²

Hence, if the assets generated by mitigation actions in place in a jurisdiction are defined as a financial instrument in that jurisdiction, but not in another acquiring jurisdiction, or vice versa, a question arises as to how this will affect them as ITMOs, since that would mean some are financial instruments, while others are not, and that a particular sort of asset might be regulated as a financial instrument in one jurisdiction, but then not be when subject to an international transfer to another jurisdiction, or vice versa. The treatment of ITMOs in this regard may have implications for investment and engagement by financial markets. How such issues are addressed may have a bearing on the effectiveness of the role that carbon markets can play.

Discussion of the treatment of mitigation outcome assets as ITMOs should not detract from the significance of transfers that might take place domestically, that is, between schemes within a jurisdiction. Such transactions may bring the same economic efficiencies and benefits to

participants in the mitigation actions as might be the case with transactions between jurisdictions, but without the necessity of cross-jurisdictional comparison, simplifying the approach to MV and its assessment, matters which are now picked up in the following sections.

4.2. Mitigation Value—Development and Refinement of the Concept

As noted earlier, a key element of the NCM initiative is a risk-based approach to assessing MV across heterogeneous carbon asset classes: mitigation efforts will have an MV, which can be translated into a trading coefficient between schemes, or a rate of exchange, or price, or ratio at which an asset generated by the mitigation action will be exchanged or purchased into another scheme or jurisdiction. In Section 3, MV is defined as a measure of mitigation impact—intended to provide necessary third party due diligence about different mitigation outcomes, in accordance with recognized rules and procedures. The process of measuring mitigation value is now described in further detail.

Measuring Mitigation Impact

Exogenous factors relevant to level of mitigation.

A jurisdiction’s effectiveness in bringing about mitigation will be a function of the mitigation actions it has in place to limit or reduce its GHG emissions by sources to the atmosphere or to enhance removals of GHG emissions by sinks from the atmosphere. Reductions in a jurisdiction’s emissions over any particular timeframe may result also from exogenous factors, such as, for example, reduced activity due to an economic downturn. While the monitored, reported and verified reductions (including any due to such exogenous factors) will be a physical quantity—at least an estimate of such if unable to be measured directly—how they are taken into account when valuing a jurisdiction’s mitigation action, may depend on how they came about.³³

NCM broader purpose than just jurisdictional comparison.

Valuing mitigation efforts of jurisdictions holistically is one approach to developing a framework to assess

²⁹ Unless the schemes are harmonized to a sufficient degree to allow assets from one to be accepted in the other, as in the case of full linking—see discussion in following paragraphs.

³⁰ Directive on Markets in Financial Instruments and amending Directives 2002/92/EC and 2011/61/EC (‘MiFID II’).

³¹ Directive on Markets in Financial Instruments and amending Directives 2002/92/EC and 2011/61/EC (‘MiFID II’), Annex I, Section C, paragraph (xi).

³² MiFID II to apply on 3 January 2018 under the currently applicable timeline: EC press release 10 February 2016.

³³ That is, whether they are due to an effort on the part of the jurisdiction, or some exogenous factor. This point is noted also in following sections of the paper, in considering valuing of a mitigation outcome asset.

and compare different mitigation actions. However, the NCM initiative seeks to achieve more than just broad comparison of jurisdictions' mitigation efforts; rather it seeks to enable comparison of different mitigation actions and trade across different assets in a way that is inclusive; transparent; efficient; and has environmental integrity.

Mitigation actions and tradable assets.

Mitigation actions may involve the creation of assets that are tradable, as in the case of an ETS that works on the basis of tradable allowances being held and surrendered against emissions. The aim is to change behaviour by providing a price signal to economic actors (i.e., the emitters) as to when it is more cost effective to alter their preference—that is, to spend on abatement, rather than buy allowances. For the price signal to work, the effect of exogenous factors on emissions needs to be taken into account.

Paris Agreement acknowledgement of role.

To recap briefly, the Paris Agreement includes provisions that acknowledge the role to be played by transfers of mitigation outcome assets between jurisdictions. Parties may engage on a voluntary basis in cooperative approaches that involve the use of 'internationally transferred mitigation outcomes' towards nationally determined contributions.³⁴ These should promote sustainable development and ensure environmental integrity and transparency, including in governance, and apply robust accounting to ensure, inter alia, avoidance of double counting consistent with the guidance developed and recommended by the SBSTA pursuant to the decision in paragraph 36.³⁵ The use of ITMOs to achieve NDCs will be voluntary and authorised by the participating Parties.³⁶

Need to value assets in terms of mitigation.

While it is too early to know what guidance on robust accounting will be developed and recommended by the SBSTA, it is clear from the Paris Agreement that being able to put a value, in mitigation terms, on the mitigation outcomes transferred between jurisdictions, which is acceptable for the purposes of that accounting guidance from the SBSTA, will be critical to these outcomes being recognized as contributing to NDCs.

Valuing Mitigation Outcome Assets

Assets valued for various reasons—compliance, price.

Economic actors will value mitigation outcome assets for different reasons. For example, an ETS being a creation of policy relies on the compliance obligations placed on compliance entities to drive demand for the allowances issued under the scheme. Hence, assets in such a market will have a value for compliance purposes—their value on surrender. The administrator/regulator of a scheme will decide what value to accept in terms of the physical emissions offset—the compliance obligation acquitted—by the asset surrendered at the end of the relevant period. The market, on the other hand, will attach a financial value to the assets—the price—and although this might be influenced by a range of factors, it will be influenced also by the scheme administrator's view of what to accept in terms of the physical emissions offset.³⁷

How to value traded assets?

In any ETS it is likely that domestically issued units will be issued with a par value. To do otherwise, the particular circumstances, or scheme design, would need to warrant that they be issued at a discount or a premium. Questions arising from this are:

- Will third parties agree that those domestic allowances should have that value? Does this accord with the value those third parties place on the mitigation impact of that scheme or jurisdiction overall?
- Secondly, what value will the scheme administrator assign to, say, project generated credits/offsets accepted under the scheme, or allowances from another scheme, or another jurisdiction?

Is the value for domestic assets realistic?

In relation to the first question, third parties that take a different view of the value of allowances issued under that scheme have two options: elect not to trade with that jurisdiction, or if they do, for allowances from that jurisdiction traded into their scheme, assign a value that reflects their view.³⁸ There is currently a range of ideas on how this can or should be approached (see below). What

³⁴ Paris Agreement, Article 6, paragraph 2.

³⁵ Ibid.

³⁶ Paris Agreement, Article 6, paragraph 3.

³⁷ Hence, in theory, price should be a function of value accorded to asset on surrender, which should be a function of mitigation value.

³⁸ Assuming, for the moment, there are no bilateral or international rules determining how the traded asset is to be valued.

will be more of an issue for the first jurisdiction is if, by assigning a par value for domestic units, the ETS achieves less emission reductions than expected.³⁹

Assigning value to imported assets.

In relation to the second question, in the case of the credits, a risk-based assessment could provide guidance as to the MV and hence the value to assign on surrender. In the case of allowances from another scheme or jurisdiction, the question becomes one of measuring and valuing the mitigation impact achieved in the other scheme or jurisdiction and converting it to a value for the individual traded allowance.⁴⁰ As noted, there is a range of ideas on how this can or should be approached, which are canvassed briefly below.

4.3. Mitigation Value Assessment—Developing a Process

This section does not deal comprehensively with all the work that has been undertaken on this subject.⁴¹ Rather, it simply aims to provide a flavour of the diversity of approaches to the question of how to undertake mitigation value assessment. Amongst other things, it flags the basic issue of the level at which value is being assessed—jurisdictional level, scheme level, or at the level of the carbon asset.

Beginning at the broadest level, one approach is to anchor mitigation value to the policy objective of the UNFCCC by valuing the ambition expressed by Parties to the Paris Agreement through their NDCs.⁴² By starting from the level at which global emissions must be capped to enable temperature increase to be limited to 1.5°C, a comparison can be made with the aggregate commitments of Parties as expressed through their NDCs. Consideration of whether the collective ambition of the NDCs is consistent with the 1.5°C limit; of what individual Parties' fair burden sharing contributions might be; and of whether those Parties will actually comply with their committed levels of

emissions, can provide a mitigation value. This MV might be operationalized through a discount factor in terms of the global temperature goal for mitigation outcome asset units and an exchange rate based on the relative ambition of the transaction participants. The discount factor and exchange rate would be applied to exported units, which would need to be 'budget compliant'.

Also at this global level, Climate Transparency is seeking to foster an independent, globally accepted source of credible, comprehensive and comparable information on climate action in countries. To do this it is bringing together a composite picture of G20 country climate performance on an annual basis. Its work streams, apart from the G20 annual report, include a Climate Change Performance Index for countries, advocacy at the G20, a UNFCCC climate transparency framework and capacity building at the national level.⁴³

At a scheme level, the World Bank Mitigation Action Assessment Protocol (MAAP) assesses the risks relating to the characteristics of a specific program.⁴⁴ It focuses on the mitigation value of carbon credits and while it is intended to enable comparison of carbon assets from jurisdiction to jurisdiction and inform linking decisions, in the short term it can be used to facilitate prioritisation, benchmarking and better program design within a jurisdiction. The MAAP consists of modules for assessing: the quality of the program's design and robustness of its implementation; the track record and capacity of the entity managing design and implementation; the level of risk associated with the jurisdiction where the mitigation action is being implemented; and the sustainable development benefits contributed by the program. Where the carbon assets generated by the program are traded, two additional areas are assessed, being: the jurisdiction's credibility in terms of the likelihood of it achieving its stated targets; and the jurisdiction's contribution to the global emission reduction effort.

³⁹ Where the jurisdiction is a Party to the Paris Agreement, this could mean performance does not match its NDC targets, however, as these are not binding and there is no obligation on Parties to, e.g., surrender AAUs against compliance, as was the case under the Kyoto Protocol, or anything similar, it is not clear at this stage how material a problem this would be.

⁴⁰ Again assuming, for the moment, there are no bilateral or international rules determining how the traded asset is to be valued this will be done by the buyer's scheme administrator.

⁴¹ All relevant references can be viewed at <http://www.worldbank.org/en/topic/climatechange/brief/globally-networked-carbon-markets>.

⁴² Johannes Heister, World Bank Group, Mitigation Value to Enable International Linkage of Domestic Programs, presentation to strategy workshop, Cologne, 28 May 2016.

⁴³ See www.climate-transparency.org.

⁴⁴ World Bank Group, The Mitigation Action Assessment Protocol, February 2016, link: <http://pubdocs.worldbank.org/pubdocs/publicdoc/2016/3/639271458579397657/Mitigation-Action-Assessment-Protocol-Feb-2016-CLEAN.pdf>; developed by DNV GL, Rating of Emission integrity and Mitigation Value of Carbon Assets: Rating of Mitigation Actions; expert reviewed and more granular approach developed by IISD/New Climate Institute, Scorecard to Assess Carbon Integrity Risks, Supplementary Note, July 2015.

At the mitigation outcome asset level, efforts have focused on delineating the components of assets issued and traded under an ETS that represent actual mitigation effort from those that represent a surplus deriving from some exogenous factor.⁴⁵ Work is continuing to examine these and other potential methodologies. Ultimately, there may not be a single methodological approach settled upon, but rather there may be a suite of such approaches that address different levels depending on the needs of any particular user. In this respect, an analogy can be drawn with credit ratings in the debt markets, where

ratings are made of both the issuer (sovereign, corporate, other public sector entity) and the instrument itself. Many elements—such as who will undertake the assessments, how will they be regulated, and how the assessments might be applied—are yet to be clarified. What is apparent, however, given the central importance of an independent assessment framework of mitigation actions to the overall concept of networking markets, is the need for these efforts to provide a workable outcome that is acceptable to stakeholders generally.

⁴⁵ See for instance, unpublished draft by Clayton Munnings, *Defining Mitigation Value for an Emissions Trading System*, dated 18 February 2016.

5. Trading between Jurisdictions

Using MV to Facilitate Trade of Mitigation Outcomes

It is clear from the preceding sections on development of the concept of MV and the process for MV assessment, that it can be a powerful informational tool for governments and policymakers in evaluating progress, both domestically and internationally, towards UNFCCC objectives. This should assist also in fostering the transparency emphasized by the Paris Agreement. Governments may also see value in MV assessments in an introspective sense, as a yardstick for measuring the success of their own mitigation actions, as a tool for internal review, benchmarking and enhancement of policies, or other non-trade related purposes. At the same time, for jurisdictions wishing to achieve greater efficiencies by promoting trade domestically between mitigation actions, or to access international markets by engaging in trade with other jurisdictions, the NCM initiative is developing concepts to facilitate application of MV assessments to foster trading of mitigation outcomes.

5.1. Effect on the Form of the Mitigation Outcome Asset Transferred

The way in which MV is applied to the transaction process can take a range of different forms, leading to differing results. The following examples in this Section 5.1 illustrate the point, which is then elaborated in Section 5.2 and Annex D. In the first example, the asset retains its original form of unit; in the second example, the asset is converted into another unit, either that of the importing scheme or jurisdiction, or some form of 'transaction unit'.

Unit Retains Original Domestic Form

In the first example, when the mitigation outcome asset from Country A is transferred to Country B, the Country A unit ends up in the Country B registry, in the account of the Country B buyer. This approach may be simpler if the buyer and seller have only a small number of trading partners. Subject to any other import restrictions that might apply, MV might be applied to determine the value of the unit, thereby preserving the integrity of trade. The mitigation value would therefore be reflected in the discounted co-efficient of each mitigation outcome transferred. If the buyer/seller have a number of trading partners, retaining the original form of the domestic unit

may be a lot more administratively complex: Figure 5 shows hypothetically all the different unit accounts that Country B might need to have in its registry. This is Scenario (ii) described in Section 5.2 and Annex D.

Unit Converted on Transaction

Alternatively, MV could be applied to convert the domestic unit for export into any of a range of different types of units. For example, at the point of trade:

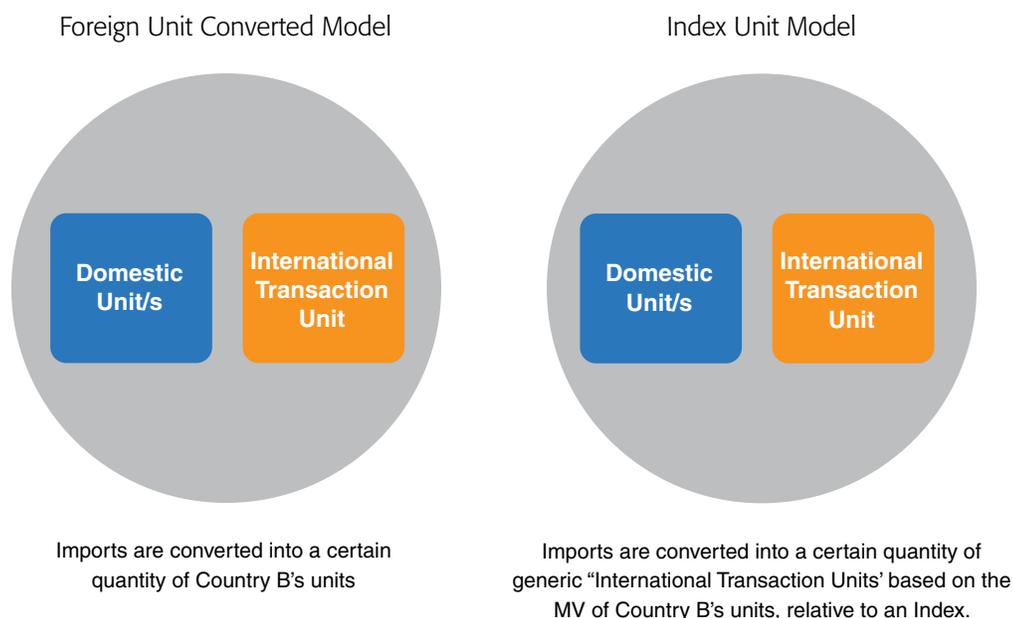
- the domestic unit might be converted into generic 'international transaction units' (ITUs), the conversion factor would be based on the mitigation value: say, if 100 domestic units are sold and the MV assigned to those units is 0.5, then a total of 50 ITUs would be created, and 100 domestic units would be cancelled; or
- the domestic unit might be converted into the unit of the importing jurisdiction;

These examples are elaborated in more detail in Section 5.2.

Figure 5: Administrative Complexity Where Units Transferred but Not Converted and There Are Multiple Trading Partners—Holding Accounts in Country B Registry



Figure 6: Converting Units for Export



5.2. Transaction Mechanisms, Including ITU/ Index 'Transaction Currency' Basis

Different Unit Forms

The forms that transactions take will have implications for how the mitigation value is reflected. To illustrate this, three scenarios are set out in Annex D. It is presumed that each of these transactions will be via an intermediary, namely a settlement platform. Aspects of the form, role and functions of the settlement platform are considered in Section 5.3. However, all transactions will need to be settled and cleared, so it is reasonable to assume that there will be such an intermediary in all transactions. The first two scenarios are:

- (i) foreign unit converted model;
- (ii) foreign unit imported model.

In both these scenarios, units from the scheme in Jurisdiction A (A units) are being sold by Seller A to Buyer B, who has compliance obligations in Jurisdiction B, which trades B units. In scenario (i), upon the transaction taking place, the A units purchased by Buyer B are converted into the equivalent number of B units by the Jurisdiction B scheme administrator, at the prevailing exchange rate, and the A units are cancelled. In scenario (ii), the A units are not cancelled but credited to Buyer B's registry account in Jurisdiction B as A units.

In scenario (i), the Buyer B account in the Jurisdiction B registry only ever receives B units. The Jurisdiction B scheme administrator cancels the A units and credits

Buyer B with the relevant number of B units. This contrasts with scenario (ii), in which A units are transferred into Buyer B's account in the Jurisdiction B registry—it then becoming a matter for the Jurisdiction B scheme administrator to determine how to ascribe value to those A units in the Jurisdiction B scheme, bearing in mind that there are differences between A units and B units (due to differing scheme design aspects).

Further, under scenario (ii), compliance entities in Jurisdiction B (as in all jurisdictions trading on this basis) would need to have accounts for units from all other trading jurisdictions from which they might possibly acquire units. If this applied across all transactions and all jurisdictions engaged in NCM, it would make administration more complex and may lead to inconsistencies and risks: for example, each jurisdiction's registry would look like that illustrated for Country B in Figure 5—every account holder holding accounts for every other participating jurisdiction with which it might trade.

These transaction scenarios illustrate how MV, translated into an exchange rate for the mitigation outcome assets, has implications for the process and, ultimately, for the price.

In scenario (i), as it is B units that are credited to Buyer B's account in the Jurisdiction B registry, the value on surrender of the purchased units will be whatever the Jurisdiction B scheme administrator has set under that scheme for B units. As such, the price of the traded assets

should be substantially influenced by the exchange rate on the transaction date. Hence the relative MVs of the respective jurisdictions should be a factor in the price paid.

By contrast under scenario (ii), on the transaction date Buyer B will not know what value the Jurisdiction B scheme administrator will place on the A units when surrendered. This decision may be influenced by a number of factors, including the way the Networking is designed, for instance, whether exchange rates are 'official' or 'unofficial'; the degree to which scheme administrators agree to apply them; and also the period of time between the transaction and surrender of the A units, by Buyer B, for compliance purposes under the Jurisdiction B scheme: the longer the time between the two events, the greater the chance that the exchange rate will change, which may affect the decision of the Jurisdiction B scheme administrator. Under this scenario, Buyer B carries this risk. It will be a powerful disincentive to purchase from another scheme.

International Transaction Unit

The introduction of a 'vehicle' for transactions (an International Transaction Unit, or 'ITU') in the Networking could greatly simplify the process. In foreign exchange transactions, use of a vehicle currency (e.g., \$USD) greatly reduces the number of exchange rates that must be dealt with in a multilateral system. For example, in a system of ten currencies, with one a vehicle, nine rates need to be quoted; without the vehicle, forty-five rates need to be quoted.⁴⁶

Hence, using a vehicle currency can yield the advantage of fewer, larger and more liquid markets with fewer currency balances, reduced informational needs and simpler operations. In theory, the same principles should hold for exchange rates in Networking. Such simplification should allow the Networking transactions to flow more rapidly and efficiently, reducing also the scope for error and capacity for manipulation and fraud.

The rationale for a transaction vehicle: analogies to the international monetary system⁴⁷

It is helpful here to consider how use of a transaction, or international, currency comes about in the international monetary system. Money fulfils three basic functions, as a:

- (1) medium of exchange;
- (2) unit of account; and
- (3) as a store of value.

An international currency serves the same functions for financial transactions between jurisdictions. Domestically, governments will usually determine what they accept as legal tender; internationally, choice is more a matter of market forces. As such, choice is dictated more by the first two functions, rather than the third. The medium of exchange and unit of account functions, as well as the role of money in conveying information about relative prices, underpin the dominant role of the US\$ as an international currency.

A transaction vehicle unit for trading mitigation outcome assets across jurisdictions would perform similar functions to an international currency. It could serve: as the medium of exchange, that is, as a vehicle for carrying out indirect exchanges between two other types of mitigation outcome asset; as a unit of account, it might be used officially to define exchange rates; and as a transmitter of information it could facilitate transactions by informing counterparties, avoiding the need for them to undertake time-consuming and expensive research of their own; and also convey information about the performance of the market in policy terms, more broadly. This is not to disregard the role it could also usefully perform as a store of value in the Networked market.

For a currency to be used internationally, as in the case of the US\$, there must be confidence in its value (that is, in the issuing country's inflation performance). It should have a stable value: its price relative to other currencies should provide sufficient information to interested parties. There also needs to be confidence in the political stability of the issuing government; and the financial markets in that country should be substantially free of controls, broad—containing a range of financial instruments, and deep—having well-developed secondary markets.

If there is to be an International Transaction Unit, how confidence in its value is gained and maintained, how the stability of its value is supported and how price information is communicated to interested economic actors, are matters that require careful consideration. The body that issues the units will need to gain the confidence

⁴⁶ See also Figure 5 in this respect.

⁴⁷ This section is based on: George S. Tavlas, Finance & Development June 1998—The International Use of Currencies: The U.S. Dollar and the Euro, June 1998, Volume 35, Number 2, International Monetary Fund: <http://www.imf.org/external/pubs/ft/fandd/1998/06/tavlas.htm>, accessed 19/02/16.

of the market in its stability, and the stability and reliability of the process it operates. For instance, if ITUs are issued by an international treaty-based body, its constitution, operational rules, funding and functions will need to be clear, transparent, independent and, above all, stable and consistent.

Index

The nature, characteristics and other aspects posited for an International Transaction Unit, such as how it could be comprised and what it would represent, are considered later in this paper. For the purpose of setting out here a transaction scenario involving an International Transaction Unit, it is proposed that its value derives from an index. However, it might equally be based on a standard or emissions budget (or the index might be), which refers back to a globally agreed emissions target (e.g., such as the UNFCCC objective of keeping average global temperature increase to less than 2°C above pre-industrial levels). These alternatives are explored later in this section.

An index can be defined as a statistical composite that measures changes in the economy or a financial market, often expressed as changes from a base year or a preceding month. Each index has its own method of calculation;⁴⁸ components may be weighted according to certain characteristics, e.g., stock index weighted for market cap.

In scenario (iii) in Annex D, there is an index (the 'Index').⁴⁹ Again, as in the previous two scenarios, units from the scheme in Jurisdiction A (A units) are being sold by Seller A to Buyer B, who has compliance obligations in Jurisdiction B, which trades B units. In this scenario, Seller A converts the A units being sold into International Transaction Units ("ITUs") at the applicable exchange rate; Buyer B then buys the number of B units into which those ITUs convert, at the applicable exchange rate. The B units are transferred to Buyer B's account in the Jurisdiction B registry, relieving the Jurisdiction B scheme administrator of the need to make the conversion by issuing B units and cancelling A units. The exchange rate for A units converted to ITUs⁵⁰ would be derived from the MV of Jurisdiction A relative to the Index. Similarly, the exchange rate for the conversion of ITUs to B units, would be derived from the value of the Index relative to the MV of Jurisdiction B.

The purpose served by the Index in scenario (iii) is to provide a way of comparing the relative MVs of the jurisdictions. In this example, the MV of each jurisdiction is measured against the weighted average for all trading jurisdictions. As noted above, in so doing it provides for ITUs to operate as a 'vehicle currency', analogous to the role of the \$US in FX transactions. The ITUs might be just a notional transaction currency, facilitating the transaction as in the scenario, or they might also serve an investment purpose in their own right. There are many other possible mathematical configurations and variations on the idea of an index. These depend on what information is sought to be communicated, and to whom.

Manner of Application of MV Influences Outcomes

The difference between scenarios (i) and (iii), versus scenario (ii), demonstrates that the form of the transaction, in relation to when and how the traded asset is ascribed a surrender value in the buyer's scheme, will impact on the risk and certainty of the trade. Scenario (iii) centralises the administrative aspect (conversion of A to B units), which would enhance the certainty and efficiency of the process.

However, in all three scenarios, the application of the exchange rate is translated into the number of units converted, which might have implications for the environmental integrity of the overall scheme, since it could potentially result in more units (which are rights to emit) being created in the scheme. While this risk might be addressed through design aspects,⁵¹ it raises a fundamental question: should the scheme design be such that the MV assessment process can translate into differentials between jurisdictions **both** in terms of (a) the environmental integrity (manifested as the value accorded to traded assets when surrendered) and (b) the price of the traded assets? Or should there be 'only one moving part', so to speak?

An alternative approach to that outlined in the above scenarios would be if the exchange rate were to be reflected only in the price. However, this would mean that each jurisdiction could only ever buy its own units. This is because if lower value units were to be bought from another jurisdiction, the environmental integrity of the

⁴⁸ This might include an index based on reference to a global emissions budget, or similar concept, discussed later in this Section.

⁴⁹ For illustration, the Index could be based on a basket of, say, the average of MV assessment outcomes for all the jurisdictions engaged in Networking, weighted according to their respective GHG emissions. Note however, that indices all have their own method of calculation and the Index could be constructed in any one of many different ways.

⁵⁰ Whether these ITUs themselves would be tradable, or simply notional units for the purposes of facilitating transactions, is another issue that is touched on briefly in Section 5.3.

⁵¹ This issue considered by Jennifer Austin, in 'Networked Carbon Markets—Concept Development—Using Mitigation Value to Guide Design of Trading Rules' and being addressed through modelling exercise, described in in Sections 5.5 and 8.3 of this paper.

overall system might again be impaired. Overvaluing low MV units has the same effect as converting high MV units into a bigger number of low MV units (which still equate to emission rights). But, as noted, this situation would be avoided if each jurisdiction could only ever buy its own units. Market participants might be more receptive to such a mechanism, as it would be simpler to understand and interpret movements in the market. The drawback is that jurisdictions could not trade with each other directly, but rather might only do so indirectly through a market maker. This alternative is further elaborated later in this section.

To summarise the transaction mechanisms floated above, see Table 1.

5.3. Relationship between Mitigation Value, Settlement Platform, and ITUs and the Index

This section, firstly, revisits MV in more detail and, in so doing, considers the role and function of the settlement platform; and secondly, examines the concept of ITUs in more detail, and the feasibility and potential benefits of an index.

Relationship between MV and Role of Exchange Rate

When units of a mitigation outcome from one jurisdiction are traded into another, comparison of the MVs is one way to provide an exchange rate. There are a number of options for how the exchange rate might be taken into

account by the scheme administrator/regulator in the buyer’s jurisdiction, such as:

- If the unit is transferred into the buyer’s registry account in the buyer’s jurisdiction:
 - If the exchange rate is not binding, for instance, because participating jurisdictions have not agreed to be bound by it, then the scheme administrator/regulator in the buyer’s jurisdiction may or may not take account of the relative MVs at the time the unit is surrendered under that scheme;
 - If, on the other hand the jurisdictions have given the exchange rate binding, or official status, then the scheme administrator/regulator in the buyer’s jurisdiction may be bound to reflect it, and hence relative MVs, in the value accorded to the unit on surrender. However, this may be affected by any time delay between the transaction date and the date when the unit is surrendered;
- If the transaction mechanism provides for conversion into units under the buyer’s jurisdiction at the time of the trade, then the units received will all be treated the same and so the decision is taken out of the hands of the scheme administrator/regulator in the buyer’s jurisdiction. The relative MVs, through the exchange rate, will determine the number of those units received—hence determining the total value on the transaction date.

Table 1: Summary of Transaction Mechanisms

Scenario	Price	No. of Units on Trade Occurring	Administration
1. Foreign unit converted	Depends on market, but exchange rate relevant	Depends on exchange rate	Decentralized
2. Foreign unit imported	Depends on market, exchange rate possibly less relevant due to surrender value uncertainty	Depends on exchange rate	Decentralized and more complex
3. International Transaction Unit transaction currency	Depends on market, but exchange rate relevant	Depends on exchange rate	Centralized
4. Via market maker, no direct trade between counterparties	Depends on market, exchange rate very relevant	Will be whatever number buyer contracts to purchase	Centralized

Table 2 summarises these possibilities.

It can be seen that a critical link between the MV and the surrender value is the exchange rate, which is derived from the MV assessment process outcomes. How the MVs translate into the exchange rate, by whom the process is carried out and the supervisory regulation exercised over that process, and the nature of the exchange rate, itself, once it has been derived, for instance, how dynamic it is, are all fundamental issues, considered by other papers commissioned under the NCM initiative.⁵²

Nature and Role of the Intermediary— The Settlement Platform

Whatever the transaction structure, there will need to be a way to effect the physical and financial settlement of transactions. This will be the case irrespective of whether the transactions are over-the-counter (OTC) or exchanged traded. Hence, for the purpose of the transaction scenarios set out above, it was assumed that there would be an intermediary—the settlement platform (referred to as the “International Settlement Platform”) through which trading would take place.

The settlement platform would probably also provide central counterparty clearing, since settlement and clearing are frequently handled together. For clearing, there would

need to be clearinghouse member firms that would act for counterparties to transactions. Under this structure, just as with the exchange traded segment of the FX market, there would be daily marking to market and settlement, and margin calls, thus frequent payments to and from brokers and clearers, reducing counterparty default risk as well as the risk of fraud.

For such an arrangement to be viable, however, it would need to be supported by an adequate volume of trading. If all transactions needed to take place via a single centralised settlement platform, this would be more likely.⁵³ It is probable also that, with such an arrangement, the risk of double counting (as well as fraud) could be more easily controlled.

The settlement platform would need to be linked to the scheme registries of the participating jurisdictions. As such, it would make sense for the settlement platform to either incorporate or be linked also to a central registry tracking the movement of carbon assets between jurisdictions across all Networking markets.⁵⁴ This would provide a means to ensure double counting was avoided.⁵⁵ A central registry could also facilitate an audit mechanism for cross-checking the individual scheme registry holdings.

Apart from a settlement platform, central clearing counterparty and registry, the other type of institutional

Table 2: Summary of Transaction/Exchange Rate Outcomes

Transaction Mechanism	Exchange Rate	Outcome
Asset unit transferred to buyer's account	Not official for scheme administrators	Value determined by buyer's scheme administrator
Asset unit transferred to buyer's account	Official as between scheme administrators	MV informs exchange rate, buyer's scheme administrator takes into account in determining value on surrender—but note, also may be affected by time delay between transaction and surrender
Asset unit converted into buyer's units at transaction	Exchange rate applied in transaction to determine number of buyer's units credited	MV informs exchange rate, which determines number

⁵² E.g., Jennifer Austin, *Networked Carbon Markets—Concept Development—Using Mitigation Value to Guide Design of Trading Rules*.

⁵³ This is envisaged under the NCM proposals—the International Settlement Platform.

⁵⁴ The International Transaction Log (ITL) under the Kyoto Protocol and the European Union Transaction Log (EUTL) under the EUETS provide models for centralised checking of transactions and holdings. For example, the EUTL automatically checks, records, and authorizes all transactions that take place between accounts in the Union registry. This verification ensures that any transfer of allowances from one account to another is consistent with EUETS rules. The Union registry centralised the national registries of the 31 participating states in 2009.

⁵⁵ Although, if the transaction mechanism was index-based with ITUs, conversion into and out of ITUs should ensure that this is the case.

entity that may be involved in the transaction is the international carbon asset reserve (ICAR). The settlement platform/central clearing and registry functions could be fulfilled without needing also to include the ICAR function. It is beyond the scope of this paper to look at the purpose and role of the ICAR (mentioned briefly at Section 6.6).⁵⁶ However, the ICAR role would be to support administrators of the schemes participating in Networking to maintain domestic prices in the target ranges envisaged by the policies of their respective jurisdictions. If so, this would seem to be more policy related and fundamentally different to the transactional management nature of the settlement platform/central clearing/registry functions.

Sole Market Maker Function

As an alternative way to remove the risk to the environmental integrity of the scheme, where traded units convert to a greater number of domestic units, hence more emissions, it is worth considering the possibility that the intermediary/settlement platform, or ICAR, or the two in conjunction, might also act as sole market maker, quoting both bids and offers and standing ready to make a two-sided market for compliance entities in any participating jurisdictions who wish to trade mitigation outcome units, for whatever reason, externally to their domestic situation. The idea would be that both the offer/bid prices and the buy/sell spread would reflect the exchange rate in the case of any jurisdiction.

If the market structure were such that a single market maker was counterparty to all transactions, where an entity sought to buy units from a seller outside their jurisdiction, or wished to sell excess units to a buyer outside their jurisdiction, application of the exchange rate would affect only the price. Hence the exchange rate would not determine the number of mitigation outcome units transacted. The scheme administrator or each participating jurisdiction would still only ever deal with its own domestic units.

Whatever entity were to perform such a role as the sole market maker, whether the intermediary/settlement platform, or ICAR, the two acting in conjunction, or some other entity, it would need to be capitalized with units from the participating jurisdictions. This may recommend

ICAR for the role, since ICAR may probably need to be active in the markets engaging in Networking anyway.

A drawback of this proposal is that jurisdictions would not actually be trading with each other, but just with the market maker, so it would be a more indirect form of Networking. However, if there is a limited trading environment when networking begins, the introduction of a single market maker might be useful for generating liquidity. Such an arrangement may prove helpful in fostering initial trading and promote familiarity with concepts such as MV, MV assessment and the exchange rates based on it.

Irrespective of the transaction mechanism which is applied in Networking, there will be scope for MV assessments and the exchange rate to be based around a 'transaction currency' and an index. Consideration is now given to the feasibility and potential benefits of doing so.

International Transaction Unit

Mention has been made in Section 5.2 of the benefit to be derived by introducing a transaction 'vehicle currency', in the form of International Transaction Units (ITUs). As noted, the introduction of the ITU, would be analogous to the use of the US\$ as a "vehicle" currency in FX transactions. However, the fact that the US\$ is the most widely transacted currency reflects not only its use as a vehicle currency in FX transactions, but also its roles⁵⁷ as:

- investment currency in many capital markets;
- reserve currency held by many central banks;
- transaction currency in many international commodity markets;
- invoice currency in many contracts; and
- intervention currency used by monetary authorities.

The reasons for this have been touched on briefly above. It is unlikely the ITU would perform similar roles (except possibly as an asset for investment in its own right). In fact, it is conceivable that ITUs might only exist in pending accounts on the International Settlement Platform, for the purpose of facilitating Networking transactions. If so, the extent of the ITU role would be that entities wishing to

⁵⁶ See, for example, 'Design Options for an International Carbon Asset Reserve' prepared by Juerg Fuessler and Martin Herren, INFRAS Consulting Group, July 2015, Networked Carbon Markets, A Knowledge Series, World Bank Group.

⁵⁷ Query the extent to which these other roles for the US\$ underpin its role as a vehicle currency in FX trading?

sell mitigation outcome assets would convert those assets into ITUs (at the applicable exchange rate) and entities wishing to buy assets would need to hold ITUs in their pending account for conversion into the desired asset denomination (at the applicable exchange rate). However, if ITUs were to be introduced it is expected their role would comprise more functions than just as a medium of exchange.

In summary, the benefits of introducing a 'transaction vehicle' unit such as the ITU include the following:

- reduces the number of exchange rates that must be dealt with in a multilateral system;
- can yield the advantage of fewer, larger and more liquid markets with fewer mitigation outcome asset balances;
- reduces informational needs, thereby fostering simpler, less cost-intensive operations;
- should allow the Networking transactions to flow more rapidly and efficiently, reducing also the scope for error and capacity for manipulation and fraud; and
- ultimately, should result in less administration and lower transaction costs across the system.

Irrespective of whether the ITU were to be notional or a tangible asset for investment, its purpose, how its value is derived, how and by whom it is created and issued and pursuant to what authority, are characteristics that need to be considered and defined. Much further work will be required to elaborate and define this instrument.

For example, the ITU might be defined as a transaction unit for the purposes of facilitating trading between Networking markets, its value being a function of the Index: this might be a composite average of the MV assessment values of all jurisdictions that have opted into Networking, weighted according to their respective emissions budgets, which might be derived from the global level of emissions necessary for keeping average global temperature increase to less than 2°C (or 1.5°C) above pre-industrial levels. Governments might agree by treaty that ITUs be created and issued by an overriding supervisory body established to ensure proper governance in globally Networking markets.

Continuing this example, the environmental value of an ITU might be set at one metric tonne CO₂-equivalent gas, calculated using GWP as defined by decision 2 of the third meeting of the COP/MOP (Decision 2/CP.3) or as subsequently revised in accordance with Article 5

of the KP.⁵⁸ Other considerations that would need to be addressed include definition of its delivery mechanism, how further definition or limitation might be made, how legal restrictions on the use of an ITU might be made and communicated, what facility an ITU would have as an investment vehicle and how a price could be placed on it.

Feasibility of an Index

As noted earlier, an index is a statistical composite that measures changes in the economy or a financial market, often expressed as changes from a base year or a preceding month. Each index has its own method of calculation. Components may be weighted according to certain characteristics, as in for example, a shares index weighted for market capitalisation.

The first question, then, might be what will the index be a composite of? If it is an MV Index, then it could be formed by a basket of MV assessment outcomes for all jurisdictions involved in Networking, as in the transaction scenario in Annex D. Another possibility is a composite formed by a basket of MV assessment outcomes for all sovereign (national) jurisdictions (irrespective of whether they engage in Networking). There are many other possible variations on this theme. In any case, however, the MV assessment outcomes for individual jurisdictions would be compared against the composite. Which of these methodologies would be more appropriate for the purposes of Networking and why that would be the case, are questions to be considered.

Components of the composite may be weighted, and there is any number of possible different weightings that might be applied to a basket of MV assessment outcomes including, for example:

- weighting according to annual emissions;
- weighting by some measure of economic size, such as GDP;
- weighting according to population size.

If the Index is a composite of MV assessment outcomes for all jurisdictions involved in Networking only, then the weighting might take account of factors such as the percent of the jurisdiction's economy covered by the trading scheme, or the percent of the jurisdiction's overall emissions covered by the trading scheme. On the other hand, from the perspective of traders, the most important weighting of the Index might be according to price. Again, which of these methodologies would be more appropriate for the purposes of Networking and why that would

⁵⁸ Cf. definition of a CER—Decision 17/CP.7 (Marrakesh Accords).

be the case, are questions that need further detailed consideration.

While it would be possible to have the Index as a composite in these terms, the question is what purpose would it serve? An index of the MV assessment outcomes of all sovereign (national) jurisdictions (irrespective of whether they engage in Networking), whichever way it is weighted, might serve to provide an indicator tracking the progress of countries generally towards the UNFCCC objective. Comparing an individual jurisdiction's performance against such an index would provide a valuable independent marker on how well or poorly that jurisdiction's mitigation actions were addressing emissions, relative to the weighted average. This would be of benefit to governments, as well as interested third parties. But its application to Networking is not clearly apparent, as the comparison would not be like-with-like if some of the jurisdictions included in the composite were not trading.⁵⁹

Another possibility is for the Index to be a composite of a limited number of Networking jurisdictions' MV assessments, based on pre-determined criteria for inclusion in the basket. A model for such an index is the composition and valuation of the IMF's Special Drawing Rights (SDR) basket. In the case of SDRs, the basket comprises the five currencies⁶⁰ issued by member states that had the largest exports of goods and services over the preceding five year period, and have been determined by the IMF to be 'freely usable', that is, widely used to make payments in international transactions and widely traded on exchange markets.

What the pre-determined criteria for inclusion in a limited Networking basket might be, to ensure validity of application of such an Index, requires careful consideration. The criteria for inclusion could, for example, be derived so as to ensure the basket provided a more stable yardstick, rather than one for which the basket composition changed regularly. Stability would foster greater confidence in the Index. However, it would also be important that the basket covered a substantial part of the overall market in mitigation outcome assets, for the Index to be relevant for traders.

A further possibility would be for the Index to be based on a basket of the MV assessment outcomes of *all* jurisdictions engaged in Networking. Such an Index could

serve as a proxy for how effective the Networking market is performing to bring about mitigation. Ultimately, the questions to be answered are what information is the Index communicating, and who wants it? Commercial exchanges offer index products to their clients after conducting thorough market research to ascertain what would be of most value to those clients. This may be a good approach to follow.

Benefits of an Index

Direct comparison between jurisdictions may be exactly what is better avoided, pointing to a clear benefit served by having the Index: no direct jurisdictional comparisons. As can be seen in transaction scenario (iii) in Annex D, interposing the Index avoids direct comparison of MV assessments between jurisdictions. All jurisdictions' assessments are considered only against the Index, the weighted average of all such assessments. Similarly there would not be an exchange rate directly between the mitigation outcomes of two jurisdictions, as all mitigation outcome asset units are only ever exchanged for transaction vehicle units (in the case of transaction scenario (iii), ITUs, where exchange rates measure jurisdictions' mitigation outcome assets against ITUs).

Another clear purpose served by the Index is that, by introducing the ITUs, there is a transaction mechanism to provide for physical settlement not by the movement of mitigation outcome asset units from one jurisdiction to another, but by movement of the value—the mitigation value—that they embody. Hence each jurisdiction will only ever need to deal with its own mitigation outcome units.⁶¹

Another benefit of this mechanism is that investors and market makers might need only to hold ITUs in a pending account on the international settlement platform, rather than maintaining accounts in denominations of all participating jurisdictions in which they might wish to trade. This would significantly reduce transaction costs and administration, making participation in the market a more attractive option.⁶²

Other Benefits?

Can the use of the Index bring other benefits, such as greater liquidity, to the NCM? As a statistical composite, there is no capacity to invest in the Index itself. An investor

⁵⁹ Query whether this would be a technical problem with the Index?

⁶⁰ China's renminbi added 2015.

⁶¹ Note that in the case of the sole market maker proposal, this would be implicit, so the Index would not add anything in this respect.

⁶² Although with the sole market maker proposal, if the carbon assets were converted into and held as ITUs, their electronic certificates would need to have identifiers to show from which jurisdiction they originated; since they would just be converted back to the mitigation outcome assets of that same jurisdiction, query what benefit would be gained from holding them as ITUs.

or market maker that wished to trade speculatively might hold ITUs, just as they might hold units of the mitigation outcome assets under any of the individual schemes, or hold project generated credits if these are tradable under Networking. As proposed in scenario (iii) in Annex D, the ITUs would only come into existence as a result of a jurisdiction's mitigation outcome asset units, or project credits (if included), being converted into ITUs. In order to hold ITUs, the investor would need either to have purchased them as ITUs, or to have converted units from one of the participating trading schemes, or project credits, into ITUs. As envisaged, the ITUs would exist in pending accounts on the settlement platform and of themselves would not be able to be surrendered against the compliance obligations of any participating scheme, but might also be capable of being traded on other exchanges. Thus the ITUs might serve two purposes: firstly, as the 'transaction currency'—a simple pass through to facilitate transactions; and secondly, as an investment vehicle, a store of value.

The degree of liquidity in the Networking will depend on the number of buyers and sellers there are willing to trade across jurisdictions. This in turn, will be a function of the potential arbitrage opportunities from one participating jurisdiction to another. The ability of investors to hold ITUs would increase their ability to find those opportunities, not least because it would facilitate price disclosure across the entire market at a glance. However, it also raises the question of whether, in maintaining holdings of ITUs, the investors wouldn't at the same time be draining supply, hence liquidity, from the market.

This is a relevant consideration in a market based on a number of ETs, since by definition, in an ETS there is a limited, finite number of asset units available, with that number, in theory, reducing over time. Networking addresses this by facilitating compliance entities from one ETS accessing assets from another ETS. But as all participating schemes are based on the same premise, namely that a limited, finite number of mitigation outcome assets is available, and is reducing over time, this benefit is, to a degree, nugatory.⁶³

The limited supply issue would, of course, be countered by project credits being available. However, not all

participating jurisdictions may accept project credits under the terms of their scheme: introduction of project credits to Networking cannot be assumed as automatic. An index-based transaction mechanism might help overcome this difficulty, as the risk-assessed project credits would be converted to ITUs, which in turn would be converted at the applicable exchange rate to the asset denomination of a buyer's jurisdiction, eliminating the risk of non-acceptance of the project credits by the scheme administrator.⁶⁴ Participating jurisdictions would need to be in agreement over the methodology for inclusion of risk-assessed project credits, in the first place.

An index can form the basis for an investment fund, as in the case of some exchange-traded funds (ETFs). However, whether investment funds based on the Index would add to liquidity in the Networking would depend on how actively those funds were traded, rather than the fact that there is an index on which they are based. ETFs themselves have a widely varying range of liquidity. The popularity and hence degree of trading in a fund would be more a function of how it is set up, its overall structure, rather than just the fact that it is based on an index.

It is noted also that an investment fund based on an MV index may be holding carbon assets, but investors will be trading shares in the fund.⁶⁵ The mechanism for how such a structure may generate liquidity in Networking is yet to be explored, as are other possible structures and indices. Other products such as forward contracts based on the Index, or spreads between future prices of the Index and the mitigation outcome assets of various jurisdictions, could also generate liquidity and depth in the market. It is likely that commercial exchanges such as the LSE, EEX and ICE would develop derivative products along these lines.

5.4. International Settlement Platform

An international settlement platform is one of the three key elements of the NCM concept and numerous references to its role are made in the preceding paragraphs of Section 5.3. The presumption is that transactions between Networking markets will need to be on an exchange traded basis, rather than over-the-counter

⁶³ This issue of satisfactory balancing of supply and demand to ensure that the Networking, as well as its constituent trading schemes, continues to provide a price signal in keeping with the overall UNFCCC policy objective is principally addressed by the NCM proposal for an International Carbon Asset Reserve (ICAR). While this is the subject of research by other parties for the World Bank, it is noted that ICAR may have a significant role through the Index by acquisition and disposal of ITUs.

⁶⁴ NB: the inclusion of project credits will have a bearing on how the index is devised: needs further consideration as introduces potentially invalid comparisons.

⁶⁵ Exact mechanism will depend on fund structure.

(OTC). Detailed consideration will need to be given to how this might operate and work on this undertaken by Networking partners will be referenced or included in further iterations of this paper in due course.

5.5. Avoiding Perverse Outcomes: Trading Rules

Insights derived from modelling and analysis work done for the NCM initiative as well as in other contexts, highlights the risks that trade flows based on exchange rates, under certain market conditions, may give rise to perverse outcomes such as an increase in emissions.⁶⁶ To examine this risk more thoroughly, the modelling and simulation exercise being conducted as part of the 2016

NCM work plan is reviewing seven design options for MV-based trading rules.

Table 3 is taken from the terms of reference for phase 1 of the modelling and simulation exercise. The exercise requires modelling of inter-jurisdictional trading and inter-sectoral trading within a jurisdiction using each of the seven types of trading rules set out.

As evident from the descriptions of the options, the exercise aims to cover the range of possible approaches that governments might take with a view to protecting the environmental integrity of schemes and avoid trading giving rise to perverse outcomes such as an increase in emissions. The modelling and simulation exercise is elaborated in more detail in Section 8.3 of this paper.

⁶⁶ Stockholm Environment Institute (Michael Lazarus, Lambert Schneider, Carrie Lee, Harro van Asselt) for the International Carbon Action Partnership (ICAP), Options and Issues for Restricted Linking of Emissions Trading Schemes, May 2015; Jennifer Austin, Networked Carbon Markets Concept Development—Using Mitigation Value to Guide Design of Trading Rules, September 2015 (prepared as part of NCM initiative, unpublished).

Table 3: Range of Scenarios for Modelling Trading Rules

Type	Option	Description
Binding	1A: Governments adjust both domestic and imported allowances to reflect the true MV	The regulator discounts all allowances (both domestic and imported) in order to allow all units to reflect the true mitigation value.
Binding	1B: Governments assign premiums and discounts to imported units	A government might choose to 'invite' foreign units by assigning a premium to imported units from jurisdictions with a higher mitigation value. At the same time, governments may also choose to discount imported units from jurisdictions with a lower mitigation value. The premiums and discounts are based on the <i>relative</i> mitigation values.
Binding	2a: Governments restrict imports (based on relative mitigation value)	A government might choose to discount imports from jurisdictions with a low mitigation value to preserve the environmental integrity of their own scheme. At the same time, the regulator may choose to not assign a premium to imports that have a higher mitigation value, in order to avoid the increase in overall emissions that is depicted in Scenario 1B.
Binding	2b: Governments restrict imports (based on actual mitigation value)	Similar to Scenario 2a but discounting reflects the actual mitigation value of imports, rather than relative mitigation value.
Guidance	3: Actual MV as the minimum discount factor	Similar to Scenario 2a but further discounting could be applied based on other considerations (e.g., political/economic factors).
Guidance	4: Discounts on import fluctuate in accordance with an actual MV range	Similar to Scenario 2b, but governments may wish to discount foreign allowances—within a set MV range—to ensure a balance between regulatory flexibility and certainty.
Binding	Constant ambition factor	Tradable units are capped at a certain level in order to adjust for relative ambition. The 'constant ambition factor' will be applied in addition to the trading rules in Scenarios 1 to 4.

6. Institutions

Building on analysis of existing financial markets, this section considers the types of institutions that might be suitable to participate in the mitigation value assessment process, providing practical examples, and considering the types of expertise and tools those institutions might leverage. However, before proceeding, it may be helpful

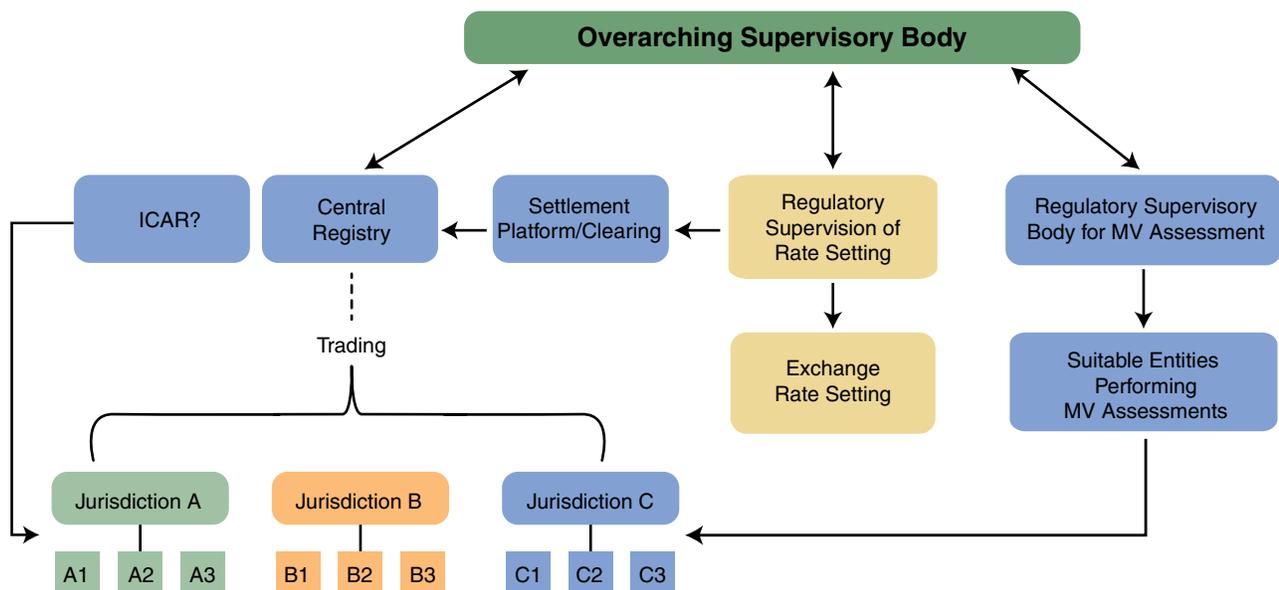
to put them in an overall context by quickly reviewing all the institutions and parties that might be involved (see Table 4).

Diagrammatically, the institutions, parties and their relationships might possibly look something like Figure 7.

Table 4: Overview NCM Institutions and Parties

Institutions and Parties	Comment
Individual jurisdictions opting into NCM	Each maintains their own scheme registry
Compliance entities from individual jurisdictions	Engage in trading across jurisdictions
Other market participants	Brokers, dealers, market makers: private sector entities
Suitable entity/entities to perform MV assessments	Considered in Section 6.1 of this paper
Regulatory supervisory body for MV assessments	Considered in Section 6.2 of this paper
Exchange rate determination and regulatory supervision	Considered in a separate paper commissioned by NCM
Settlement platform and clearing	Considered in a separate paper commissioned by NCM and see Section 5 in general
Central registry	Could be linked to settlement platform, see Sections 5 and 7
ICAR	Considered in a separate paper commissioned by NCM
Overriding governance structure for NCM	Considered in Section 6.7 of this paper and in a separate paper commissioned by NCM

Figure 7: Schematic of Possible NCM Market Structure



This section begins by examining what the mitigation value assessment process requires of a 'suitable institution', including in terms of tools and expertise. Without disregarding the possibility of other options, two specific examples of types of institutions that, at least in part, already may meet the requirements of the process are considered. It also considers options for regulatory supervision of the MV assessment process. Other institutions involved will include those participating in the exchange rate setting process, registries, the ISP (international settlement platform), ICAR (international carbon asset reserve) and the approach that might be taken to determining an appropriate institution to exercise overarching regulatory supervision, such as the UNFCCC.

6.1. Suitable Institutions to Perform MV Assessments

What Does the Process Require of a 'Suitable Institution'?

What are practical examples of the types of suitable institutions that would participate in the mitigation value assessment process? What tools and expertise would they need to leverage? To answer these questions, the logical starting point is to consider what that process is, what it entails:

- 'assessment' requires suitably qualified analysts, access to relevant information and the hardware for the analysts to evaluate that information;
- it is posited that 'mitigation value' means a measure of mitigation impact—the effectiveness of their mitigation actions—emission reduction programs—in 'mitigating', which takes account of their respective jurisdictional 'circumstances', so on this basis, analysts need to be qualified in:
 - assessing emission reduction programs and other mitigation actions,
 - evaluating mitigation action effectiveness,
 - evaluating mitigation action ambition, or pledges,
 - evaluating jurisdictional circumstances and all that entails,⁶⁷ and

apart from being able to review and evaluate large amounts of factual information, the analysis needs to be able to account for large data sets, complex

statistical analysis and mathematical modelling, critical weighting of factors, detailed and extensive research, and the exercise of experienced, expert judgment;

- as a relative measure as between jurisdictions, it would involve a process similar to rating processes, that is, design of a process to score the mitigation effectiveness of jurisdictions' mitigation actions.

These technical requirements presuppose:

- financial resources necessary to ensure in-house (or access to) research materials;
- not only the ability to access and obtain databases and datasets, but also:
 - the ability to store the information,
 - to assess, analyse and interpret the information,
 - the capacity to evaluate and form opinions based on that information, and
 - the capacity to communicate the outcomes of these deliberations in meaningful ways that are readily accessible to stakeholders;
- mathematical analytics;
- skilled and experienced personnel, premises in which to house those personnel in suitable locations (probably needing to be near a financial centre), appropriate organisational IT and communications infrastructure;
- these personnel requirements presuppose not only financial resources, but the appropriate support systems such as an effective management structure, operational and administrative systems, training and governance systems.

Bearing these requirements in mind, a minimum size of organisation would appear to be necessary, needing to be capitalised to a minimum extent. In view of the need to avoid conflicts of interest or perceptions of bias, it is unlikely that national or sub-national public sector bodies would be suitable. It is possible that a multilateral agency might be considered suitable, however, this might also be viewed as 'putting all the eggs in one basket', limiting the scope for a diversity of views and methodological approaches, and also increasing the potential for bureaucratic hurdles. So, focusing on private sector entities, a certain type of organisation would more readily have the personnel profile and internal infrastructure to undertake the process elements described

⁶⁷ See, for instance, jurisdictional elements listed in Section 3, Sub-section G, preceding.

above. These considerations point initially towards: (a) credit rating agencies; and (b) organisations that have been accredited as Designated Operational Entities (DOEs), under the Kyoto Protocol.

This is not to exclude other organisations that might equally undertake such operations, such as:

- large international (ex-accountancy) consultancies (PwC, KPMG, EY, etc.);
- investment banks;
- large global accounting firms or other large global multi-disciplinary consultancies (e.g., non-DOE environmental consultancies);
- organisations like Climate Action Tracker (a consortium of consultancies and NGOs); or even
- large global law firms (now that they can have multi-disciplinary teams), or
- consortia, made up from combinations of any of these types of organisations.

Credit Rating Process Similar to MV Assessment Process

To the extent that this exercise is to look for suitable institutions to participate in the 'mitigation value assessment process', it is worth considering that the closest comparable business process would be that carried out by credit rating agencies in rating public sector debt and public sector issuers of debt, including sovereign governments.

It is in the context of the bond market, and in relation to debt and borrowings generally, that the concept of ratings is most often used. When borrowing, sovereigns, all levels of government, corporate borrowers, even individuals, are rated on their creditworthiness, that is, their willingness and capacity to meet their commitments: to pay interest and repay their capital borrowing. Continuing the analogy for Networking, the jurisdiction issuing the carbon asset would be evaluated as a whole, in terms of the MV of the mitigation actions in place to achieve mitigation outcomes from within its boundaries. An ETS would be evaluated as a part of this MV assessment process. The MV of the jurisdiction could be considered relative to that of other jurisdictions (or against a composite weighted average thereof), to give an ordinal ranking similar to that of sovereign or other governmental issuer credit ratings.

Additionally, it is noted that the risk weighting of sovereign debt has arisen in the context of bank capital adequacy.

Historically, sovereign debt has been zero risk rated when determining the capital holding requirements for banks (at least in the eurozone). However, in the wake of the Greek, Spanish, Irish and other credit crises, this policy has been raised for discussion by governments.⁶⁸

Points to Be Drawn from Consideration of Credit Ratings and Credit Rating Agencies

A number of important points can be drawn from the experience of credit ratings and credit ratings agencies:

- Just as is the case with credit rating agencies, suitable institutions for performing the MV assessment process should be independent, private sector and, preferably, for-profit organisations. The aim would be to avoid any potential risk of national, or sub-national jurisdictional bias, or even the perception of such bias, on the part of the entities carrying out the assessments. For-profit organisations are preferred, as most not-for-profit organisations derive some form of governmental benefit—even if only in the form of non-taxable status, and this could leave open suggestions of partiality, no matter how unfounded;
- Suitable institutions should be subject to regulatory supervision:
 - This is now the case with credit rating agencies under, for example:
 - the EU Regulation on Credit Rating Agencies—Regulation (EC) 1060/2009, and
 - in the US, the 2010 Dodd-Frank Wall Street Reform and Consumer Protection Act;
 - Under the EU Regulation, for instance, credit rating agencies must fulfil certain obligations, such as:
 - avoiding conflicts of interest;
 - ensuring the quality of their ratings and rating methodologies; and
 - ensuring transparency;
 - Under the EU regulation, credit ratings agencies will be subject to a high level of supervision, including investigatory powers, centralised under European Securities & Markets Authority (ESMA);
 - What might be appropriate in this respect is considered more in Section 6.2;

⁶⁸ Financial Times, 2 May 2016, 'Sovereign risk system needs reforming' Patrick Jenkins.

- There should be encouragement for a multiplicity of organisations to become MV assessment agencies: the greater the number of suitable organisations there is, independently performing MV assessments, in theory, the greater the reliability of the MV assessment process should be. In light of some of the criticism levelled at the credit ratings sector in the wake of the global financial crisis,⁶⁹ it would be preferable to avoid a small number of large organisations dominating the market, for example, it has been reported that just three organisations, Moodys, S&P and Fitch, have about 95% of the global credit ratings market;⁷⁰
- Remuneration of MV assessment agencies should be structured so as to avoid potential conflicts of interest or the perception of such and, if possible, so as to foster desired policy outcomes:
 - The ‘issuer pays’ model, (versus subscriber pays) which is the usual method of remuneration in credit ratings at the very least gives rise to a perception of possible conflicts of interest risk;
 - One possible alternative approach to remuneration for MV assessment agencies might be to have a small levy on transactions arising from Networking (as in the example of Share of Proceeds (SOP-Admin) in CDM) to create a pool from which MV assessment agencies would be remunerated. This and other possible approaches need to be explored;
- The type of organisation and the number will ultimately be up to the relevant supervisory body; however, it is suggested that:
 - Organisations should be required to satisfy minimum criteria in order to be considered suitable to become an MV assessor, including for example:
 - technical and financial capacity;
 - access to resources;
 - governance;
 - knowledge-base;
 - management systems and personnel;
 - training; and
 - any other matters pertinent to the requirements mentioned above;
- The methodologies for carrying out the MV assessment process should either be:
 - (i) specified by the supervisory body; or
 - (ii) accredited by the supervisory body and transparent, for example, by being made publicly available: the opacity of ratings methodologies was another criticism levelled at the credit ratings sector in the wake of the global financial crisis;⁷¹
- While suitable institutions for conducting MV assessments should be afforded regulatory recognition, this should not be allowed to become a hurdle for potential new entrants;
- In considering the types of organisations that might be suitable institutions for conducting MV assessments, it is important to remember that, from the perspective of both their core business and their regulatory obligations, credit rating agencies are solely focused on rating their subjects’ creditworthiness, that is, the willingness and capacity to meet commitments: to pay interest and repay capital. Hence, while there are useful principals to be drawn from the experience of credit rating agencies, *per se*, they may not be suitable institutions to conduct MV assessments.

DOE Roles and Functions Comparable to MV Assessment Process

The other types of organisations that have experience conducting similar types of assessments to those envisaged in the MV assessment process are Designated Operational Entities (DOEs), accredited under the Kyoto

⁶⁹ World Bank Group, Financial and Private Sector Development Vice Presidency, ‘Credit Rating Agencies, No Easy Regulatory Solutions’, Crisis Response, Public Policy for the Private Sector, Note Number 8, October 2009, <http://siteresources.worldbank.org/EXTFINANCIALSECTOR/Resources/282884-1303327122200/Note8.pdf>, accessed 15 April 2015.

⁷⁰ European Commission, Memo/ 13/571, 18 June 2013, New Rules on Credit Rating Agencies (CRAs) enter into force http://europa.eu/rapid/press-release_MEMO-13-571_en.htm, accessed 15 April 2015; note that this was in part due to the quasi-regulatory status they were afforded as “nationally recognised statistical rating organisations” per 1975 US SEC Regulations.

⁷¹ Note 70 supra.

Protocol. DOEs will have already had a taste of the type of assessments described, albeit in the context of CDM projects, and Programmes of Activities (POAs).

DOEs are accredited by the CDM Executive Board and designated by the COP/MOP⁷² to undertake usually either validation, or verification and certification, of CDM projects and POAs. They are independent auditors that assess whether a potential project meets all the eligibility requirements of the CDM (validation) and whether the project has achieved greenhouse gas emission reductions (verification and certification). In one sense, the experience of DOEs is more pertinent, since it involves risk-based evaluations of processes designed to mitigate GHG emissions. However, in another sense it is more limited, since it might be characterised as a rule-based audit process of mitigation activities, based to some degree more on box ticking for past activities and to a lesser extent on judgment of future outcomes and directions.

The roles and functions of DOEs include:

- validating proposed CDM project activities;
- verifying and certifying reductions in anthropogenic emissions by sources of greenhouse gases;
- complying with applicable laws of the Parties hosting CDM project activities when carrying out functions;
- demonstrating an absence of real or potential conflict of interest with the participants in the CDM project activities for which validation or verification and certification functions are being carried out;
- maintaining a publicly available list of all CDM project activities validated, verified and certified;
- submitting an annual activity report to the Executive Board;
- making information obtained from CDM project participants publicly available, as required by the Executive Board. Information marked as proprietary or confidential shall not be disclosed without the written consent of the provider of the information, except as required by national law.

It can be seen that the DOE roles and functions are quite closely prescribed. The CDM Executive Board is prescriptive in its approach to supervising performance by the DOEs of their roles and functions. For example, the annual activity report must include information on

activities relating to the consideration of project activities as follows:

- list of project activities;
- status of project activities;
- regional distribution of project activities;
- sectoral distribution of project activities;
- list of project activities declined, if any, including the reasons for doing so;
- list of the project activities undertaken in countries having less than 10 registered project activities;
- number of project activities under validation or verification per qualified auditor;
- average timeframes for the validation and verification of project activities (from the signing of contract to submission of the request to the CDM EB), divided by region;
- average fees for the validation and verification of CDM project activities, divided by region.

DOE functions are to independently audit the project methodologies, including baselines and to assess whether the project has achieved the intended mitigation. In this sense their roles are very much aligned with the types of activities that suitable institutions participating in the mitigation value assessment process would be expected to carry out, that is, in relation to the subject matter. However, as noted above, the actual activity performed being more a rule-based audit process of mitigation activities, would probably be less aligned than the activities carried out by, say, credit ratings analysts.

The analysts employed by DOEs would clearly satisfy at least the first two requirements outlined above, that firstly, they need to be qualified in assessing emission reduction programs; and secondly, they need to be qualified in evaluating mitigation effectiveness. On the other hand, analysts from credit ratings agencies would be more likely to satisfy the third requirement, that they need to be qualified in evaluating jurisdictional circumstances and all that entails.

Points to Be Drawn from a Consideration of DOEs

Guidance and regulatory supervision of the MV assessment process is considered in more detail in Section 6.2, however, to summarise the preceding

⁷² Conference of Parties to the Convention serving as the meeting of Parties to the Protocol.

points, it is noted in relation to DOEs under the Kyoto Protocol that:

- the subject matter of their activities is directly relevant as it relates to risk-based evaluations of processes designed to mitigate GHG emissions;
- consequently, DOE analysts need to be qualified in assessing emission reduction programs and in evaluating mitigation effectiveness;
- however, the process they carry out might be characterised more as a rule-based audit process of mitigation activities; and
- the CDM Executive Board exercises a tight rein on the scope of their activities.

In spite of the current lower level of demand for certified emission reductions produced by CDM registered project activities and programmes of activities, there were still fifty-one entities accredited and provisionally designated to carry out various ranges of sectoral scopes by the Executive Board in the period October 2013 to September 2014, as reported to the COP/MOP in December 2014.⁷³ This suggests there is a large potential pool of suitably qualified professionals available from this source. Whether this potential might be borne out, depends to a degree on the processes carried out by these entities and the quality of the training provided to their analysts.

Suitable Institutions to Participate in the Mitigation Value Assessment Process

A conclusion that might be drawn from the foregoing is that the type of institution most suitable for participating in the mitigation value assessment process may be one that combines the skills, knowledge, experience and resources of a credit rating agency with that of an organisation that has been accredited as a DOE.

It is suggested that suitable institutions should be independent, private sector organisations. They would need to be well resourced technically and financially, and should be subject to regulatory oversight. Encouragement should be provided for a reasonable number of organisations to participate in the MV assessment process and consideration should be given, in particular, to how they are remunerated to avoid the potential conflict of interest, inherent in 'issuer pays' arrangements.

6.2. Regulatory Supervision of MV Assessments

MV and the MV assessment process are integral to the NCM initiative. Given the need to avoid, and to be perceived to avoid, conflicts of interest in undertaking the MV assessment process, it is unlikely that state entities or even intergovernmental organisations could be involved in performing this role. This section has proceeded on the basis that the MV assessment process would be best carried out by independent, private sector, for-profit organisations, to the extent feasible, without connections to the government of (a) their domicile, or (b) their location of residence for tax purposes, or (c) their main operational location.

On the other hand, it is likely that an intergovernmental organisation, or organisations, will have an important role to play in providing regulatory supervision of both the entities that carry out the MV assessments and of the process itself. In view of the importance of the MV assessment process and the proposition that it be conducted by the private sector, regulatory supervision of the MV assessment agencies and the MV assessment process is a critical part of the model. But what level of regulatory supervision will be required and why?

Financial Regulation

In considering these questions, it is noted as a broader point, that mitigation outcomes will be regulated as financial instruments in some jurisdictions. This may not be the case in all jurisdictions that potentially may participate in Networking. Furthermore, where they do apply, the financial regulations may apply to some carbon assets, but not to others. For example, in the EU, Directive 2014/65/EU,⁷⁴ defines 'financial instrument' to include emission allowances, consisting of any units recognised for compliance with requirements of Directive 2003/87/EC (Emissions Trading Scheme).⁷⁵ This means that EUAs and some, but not all, CERs are financial instruments. Other mitigation outcomes that may come under Networking do not fall within that definition. In time, these financial regulations may need to be modified to take account of mitigation outcomes under Networking more uniformly. However, the basic point is that there already exist bodies of rules that will need to be taken

⁷³ Annual report of the Executive Board of the clean development mechanism to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol. Lima, Peru. December 2014. <http://unfccc.int/resource/docs/2014/cmp10/eng/05.pdf>, accessed 17 August 2015.

⁷⁴ Directive on Markets in Financial Instruments and Amending Directives 2002/92/EC and 2011/61/EC ('MiFID II').

⁷⁵ Directive on Markets in Financial Instruments and Amending Directives 2002/92/EC and 2011/61/EC ('MiFID II'), Annex I, Section C, paragraph (xi).

into account in developing Networking and, once the Networking is functioning, observed by participants.

Regulation of CRAs

Returning to regulatory supervision of the MV assessment process in particular, reference has been made to US and EU rules above in the context of credit ratings. These rules of themselves would not directly apply to MV assessment, since they deal specifically with credit rating agencies ('CRAs'). Hence, irrespective of whether mitigation outcomes in Networking are characterised as financial instruments and Networking as a financial market, it will still be necessary to provide specifically for regulatory supervision of the MV assessment process and the institutions considered suitable to undertake that process.

To illustrate an approach that might be taken for regulatory supervision of institutions undertaking MV assessments, it is useful to consider the CRA regulations more closely. For example, the EU Regulation on Credit Rating Agencies—Regulation (EC) 1060/2009⁷⁶ includes provisions that:

- to perform ratings for regulatory purposes, a CRA must be registered and in order to be registered, must fulfil certain obligations (i) on the conduct of their business, (ii) intended to ensure the integrity and independence of the rating process and (iii) to enhance the quality of the ratings issued;
- the European Securities and Markets Authority (ESMA) is responsible for registering and directly supervising CRAs;
- CRAs must avoid conflicts of interest (e.g., to ensure an employed analyst does not rate an entity in which they have a financial interest); must ensure the quality of the ratings (e.g., carry out on-going monitoring of credit ratings); must ensure the quality of the methodologies (e.g., methodologies must be rigorous and systematic); and must have a high level of transparency (e.g., by publishing an annual transparency report);
- ESMA is endowed with comprehensive investigatory powers, including the power to demand documents or data; to summon persons to hearings; to conduct on-site inspections; to impose administrative sanctions, fines and penalties;
- places requirements on CRAs as to when ratings of sovereign debt are undertaken, how many unsolicited

such ratings can be made per year, the timing of publication of outcomes, and for six-monthly (as opposed to annual) reviews;

- make CRAs accountable for their ratings, which are no longer considered 'mere opinions';
- require publication of all ratings on a European Rating Platform (established by ESMA) to improve comparability and visibility of all ratings;
- address conflicts of interest by imposing restrictions on shareholdings covering CRAs and rated entities and requiring rotations of CRAs at least every four years where the 'issuer pays' model applies;
- encourage issuers to use smaller CRAs with less market share to encourage broadening of the market.

The CRAs still devise and apply their own ratings methodologies. However, process timing requirements mean issuers have more time to respond before they are made public, so at least there is time for factual errors to be rectified and publication is less distortive of markets. If CRAs intend to change materially existing or use new methodologies, models or key rating assumptions that may impact rating outcomes, they must first publish the intended changes and invite comment for a fixed period, together with detailed explanation of the reasons and implications.

DOEs and the CDM Executive Board

The other specific example considered in relation to suitable institutions for undertaking the MV assessment process was that of DOEs accredited under the Kyoto Protocol. These entities are accredited ('provisionally designated') by the CDM Executive Board upon a recommendation by the CDM Accreditation Panel, which is advised by a specially constituted CDM Accreditation Team.⁷⁷ They are then designated by the COP/MOP and are required to submit annual activity reports to the CDM Executive Board. Annual reports must satisfy CDM Executive Board guidance to ensure consistency and completeness of reporting with respect to the key CDM activities of a DOE.

DOEs are accountable to the COP/MOP through the CDM Executive Board and are required to comply with the decisions and instructions of the Board, which have been many and frequent. Problems have arisen due to the fact that DOEs are under contractual arrangements

⁷⁶ As amended by Regulation 462/2013 and Directive 2013/14/EC.

⁷⁷ Membership is open to both external experts and secretariat staff: see 'Procedure: Selection and performance evaluation of experts on the CDM accreditation roster of experts', version 01.0, document CDM-EB79-A02-PROC, UNFCCC.

with client project developers, while at the same time being obliged to satisfy CDM Executive Board requirements. DOEs are fully responsible to the CDM Executive Board for the quality of their work, and therefore cannot include disclaimers, but the same is not true for client relationships. Client contracts routinely disclaim liability other than in situations of gross negligence and even then, often limit commercial liability. This is understandable, given that DOEs do not want to carry the risk of liability to the client stemming from a third party intervention, namely that of the CDM Executive Board. The inevitable result is that clients suffer the consequences, such as delays, due to DOEs not meeting the CDM Executive Board's prescriptive requirements, a situation exacerbated by the market for DOE services being a seller's market.

The roles and functions of the CDM Executive Board, include:

- Making recommendations to the COP/MOP on further modalities and procedures for the CDM;
- Approving new methodologies relating to, inter alia, baselines, monitoring plans and project boundaries;
- Being responsible for the accreditation of operational entities, in accordance with accreditation standards, and making recommendations to the COP/MOP for the designation of operational entities. This responsibility includes:
 - decisions on re-accreditation, suspension and withdrawal of accreditation;
 - operationalization of accreditation procedures and standards;
 - review the accreditation standards;
- Making publicly available relevant information, submitted to it for this purpose, on proposed CDM project activities in need of funding and on investors seeking opportunities, in order to assist in arranging funding of CDM project activities, as necessary;
- Making any technical reports commissioned available to the public and provide a period for public comments on draft methodologies and guidance before documents are finalized and any recommendations are submitted to the COP/MOP for their consideration;

- Developing, maintaining and making publicly available a repository of approved rules, procedures, methodologies and standards;
- Developing and maintaining the CDM registry;
- Developing and maintaining a publicly available database of CDM project activities containing information on registered project design documents, comments received, verification reports, its decisions as well as information on all CERs issued; and
- Addressing issues relating to observance of modalities and procedures for the CDM by project participants and/or operational entities, and report on them to the COP/MOP.

In spite of this seemingly broad mandate, in a number of respects the COP/MOP, not the CDM Executive Board, is the final decision maker. Additionally, the level of transparency with regard to the performance of DOEs and actual issues arising from registration and issuance has been found to be generally low. A 2010 report commissioned by WWF,⁷⁸ found that meeting reports and case-specific recommendations information were kept confidential in the case of accreditation, and registration and issuance.

Regulatory Conclusions

While the illustrations outlined above evidence significant levels of regulatory supervision of the respective activities, they offer different approaches to how regulatory supervision might be applied to the MV assessment process. In both cases, the entities need to satisfy the requirements to become registered or accredited/designated. However, the CRAs devise and apply their own ratings methodologies, whereas DOEs must conform to the methodologies, modalities and procedures laid down for the CDM by the Executive Board. In the case of CRAs, there is a shift towards greater accountability for their decision-making. In the case of DOEs, the CDM Executive Board performs its role in relation to the DOEs, but largely leaves the DOE and its project developer client to sort out liability and risk issues as between themselves. In a similar vein, regulation of CRAs is moving towards greater transparency, whereas the evidence suggests regulation of DOEs has been treated as confidential, hence less transparent.

⁷⁸ Öko-Institut e.V., Berlin June 2010. '2010 rating of Designated Operational Entities (DOEs) accredited under the Clean Development Mechanism (CDM)', report for WWF.

Bearing these points in mind, and taking account of the fact that the process of MV assessment is closer to that performed by the CRAs in making credit ratings, but noting also that the process of credit rating has been around for over one hundred years and so is developed, refined and, within boundaries, a settled process, whereas MV assessment is an entirely new concept, an approach to the level of regulatory supervision appropriate might be along the following lines:

- institutions considered suitable to undertake MV assessments should be registered and maintain their registration with the supervisory body at all material times;
- to be eligible for registration, institutions would need to satisfy criteria, such as those outlined in Section 6.1;
- registered suitable institutions would also need to submit their proposed methodologies for undertaking MV assessments, which would need to be accredited by the supervisory body;
- it would be important for the supervisory body to exercise close oversight of the methodologies for MV assessments: referring again to the illustration of CRAs, one of the main points of criticism of credit ratings agencies' roles in the 2008 financial crisis, was that they created complex but unreliable models to calculate probability of default for mortgages as well as securitised mortgage-backed products;⁷⁹
- the supervisory body might publish guidelines on the factors and criteria on which it would accredit methodologies, then it would be up to the registered institutions to submit their proposed methodologies, criteria, factors to be taken into account in making MV assessments, to the supervisory body for accreditation. In determining these guidelines, the supervisory body might obtain useful guidance from expert bodies such as the International Standards Organisation (ISO);
- MV assessment methodologies would be publicly available, either on the supervisory body's website and/or the relevant institution's website;
- if a registered institution intended to change materially existing or use new methodologies, models or key assumptions that may impact MV assessment outcomes, they would be required first to publish

the intended changes and invite comment for a fixed period, together with detailed explanation of the reasons and implications;

- registered institutions would be required to publish a schedule of the MV assessments (solicited and unsolicited) proposed to be undertaken over specified forthcoming (e.g., next six months, annual) periods;
- all MV assessment outcomes would be published, along with reasons, key assumptions, etc, in accordance with the accredited methodology applied;
- registered institutions would be accountable for the MV assessment outcomes they publish; and
- the supervisory body might be vested with investigatory and regulatory powers and functions similar to those vested in ESMA, under the EU Regulation on Credit Rating Agencies (as amended).

There are many models for how the supervisory body might be constituted. For example, the CDM Executive Board is established by the Kyoto Protocol and various decisions of the UNFCCC COP have determined its role and functions. Its rules of procedure have been adopted by the COP and cover matters such as its composition; nominations and appointments; terms of service of members; qualifications and conduct; officers; meetings, voting rules and so on. On the other hand, it is noted that the supervisory body would be performing a role similar in many respects to that performed by ESMA in relation to CRAs, so ESMA might provide another pertinent model, as a financial market regulator.

6.3. Exchange Rate Setting

Detailed consideration will need to be given to how regulatory supervision of any exchange rate setting mechanism or process operates. Work on this carried out by NCM partners will be referenced or included in further iterations of this paper in due course.

6.4. Registries

Detailed consideration will need to be given also to how regulatory supervision of the operation of a central registry might be provided. Work on this undertaken by NCM partners will be referenced or included in further iterations of this paper in due course.

⁷⁹ For example, in 2007 as US housing prices began to fall, Moody's downgraded 83% of the US\$869 billion in mortgaged-backed securities it had rated AAA in 2006.

6.5. ISP—International Settlement Platform

An international settlement platform is one of the three key elements of the NCM concept and there will need to be an appropriate body ensuring proper governance and exercising supervisory oversight of its activities. Detailed consideration will need to be given to how any such body might be constituted. Work on this carried out by NCM partners will be referenced or included in further iterations of this paper in due course.

6.6. ICAR—International Carbon Asset Reserve

One of the three elements of the NCM initiative is exploring the possibility of an institutional structure in the form of a pooled reserve of carbon assets, to support a network of carbon markets by addressing market risks and failures. Such an international carbon asset reserve (ICAR) could provide a source of liquidity or perform the role of market maker, mentioned in Section 5. The form, scope and functions of an ICAR are still being explored; however, it is intended that any such institution would support, rather than replace, jurisdictional level market stabilisation instruments.

Three options for the ICAR representing a range of possibilities have been presented in a paper by INFRAS and GRI.⁸⁰ They encompass at one end of the range, the ‘hands off’ approach with ICAR a platform (or marketplace) to facilitate trading between ETSs for accessing low-cost abatement opportunities, but not providing a reserve; and at the other end, the ‘hands on’ approach of a central hub that would also provide a tool for mitigating carbon risk via centralised intermediation services and buy/sell services—thus it would hold a pool of internationally-fungible allowances. The third option is for a more specialised ‘gateway and insurance’ ICAR to facilitate creation and transfer of units from a developing country with a carbon instrument such as a project based credit scheme to participating ETSs, thus it would also need to hold a pool of internationally-fungible allowances.

The authors note also that establishment of a mechanism that will determine the mitigation values of carbon units will be very important to how the ICAR develops, as this will enable comparability and hence fungibility of mitigation outcomes from different jurisdictions.⁸¹ Given the importance and difficulty that this might entail, they

identify three stages in the evolution of the ICAR, the initial stage accommodating the platform and gateway and insurance options; the second stage would see the emergence of the universal mitigation value system and introduction of the central hub option to mitigate the risks associated with transfers of allowances; and the final stage would see the drawing in of existing networks and linking agreements.⁸²

6.7. Overriding Regulatory Supervision

Whichever way the supervisory bodies are constituted, the question arises of to what higher authority should they be accountable? This is the case for all regulatory bodies formed under NCM, so for example, relates not just to the body supervising MV assessments, but also to the one that might be needed to supervise exchange rate determination, setting and adjustments. Bearing in mind the ultimate objective of mitigation, and the purpose of the NCM initiative, one answer would appear to be that oversight should be exercised by the UNFCCC COP, possibly by making the overriding supervisory body a Constituted Body under a new protocol.

Presently, none of the institutions that exist within the UNFCCC framework address the role and functions of the market, how to achieve and maintain market stability, or how to manage a disorderly market. Nor do they appear functionally capable of doing it. As the table on page 42 shows, they are not engaged in the markets and, as currently constituted, would appear unsuited to engagement in the markets.

Table 5 shows a cross-section of the existing UNFCCC institutions and their roles and functions.

In the roles and functions set out for these bodies, there is no consideration given to the role of the market in furthering the ultimate objective of the climate change regime. There appears to be no consideration of the interaction of the market activities with other measures in the suite of policies aimed at achieving that ultimate objective.

In the context of the Kyoto Protocol, there is no mention of Article 17 or emission trading markets, in relation to any of the institutions. Furthermore, the bodies themselves would not appear suited to addressing questions

⁸⁰ INFRAS (Fuessler and Wunderlich) and GRI (Taschini): ‘International Carbon Asset Reserve—Prototyping for instruments reducing risks and linking carbon markets’, 16 February 2016, draft paper presented in Zurich.

⁸¹ Ibid at p.19.

⁸² Ibid.

concerning the market: the COP and MOP are negotiating fora and inter-governmental decision-making bodies. The Secretariat is an administrative and regulatory body, as are the CDM EB, JISC and Compliance Committee. These bodies are made up of government representatives, administrators and technocrats. It would be interesting to ascertain how many, if any, come from a market, trading or financial governance background.

Bearing in mind also that if trading takes place between carbon markets it will be, in essence, a new global financial market, other possibilities need to be considered.

While there may be no single body responsible for overseeing the entire global financial system, there are treaty-based bodies whose functions encompass global roles: for example, the Bank for International Settlements (BIS), the International Monetary Fund (IMF), International Organisation of Securities Commissions (IOSCO), while in Europe, there is the European Central Bank (ECB) and now the European Securities and Markets Authority (ESMA). The World Trade Organisation (WTO) might also provide a useful comparative example for such a supervisory body. If the NCM initiative develops and

Table 5: UNFCCC Institutions' Roles and Functions

Institution	Role and Functions
COP	<ul style="list-style-type: none"> The supreme policy making, decision making body, and negotiating forum, of the UNFCCC Made up of representatives of all the signatories to the UNFCCC Meets annually
COP/MOP	<ul style="list-style-type: none"> As for the COP, the main body for the KP, which for efficiency meets conjointly with the COP
Secretariat	<p>The functions of the Secretariat are set out in Article 8 UNFCCC in general terms:</p> <ul style="list-style-type: none"> To make arrangements for sessions of the Conference of the Parties and its subsidiary bodies established under the Convention and to provide them with services as required; To compile and transmit reports submitted to it; To facilitate assistance to the Parties, particularly developing country Parties, on request, in the compilation and communication of information required in accordance with the provisions of the Convention; To prepare reports on its activities and present them to the Conference of the Parties; To ensure the necessary coordination with the secretariats of other relevant international bodies; To enter, under the overall guidance of the Conference of the Parties, into such administrative and contractual arrangements as may be required for the effective discharge of its functions; and To perform the other secretariat functions specified in the Convention and in any of its protocols and such other functions as may be determined by the COP.
IPCC	<ul style="list-style-type: none"> Surveys world-wide scientific literature and publishes assessment reports that are recognized as the most credible existing sources of information on climate change Works on methodologies, e.g., within the National greenhouse Gas Inventories Programme, it assesses and develops methods and practices for inventories and disseminates related information Responds to specific requests from the COP, SBI and SBSTA or other environmental Conventions
Subsidiary Bodies: <ul style="list-style-type: none"> SBI SBSTA 	<p>SBI: (Article 10 UNFCCC)</p> <ul style="list-style-type: none"> Consider the information communicated in accordance with Article 12, paragraph 1, to assess the overall aggregated effect of the steps taken by the Parties in the light of the latest scientific assessments concerning climate change; Consider the information communicated in accordance with Article 12, paragraph 2, in order to assist the Conference of the Parties in carrying out the reviews required by Article 4, paragraph 2(d); and Assist the Conference of the Parties, as appropriate, in the preparation and implementation of its decisions.

Institution	Role and Functions
	<p>SBSTA: (Article 9 UNFCCC)</p> <ul style="list-style-type: none"> • To provide the Conference of the Parties and, as appropriate, its other subsidiary bodies with timely information and advice on scientific and technological matters relating to the Convention; • Provide assessments of the state of scientific knowledge relating to climate change and its effects; • Prepare scientific assessments on the effects of measures taken in the implementation of the Convention; • Identify innovative, efficient and state-of-the-art technologies and know-how and advise on the ways and means of promoting development and/or transferring such technologies; • Provide advice on scientific programmes, international cooperation in research and development related to climate change, as well as on ways and means of supporting endogenous capacity-building in developing countries; and • Respond to scientific, technological and methodological questions that the Conference of the Parties and its subsidiary bodies may put to the body.
CDM Executive Board (EB)	<p>The executive board supervises the CDM, under the authority and guidance of the COP/MOP, and is fully accountable to the COP/MOP.⁸³ In this context, the executive board:</p> <ul style="list-style-type: none"> • Makes recommendations to the COP/MOP on further modalities and procedures for the CDM, as appropriate; • Makes recommendations to the COP/MOP on any amendments or additions to rules of procedure for the executive board, as appropriate; • Reports on its activities to each session of the COP/MOP; • Approves new methodologies related to, inter alia, baselines, monitoring plans and project boundaries; • Reviews provisions with regard to simplified modalities, procedures and the definitions of small scale project activities and makes recommendations to the COP/MOP; • Is responsible for the accreditation of operational entities, in accordance with accreditation standards, and makes recommendations to the COP/MOP for the designation of operational entities. This responsibility includes: (i) Decisions on re-accreditation, suspension and withdrawal of accreditation; (ii) Operationalization of accreditation procedures and standards; • Reviews the accreditation standards and makes recommendations to the COP/MOP for consideration, as appropriate; • Reports to the COP/MOP on the regional and subregional distribution of CDM project activities with a view to identifying systematic or systemic barriers to their equitable distribution; • Makes publicly available relevant information, submitted to it for this purpose, on proposed CDM project activities in need of funding and on investors seeking opportunities, in order to assist in arranging funding of CDM project activities, as necessary; • Makes any technical reports commissioned available to the public and provides a period of at least eight weeks for public comments on draft methodologies and guidance before documents are finalized and any recommendations are submitted to the COP/MOP for their consideration; • Develops, maintains and makes publicly available a repository of approved rules, procedures, methodologies and standards; • Develops and maintains the CDM registry; • Develops and maintains a publicly available database of CDM project activities containing information on registered project design documents, comments received, verification reports, its decisions as well as information on all CERs issued; • Addresses issues relating to observance of modalities and procedures for the CDM by project participants and/or operational entities, and reports on them to the COP/MOP.

(continued)

⁸³ Decision 17/CP.7, Annex paragraph 5.

Table 5: UNFCCC Institutions' Roles and Functions (Continued)

Institution	Role and Functions
JI Supervisory C'ee (JISC)	<ul style="list-style-type: none"> Provides international oversight of JI projects to ensure they meet requirements for the JI program
Compliance Committee	<ul style="list-style-type: none"> Committee focusing on compliance with the KP Functions through a plenary, a bureau, a facilitative branch and an enforcement branch
Registries: <ul style="list-style-type: none"> International Transaction Log (ITL) CDM Registry National Registries 	<ul style="list-style-type: none"> ITL established and maintained by the Secretariat ITL will verify transactions involving ERUs, CERs, AAUs and RMUs under the KP ITL required to refuse registration of any transaction where the pre-requisites have not been satisfied CDM registry will maintain accounts of CERs on behalf of non-Annex I Parties to the KP participating in CDM projects CDM registry maintained by the CDM EB and will operate in conjunction with the ITL in relation to transactions involving CERs National registries established by Annex I Parties National registries contain accounts for all legal entities authorised by the Party to hold allowances or credits

carbon markets continue as instruments of policy for mitigating anthropogenic GHG emissions, it may be appropriate to consider the need for a treaty-based organisation to ensure both environmental and financial market regulatory coordination and governance going forward. This is an area for further research.

Some of these issues have been considered in a recent paper.⁸⁴ The authors survey existing frameworks for bilateral, regional and multilateral linkages⁸⁵ before analysing the particular requirements of networking

as considered under different models such as under multilateral environmental agreements, or trade agreements such as the Trans-Pacific Partnership Agreement and the World Trade Organisation agreements.⁸⁶ However, the paper concludes that in the absence of a more tangible idea of how linking might occur, it is difficult to consider options for a regulatory framework other than at the high level of institutional regulatory frameworks canvassed by the paper.

⁸⁴ Reed Smith (Peter Zaman and Adam Hedley) 'The regulatory framework to support carbon market linkage—a concept paper'. 27 April 2016.

⁸⁵ Ibid, section 6, pp. 13 et seq.

⁸⁶ Ibid, section 7, pp. 19 et seq.



7. Market Design + Market Information Technology Architecture; the Plumbing

This section looks at questions of market design and the essential infrastructural elements that might be necessary: hardware and software. It begins by reviewing the architecture and plumbing currently in place for international emission trading under the Kyoto Protocol and EUETS, before considering what different requirements might be necessary for trading under a future Networking structure. It concludes by considering the potential application of new developments and concepts in information technology, such as the 'blockchain'.

7.1. International Emissions Trading to Date

International emissions trading has taken place pursuant to the Kyoto Protocol through the International Transaction Log (ITL) and registries. Decision 19/CP.7 contains general requirements for the ITL and registries and modalities for the accounting for assigned amounts under the Kyoto Protocol. The registries are the national registries of the 38 Annex B Parties containing accounts within which units are held in the name of the government, or legal entities authorised by the government to hold and trade units; and the CDM registry implemented by the UNFCCC secretariat under the authority of the CDM Executive Board.

The process for a transaction involves:

- The seller and buyer agreeing to conclude the transaction either over-the-counter (OTC) or through an exchange (either way, their contract will need to provide for settlement to be subject to or based on completion of the transfer to the buyer's account in the transferee registry);
- Seller directs its registry (transferring registry) to transfer units to the buyer's account in another registry;
- The transferring registry sends a transaction proposal to the ITL;
- The ITL assesses the proposal against a set of defined checks, for example: units previously retired or cancelled; units existing in more than one registry; units improperly carried over or improperly issued; legal entities authorised to participate in the

transaction; infringement of Commitment Period Reserve by transferring Party;

- ITL responds to the transferring registry's proposal by clearing it for further processing;
- If approved, the transferring registry completes the transaction; if rejected, the ITL sends an error code to the transferring registry;
- For transactions under EU trading legislation, EU registries send proposals to the ITL, which conducts its 'Kyoto checks', then forwards the information to the Community Independent Transaction Log (CITL) for it to conduct supplementary checks defined under the EU scheme. This would also be the process in the case of other supplementary transaction logs.

Hence, as well as recording the holdings of units in registry accounts, the registries allow for settlement of an emissions trading transaction to occur by delivering units from the seller's account to the buyer's account. Figure 8 shows the process.

Financial settlement depends on completion of the physical settlement process which takes place through the registries and ITL/CITL, as shown in Figure 9 taken from the UNFCCC website (shows in more detail, the right-hand side of Figure 8 on the following page).

Technical Requirements under the Existing System

The full specifications for the ITL and registry system are set out in the Data Exchange Standards (most recent version sighted: *Data Exchange Standards for Registry Systems under the Kyoto Protocol, Technical Specifications (Version 1.1.11) 24 November 2013*), which describes the technical requirements for electronic communications between the ITL and registries—*how* the data exchange standards are to be implemented, based on functional specifications for data exchange, that define *what* data are exchanged and by *whom* (the basic 'plumbing' for the system). The Data Exchange Standards define how data are exchanged between national registries, the CDM registry and the ITL, as well as any supplementary transaction logs (STLs). The CITL is the only STL at present.

Figure 8: Transaction Flow at Present

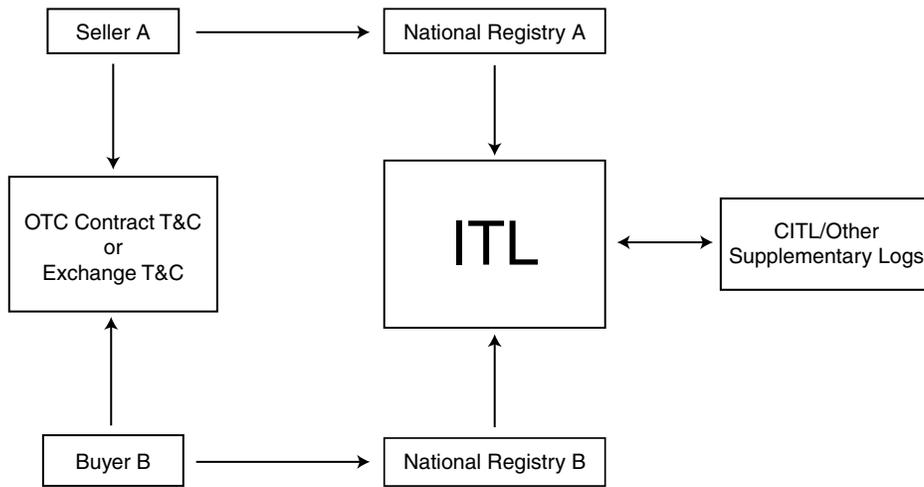
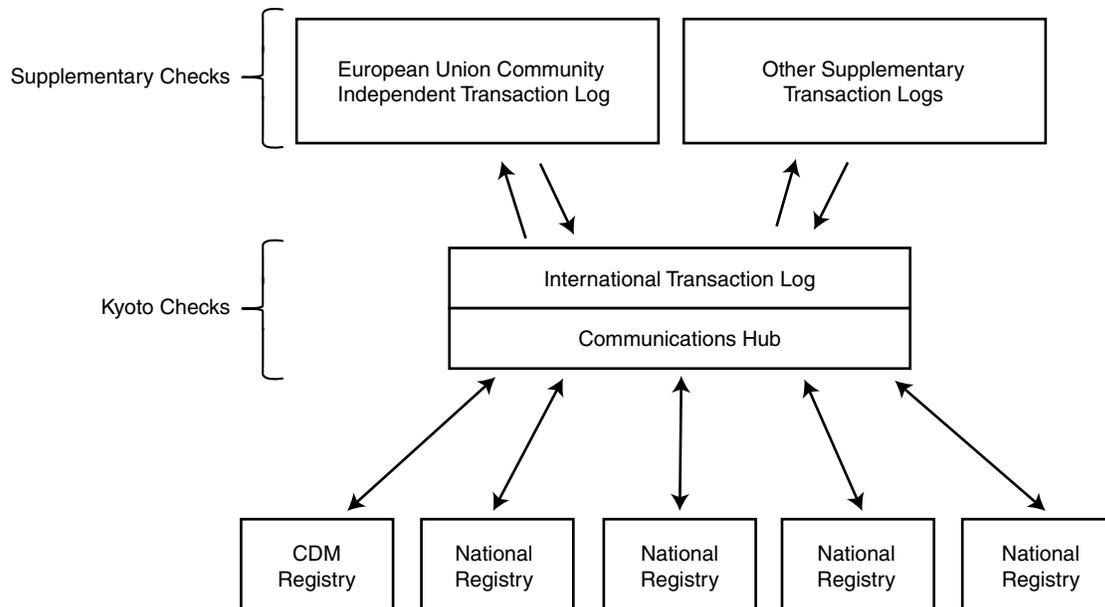


Figure 9: Detail of ITL Process



Under the Data Exchange Standards, communications between registries and the ITL must be secure and processed as real-time transactions, using encrypted messages over the Internet. The technical specifications require:

- Web services using Simple Object Access Protocol (SOAP)
- Hardware-based Virtual Private Network (VPN)
- XML⁸⁷ formats adhering the prescribed standards
- Digital signature authentication
- Network time protocols

Web services enable applications running on different machines to easily exchange information with one another without requiring additional proprietary software or hardware. Web services depend on standard extensible mark-up language (XML) messaging systems and SOAP, and are not tied to one operating system or programming language. Any information exchanged to and from registries and the ITL is through the use of XML exchanged via SOAP. All communications are encrypted using Secure Socket Layer (SSL).

The types of Kyoto units enabled by the Data Exchange Standards are shown in Table 6.

The types of transactions enabled are shown in Table 7.

Table 6: Kyoto Units Enabled by the Data Exchange Standards (Table copied from the UNFCCC website)

Kyoto Units				
Unit	Unit Name	Issuer	Description	Kyoto Protocol
AAU	Assigned Amount Units	National registry	Units representing the initial assigned amount of each Annex B Party	Article 3.7
RMU	Removal Units	National registry	Units given for net removals from land use, land-use change and forestry activities	Articles 3.3, 3.4
ERU	Emission Reduction Units	National registry	Units converted from AAUs or RMUs on the basis of JI projects	Article 6
CER	Certified Emissions Reductions	CDM registry	Credits given for emission reductions certified for a CDM project	Article 12
tCER	Temporary CERs	CDM registry	Credits given for emission removals certified for an afforestation or reforestation CDM project (to be replaced upon expiry at end of the second commitment period)	Article 12
ICER	Long-Term CERs	CDM registry	Credits given for emission removals certified for an A&R CDM project (to be replaced upon expiry at end of the project's crediting period or in event of storage reversal or non-submission of a certification report)	Article 12

⁸⁷ Extensible Mark-up Language (XML) defines a set of rules for encoding documents in a format that is machine-readable and human-readable. The design of XML focuses on documents, but it is widely used for other purposes and hundreds of documents formats using XML have been developed, as XML is commonly used for the interchange of data over the Internet. Briefly by way of background, XML is an application of Standard Generalised Markup Language (SGML). SGML is an ISO standard—ISO8879:1986 Information Processing—Text and Office Systems—Standard Generalised Markup Language, which was derived from IBM's Generalised Markup Language (GML). SGML was originally designed to enable sharing of machine-readable large project documents in government, law and various industries. With growth in the World Wide Web, SGML was seen as offering solutions to some development problems.

Table 7: Types of UNFCCC Transactions Enabled (Table copied from the UNFCCC website)

Kyoto Transaction Types	
Issuance	Initial creation of an AAU, RMU, CER, tCER or ICER
Conversion	Transformation of an AAU or RMU into an ERU based on a JI project
External Transfer	External transfer of a unit from one registry to another registry
Cancellation	Internal transfer of a unit to a cancellation account, in order that it may not be used for compliance with an emission target
Replacement	Internal transfer of a unit to a replacement account, in order to replace tCERs or ICERs when required
Retirement	Internal transfer of a unit to a retirement account, in order that it can be used by the Annex B Party for compliance with its emission target
Carry-Over	Change of validity an AAU, ERU (only those converted from AAUs) or CER from one commitment period to the next
Expiry Date Change	Change in the expiry date of a tCER or ICER
Internal Transfer between Holding Accounts	Internal transfer of a unit between holding accounts within the same registry (the ITL does not verify such transactions but forwards them to the CITL to allow their verification under the EU trading scheme)

7.2. NCM Transactions

Will the existing architecture be adequate for NCM transactions? Perhaps not, taking account of the following considerations:

- The types of Kyoto units enabled by the Data Exchange Standards can all be measured in a common currency, the basic unit being one tonne CO₂-eq GHG. However, this may not necessarily be the case under Networking;
- Each heterogeneous trading scheme, presumably, will have its own registry already, and these may or may not be capable of satisfying the Data Exchange Standards;
- The transaction types may also differ from those enabled by the Data Exchange Standards:
 - The actions carried out by the ITL/STLs are (i) performing checks (all binary in nature); and (ii) updating account records: there is no trading component, but rather the process the ITL/STLs perform is just a condition precedent to financial settlement of the transaction which takes place independently. Consideration should be given to whether this needs to change for trading and settlement under Networking.
- Transactions under Networking presumably will need to account for exchange rates/price differentials/ratios between the respective mitigation outcomes. The question arises whether the basic electronic 'plumbing' of these transactions should be able to account for the trading side of the transaction also, as well as the transaction log-type checks? Or should it remain separate, as under the existing arrangements?
- Transaction log-type checks will need to be performed on mitigation outcome assets traded under Networking, since presumably they will need to be compliant for the purposes of counting towards NDCs. In this case, relevant checks against the requirements for that compliance will need to be conducted, but these will be done by the STLs, presumably, not by the ITL: this begs the question what will the ITL role include: will it just be account keeping? Auditing checks on STLs? Other?
- The advent of new technologies such as the distributed ledger technology canvassed below.

What might these considerations mean for design for this market?

7.3. New Approaches: Distributed Ledger Technology

The accuracy and reliability of transaction record-keeping and accounting will be paramount to the operation, let alone the success of any networking of carbon markets. The importance of robust accounting for international transfers has been underscored in the words of Article 6, Paris Agreement, Parties may engage:

“... on a voluntary basis in cooperative approaches that involve the use of internationally transferred mitigation outcomes towards nationally determined contributions, promote sustainable development and ensure environmental integrity and transparency, including in governance, and **shall apply robust accounting to ensure, inter alia, avoidance of double counting consistent with the guidance** [developed and recommended by the Subsidiary Body for Scientific and Technological Advice (SBSTA) pursuant to the decision in paragraph 37].” (emphasis added)

In this respect, the advent and development of blockchain, or distributed ledger technology, may prove timely. In January 2016, the United Kingdom Government’s Chief Scientific Adviser published a report⁸⁸ recommending the widespread application of this technology by the government. He begins:

“Ledgers have been at the heart of commerce since ancient times and are used to record many things, most commonly assets such as money and property. They have moved from being recorded on clay tablets to papyrus, vellum and paper. However, in all this time the only notable innovation has been computerisation, which initially was simply a transfer from paper to bytes. Now, for the first time algorithms enable the collaborative creation of digital distributed ledgers with properties and capabilities that go far beyond traditional paper-based ledgers.

“A distributed ledger is essentially an asset database that can be shared across a network of multiple sites, geographies or institutions. All participants within a network can have their own identical copy of the ledger. Any changes to the ledger are reflected in all copies in minutes, or in some cases, seconds. The assets can be financial, legal, physical or electronic. The security and accuracy of the assets

stored in the ledger are maintained cryptographically through the use of ‘keys’ and signatures to control who can do what within the shared ledger. Entries can also be updated by one, some or all of the participants, according to rules agreed by the network.”

The two main advantages of distributed ledger technology are firstly, its accuracy, since it offers a traceable record of every transaction in the history of the asset; and secondly, security, since the ledger is extremely difficult to tamper with or make unauthorised changes to, as there are multiple copies of the database which are shared publicly.⁸⁹

Because it is based on a distributed ledger, this technology may also render centralised clearing the settlement (for example, in the case of the proposed ISP) unnecessary and so it is important that it is considered as part of the NCM development process. It has been reported that already banks and financial institutions see the threat it poses to their traditional roles, so they are investing large sums in developing and testing the technology for incorporation into their e-commerce and crypto-currency strategies. One illustration given is that of the Australian Stock Exchange, which in January 2016 announced that it was developing a distributed ledger solution to replace its existing platform for clearing and settling trades.⁹⁰

The applications for international carbon trading extend beyond the application to incorruptible registries and databases. Technology companies are developing self-executing smart contract programmes whereby a blockchain database hosts a secure smart contract along with an algorithm specifying the execution rules. Once those rules are met, the contract is automatically executed.⁹¹ This offers lower costs, scalability and a higher level of trustworthiness that may well find an application in networked carbon market transactions.

With clear applications in and interest from the financial sector, it is unsurprising that financial regulators are already taking an interest in getting to better understand the technology and its applications. Parties interested in developing linked or networked carbon markets to achieve a more globally uniform carbon price would do well to follow their example.

⁸⁸ Mark Walport, UK Government Chief Scientific Adviser, Distributed Ledger Technology: beyond block chain, https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/492972/gs-16-1-distributed-ledger-technology.pdf, accessed 17/05/16.

⁸⁹ Mason, Hayes & Curran, Blockchain Game Changer: Blockchain and the Distributed Ledger Technology Deciphered, 14 March 2016, at www.lexology.com, accessed 5/04/16.

⁹⁰ Ibid.

⁹¹ Ibid.



8. What Is the Market?

This section asks the essential questions: what is the market? Where will demand come from, how and why will it grow?

8.1. Who Will Trade? Why? How Will Networking Begin?

There are parties already that may wish to participate in trading across networked carbon markets. As noted in Section 2, as of 2015, there were nearly 40 countries and 23 sub-national jurisdictions designing or implementing different carbon pricing policies such as emissions trading systems or carbon taxes. In the lead up to COP21, governments submitted their intended nationally determined contributions (INDCs) and in 90 of these, the governments expressed interest in using carbon markets to reach their emission reduction targets.⁹² Some governments actually indicated that, in addition to domestic contributions, additional reductions could be achieved with access to international market-based mechanisms.⁹³

Why might they wish to do so? Benefits of linking markets that have been put forward include:

- a widely accepted price on carbon, bringing greater certainty to investors and encouraging more sources of climate finance, which in turn can generate benefits such as technology transfers between countries and innovation, as well as fostering sustainable development;
- greater depth and liquidity in the markets, affording better stability, clearer price movements and decreasing the risk of price shocks, all of which will further encourage investment;
- greater cost efficiency and effectiveness in achieving emissions mitigation, the ultimate objective of applying the market mechanism.

At the moment, however, in the absence of a framework for trading between schemes and jurisdictions, these anticipated benefits are only theoretical. In a sense, we are currently in the position of having obtained some research data, which while promising, doesn't actually prove a demand exists for trading across schemes or

jurisdictions. The questions are: how can this demand be proven sufficiently? Sufficiently for what to happen?

8.2. Market Development: Phased Development

One answer to those questions is that development of the market needs to take place in a phased manner. Initially trading might take place between schemes in the same jurisdiction, for example, in China, the trade may occur between a compliance entity under one provincial ETS (e.g., Guangdong) and a compliance entity under another provincial ETS (e.g., Shenzhen); or in the US, between a compliance entity under RGGI and a compliance entity under the California ETS.

The next phase might then see trading occur on a jurisdictionally bilateral basis, for instance, between a provincial ETS in China and, say, the California ETS; or when the Chinese national ETS is running, between a compliance entity under that scheme with a compliance entity under the EUETS. This type of stepwise growth might develop into limited multilateral trading arrangements between a group of jurisdictions or 'carbon club', the final phase of development seeing full open international (or transnational) opt-in trading.

However, while this phased approach might allow for the gradual building of confidence in the benefits to be gained and operability of the concept, it still does not answer the question of how it will happen: what will be required to enable these trades to take place and who will provide it? The rules, institutions, infrastructure—the necessary wherewithal to make it happen the way it needs to happen, that is, in a way that ensures proper, robust accounting; that affords transparency and integrity; and that doesn't compromise the environmental integrity of any participant's scheme or that of the overall system.

Ultimately, there will need either to be such a clamouring demand that the incentive will exist for parties (either private or public sector) to apply the required resources to provide such wherewithal, or adequately resourced parties—whether national governments or intergovernmental organisations—will see it as part of their remit to commit risk resources in order to stimulate and

⁹² Environmental Defence Fund (EDF) and International Emissions Trading Association (IETA), April 2016. Carbon Pricing The Paris Agreement's Key Ingredient.

⁹³ Ibid 50.

foster this development. As noted earlier, in Section 3, carbon markets are creations of policy and compliance driven, so while it would be encouraging if large private sector institutions saw it as part of their remit to stimulate and foster trading between schemes and jurisdictions, that outcome is considered unlikely. The stimulus and incentive is most likely to come from the public sector.

In this respect, the World Bank Group is acting already through the NCM initiative and other programmes such as the Partnership for Market Readiness (PMR). The NCM work plan for 2016 has a country focus: following Peru and Thailand, piloting the MAAP in other jurisdictions, as well as conducting feasibility studies with local partners in China, Japan and India. The work plan also includes the modelling and simulation exercise, mentioned earlier, which has the dual purposes of developing trading rules that might be applied to transactions across schemes or jurisdictions, and of providing a tangible focus for interested stakeholders. This exercise is further elaborated in the following section.

8.3. Simulating the Market, Trading Rules, Testing for Perverse Outcomes, Results, Direction

The NCM initiative is exploring the use of MV to determine trading ratios for mitigation outcome asset units deriving from various heterogeneous mitigation actions and, for this purpose, has commissioned a modelling and simulation exercise to take place over 2016. While there is no finalised definition for what MV is, for the purpose of the exercise MV has been defined as the likelihood that any domestic carbon asset unit actually represents a meaningful unit limit or reduction of GHG emissions.

The first phase of the exercise aims to assess the impact of linking mitigation actions both within and across jurisdictions by setting up an inter-jurisdictional model (based on three G20 countries) and an inter-sectoral model (based on sectors within a country) to run three scenarios for the year 2030 as follows:

- no linking: each country/sector has its own ETS;
- direct linking: the three countries and sectors all participate in a single carbon market whereby allowances are traded between jurisdictions on a 1:1 basis; and

- networking: the three countries and sectors linked using trading rules proposed on the basis of seven different design options for MV-based trading rules, specified under the modelling exercise (see Table 3, in Section 5.5).

The aim is to model and compare impacts under each of these scenarios on:

- (a) the prices of the carbon allowances;
- (b) emissions (both domestic and traded) achieved by each country and each sector;
- (c) emissions intensity by country and sector;
- (d) marginal abatement costs by country and by sector;
- (e) total cumulative abatement costs by country and by sector;
- (f) net trade balance by country and by sector; and
- (g) total costs and revenues by country and by sector.

The outcomes of this phase of the exercise will include identification of factors that might influence the results for items (a)–(g) under the networking scenario, as well as any potential benefits and/or risks of networking under any of the seven design options modelled. The second phase of the modelling exercise would then run and re-run the transaction scenarios modelling with the rules and MV assessment process, as well as devising the business process flow for trading to ensure market integrity. The objective would be design testing and formulating trading rules. The third phase of the exercise would then be to run a simulation exercise, possibly involving jurisdictions and actual market participants and trading entities. A significant aspect of this phase would be to achieve outreach and stakeholder engagement.

The preliminary modelling for phase one has looked at China, Mexico and South Korea and energy related emissions in the following thirteen sectors: power; chemicals; manufacturing; mineral products; steel; upstream & refining; residential; services; agriculture; road transport; domestic air transport; other transport; and waste.⁹⁴ This work is on-going.

⁹⁴ ENERDATA, Using Mitigation Values to Guide the Design of Trading Rules, workshop presentation, 28 May 2016.



9. Recommended Next Steps

As a general observation, the overall body of work for developing the NCM initiative conceptually might be considered to comprise seven modules or strands:

- development and refinement of the concept of 'mitigation value' and developing the process for assessing mitigation impact;
- using mitigation value to inform trading;
- development of the transaction mechanism for networking;
- development of the role and functions for the settlement platform;
- elaboration of a market design;
- development of the International Carbon Asset Reserve (ICAR); and
- identifying and fostering development of the market—participants, size, demand, modelling.

However, the emphasis for the immediate future is to park further development and elaboration of the conceptual side of the NCM and focus rather on identifying where the demand might come from. In a sense, this concentrates on the last of the strands listed above, but it takes a much more 'hands on', tangible manifestation. The emphasis is on the institutions within potentially interested jurisdictions, including China, India, Chile, Mexico and others through the World Bank Group's Program for

Market Readiness, to develop the model as it stands as it might suit their domestic circumstances and to engage relevant stakeholders locally. As noted, the NCM work plan for 2016 has a country focus, exploring opportunities for piloting the MAAP and, amongst other things, conducting stakeholder consultations in China.

Nevertheless, to the extent that the conceptual work will continue at some point, there are a number of areas identified in this paper that invite specific, follow-up work. For the purpose of making recommendations as to next steps, these might be grouped into the following five categories:

- (i) general development of mitigation value concept and process for assessment;
- (ii) how to form the 'view' on level of ambition, if that concept is developed;
- (iii) how to translate mitigation values into exchange rates;
- (iv) the supervisory bodies for suitable institutions making mitigation values assessments and other roles identified; and
- (v) the possibilities for introduction of International Transaction Units and an Index.



Glossary of Selected Acronyms

BAU	Business as usual	ISO	International Standards Organisation
BIS	Bank for International Settlements	ITL	International Transaction Log
CCC	Central counterparty clearing	ITMO	Internationally transferred mitigation outcomes
CDM	Clean Development Mechanism	ITU	International Transaction Unit
CERs	Certified Emission Reductions	JI	Joint Implementation
CITL	Community Independent Transaction Log	KP	Kyoto Protocol
CMA	Conference of Parties serving as the Meeting of Parties to the Paris Agreement	LSE	London Stock Exchange
CO ₂	Carbon dioxide	MiFID	Directive on Markets in Financial Instruments
CO ₂ -eq	Carbon dioxide equivalent gas	MV	Mitigation value
COP	Conference of Parties to the UNFCCC	NCM	Networked Carbon Markets
COP/MOP (or CMP)	Conference of Parties serving as the Meeting of Parties to the Kyoto Protocol	NDC	Nationally Determined Contributions
COP21	Twenty-First Conference of Parties to the UNFCCC	NGO	Non-governmental organisation
CRA	Credit Rating Agency	OTC	Over-the-counter
CV	Compliance value	PA	Paris Agreement
DOE	Designated Operational Entity	POA	Programme of Activities
EC	European Commission	PPP	Programs, policies and pledges
ECB	European Central Bank	QELRC	Quantified emission limitation and reduction commitment
EEX	European Energy Exchange	S&P	Standard & Poor's
ESMA	European Securities and Markets Authority	SBI	Subsidiary Body for Implementation
ETS	Emission Trading Scheme	SBSTA	Subsidiary Body for Scientific and Technological Advice
EU	European Union	SDR	Special Drawing Rights
EUETS	European Union Emissions Trading Scheme	SO ₂	Sulphur dioxide
FTSE	Financial Times Stock Exchange	SOAP	Simple Object Access Protocol
FV	Financial value	SOP	Share of proceeds
FX	Foreign exchange	SSL	Secure Socket Layer
G20	Group of Twenty major economies (EU + 19 countries)	STL	Supplementary Transaction Log
GDP	Gross Domestic Product	UNFCCC	United Nations Framework Convention on Climate Change
GHG	Greenhouse gas	US	United States
GWP	Global warming potential	USEPA	US Environmental Protection Agency
ICAR	International Carbon Asset Reserve	VPN	Virtual Private Network
ICE	Intercontinental Exchange	WBCSD	World Business Council for Sustainable Development
IISD	International Institute for Sustainable Development	WRI	World Resources Institute
IMF	International Monetary Fund	WTO	World Trade Organisation
INDC	Intended Nationally Determined Contributions	WWF	World Wide Fund for Nature
IOSCO	International Organisation of Securities Commissions	XML	Extensible Mark-up Language
IPCC	Intergovernmental Panel on Climate Change		



Annex A

This Annex sets out an extract of relevant sections of the discussion paper titled “NCM and the Post-2020 Global Climate Change Regime” by Andrei Marcu.

3. Basic Concepts

A number of concepts and definitions need to be examined, and well understood, as they will appear frequently in this paper and used to answer the questions identified in Section 2. It is especially important to understand what NCM is, and especially what it is not.

The concepts that will be reviewed include:

- Markets: Natural vs. Regulatory
- Markets: Voluntary vs. Compliance
- Markets: Domestic vs. International
- Markets: Under international agreement vs. outside international agreement
- Markets: Linked vs. Networked
- Value of Units: Financial, Mitigation, Compliance
- Networked Carbon Markets

3.1. Value of Units

In GHG markets units can have a number of values: Financial Value (FV), Mitigation Value (MV) and Compliance Value (CV). The concept of Mitigation Value is fundamental to the discussions on NCM, as is the relationship between the Mitigation Value and Compliance Value.

Mitigation value: The Mitigation Value refers to the relative value of a unit versus a defined Standard Unit of reduction. What the concept of Mitigation Value is can be described in a number of ways, but it is also important to define what it does not refer to.

MV is a relative value that is helpful in defining the fungibility of units in heterogeneous carbon markets where it is difficult to compare the value of different units.

MV does not refer to the atmospheric impact of a unit of a ton of CO₂e reduced. It is used as a relative value to help define the value of units coming from different carbon pricing systems. One expression that has been sometimes in relation to MV is that “a ton is not a ton.” This has been interpreted as implying that a ton of GHG reduced in one place does not have the same environmental effect in

terms of combating climate change. That is not the case, and indeed, can never be the case.

The MV, as a relative value, can be interpreted in more than one way. One perspective is that it shows how much the effort to reduce a unit (e.g., a ton of CO₂e) in a jurisdiction is worth—relative to another jurisdiction. Alternatively, it could be expressed as how the effort to contribute to addressing climate change is rated in a jurisdiction, relative to a defined standard.

The MV of unit can also be described as the value stakeholders/society attaches to the effort to reduce a unit in terms of what **it thinks** that the jurisdiction **should do** to address climate change. In this perspective, the MV can be a function of a number of factors, which may include:

- The level of the effort that is promised and undertaken
- Characteristics of the economy—what is the abatement cost curve
- Characteristics of the program or activity undertaken to reduced GHG—that is the quality of the program and the certainty of delivery of the reduction
- Resources available to dedicate to mitigation efforts
- Capacity to undertake mitigation efforts

Another perspective can be a probabilistic one (or risk based), and refers to the probability that a unit of reduction in a jurisdiction (credit issued, or allowance to emit a ton of CO₂e) represents a ton of CO₂e. The MV value is therefore a 1 ton x MV = amount of CO₂e reduction that a unit represents. In this perspective the elements of risk that define the MV are discussed below.

Program Level—Carbon Integrity Risk

This risk relates to the extent to which a specific low-carbon program or activity (e.g., regulatory instrument, price instrument and quantity instrument) will achieve its intended outcome. The challenge is to establish an approach that can accommodate the wide range of new and heterogeneous low-carbon programs that are now emerging. Currently, systems like the Clean Development Mechanism provide only a binary ‘yes or no’ outcome on the validity and verification of emissions reductions. However, this limits the ability to differentiate among projects that have met minimum requirements, or to evaluate to what degree projects perform, vis-à-vis the

threshold. As a result, there is a wide range of low-carbon programs and activities whose overall benefits/risks are not captured by this approach. This is evident in certain sectors, geographies and areas of activity with the highest sustainable development potential, or those which contribute most to transformational change.

Jurisdiction Level—Policy/Regulatory Risk

Policy/regulatory risk relates to the extent to which a jurisdiction's collective low-carbon policies will achieve the intended outcomes. It involves technical considerations, such as the extent to which the set of policies designed to achieve the mitigation target within the existing policy context are likely to achieve the intended outcome. It also involves political considerations, such as the extent to which the government has the political will, track record, and institutional strength to maintain or adjust policies to achieve appropriate mitigation targets.

Global Level—Relative Climate Mitigation Contribution

Assessing a jurisdiction's relative climate mitigation contribution relates to the extent to which its climate mitigation targets are perceived as a sufficient contribution to the global effort to limit global warming. The objective of this approach is to incentivize jurisdictions to increase their level of effort.

A Mitigation Value can be determined and assigned by a regulator, or by any stakeholder. Those that wish to assign a MV to a unit of GHG reduction can use many algorithms and factors.

It is important to note that both concepts outlined above represent a valid point of view in terms of relativity concepts, and are in some ways, a mirror image of each other. The former sees relativity in the effort that is put into reducing a ton of CO₂ in different jurisdictions. The latter sees relativity in what can be achieved with a unit of effort, or in a more classic way, what is the probability that a unit reduction in a jurisdiction represents 1 ton of CO₂e.

What these two concepts also share is a degree of subjectivity in assigning value, whether it is to the relative effort, or the probability of delivery. The body of knowledge and experience developed in assigning probability of outcome is much better understood, and consequently this paper will take the definition of Mitigation Value as being the probability of a unit of reduction from a jurisdiction represent 1 ton of CO₂e.

For illustration purposes we will provide an example. When the KP was agreed, AAUs were assigned by the regulator (the COP) at a MV = 1 (that is representing the probability of representing a reduction, in terms of

probabilities defined above). However, as circumstances changed, and "hot air" emerged as an issue, the MV of an AAU from the former Eastern Block was seen as less than 1, and less than the MV of a Japanese or NZ AAU.

This is a relative and judgmental value, but there was a clear differentiation that emerged. AAUs from one jurisdiction were seen as representing a high probability of 1 ton of reduction, while the other one, rightfully or wrongfully, was seen as less probable as representing 1 ton of reduction. This was reflective of the desire of those purchasing an AAU that it represent a 1 ton actual effort to reduce, not an incidental reduction.

The MV of CERs provides another example. Gold Standard CERs and "regular CERs," in spite of having gone through the same CDM regulatory cycle, receive a higher MV from stakeholders. The added Gold Standard filter re-assures those willing to purchase CERs or reductions that it has a high probability to actually represent a ton CO₂e reduced.

Compliance value: This is the value that the regulator decides to assign to a unit used for compliance purposes in a jurisdiction. A unit could have multiple CVs:

- Domestic, in the jurisdiction where it was issued
- International
- Domestic, in the jurisdiction where it is imported, and used for compliance

As opposed to the Mitigation Value of a unit, where any stakeholder can assign a MV, in a compliance regime it is only the regulator that can decide the compliance value in a given jurisdiction. Alternatively, the regulator may decide, voluntarily, that it delegates that decision to another body.

For illustration purposes, CERs resulting from HFC projects have different CVs. Whereby a CER is worth a tone for UNFCCC compliance, it is valued at 0 (zero) for compliance under the EUETS. It is therefore possible that the issuing regulator and the regulator that controls the compliance process, if not the same, may assign different values to the same unit.

Relationship between MV and CV

An important element in creating fungibility across heterogeneous markets is the relationship between MV and CV. That relationship is not well understood, and yet it can be used to explain many of the symptoms emerging in GHG markets, and which need to be addressed.

As discussed above, the regulator, or any stakeholder can set a MV. It is an important value as it provides the credibility of the GHG market, which is purely regulatory in nature, and therefore needs a license to operate.

The tendency of the regulator is to set (assume) a $CV = MV = 1$. As long as this equation holds true, the GHG market will maintain credibility, and will be allowed to function.

Once the set CV is different from the generally accepted MV, then the market loses credibility, and is under pressure to introduce measures to address the situation. A few examples can illustrate this type of situation.

When KP was signed, the COP, as a regulator, saw AAUs as having as $MV = CV = 1$. Stakeholders initially accepted this MV. However, as soon as significant amounts of “hot air” starting to emerge in Russia, Ukraine, etc., perception of AAU having a MV less than 1 became prevalent. However, the CV of the AAUs was maintained at 1 for KP compliance, which led to a loss of credibility of AAUs (the ones available on the market were from former Eastern Block countries) as a trading for compliance unit, while maintaining its accounting function.

This situation eventually led to pressure to “do something” about surplus AAUs. That pressure materialized in Doha, when provisions were introduced to eliminate the surplus AAU in the SCP of the KP.

The EUETS finds itself in a situation that is not dissimilar. There is currently a huge surplus of EUAs primarily due to the economic recession (could be seen as EUETS “hot air”). This has led the MV of the EUA to be seen as less than at assigned CV, resulting in efforts to address the situation in an ad-hoc manner through back loading, and through the MSR, on a more permanent and predictable basis.

One aspect that needs to be highlighted is the fact that the MV and CV of units, can be **binary or risk adjusted**. For illustration purposes, currently a CDM project is deemed to be additional (and meet the rest of the regulatory cycle). In the case that project is deemed additional a CER is issued. If not there is no issuance.

The reality is that as a counterfactual argument, a project can never be said with 100% certainty to be additional or not. As such, an alternative approach would be to assign it a **risk-adjusted** value (between 0% and 100%). This would be an approach more in line with the realities of how the credits are created and the MV of a unit of reduction.

Financial value. This is the value that the market place assigns to a compliance unit, and will be dependent on a number of issues, including demand/supply balance, market liquidity of the product, etc. However, the FV is likely to be dependent on the MV as well as the perceived relationship between the Mitigation Value and the Compliance Value. The FV is a function of the MV in two ways. Firstly, if the $CV = MV$ then the market will pay accordingly, 1 or less than 1. Alternatively, if there is a discrepancy between the determined MV, and assigned CV, this leads to the expectation of a regulatory intervention, with implications for its FV.

While market actors set the FV in the marketplace, it is by no means a rare occurrence to have legislation of regulation or legislation interfere in setting a FV.



Annex B

This Annex sets out the findings of the earlier unpublished concept paper titled “Designing a Model for Networked Carbon Markets,” which draw on the examination of three comparable financial markets, namely the bond/ debt market; the foreign exchange market; and physical commodities markets.

Section 4: NCM Model, as a Focus for Further Discussion

To summarise points/issues elicited from the foregoing, for the purpose of proposing elements of a model:

- Trading should be on an exchange, as opposed to OTC, through a central clearing counterparty model;
- Rating:
 - MV rating will be of the jurisdiction overall;
 - However, at the beginning, there will also need to be an evaluation made of the carbon asset and trading scheme⁹⁵ to assess whether electronic trading architecture can be applied to it—that is, whether the carbon assets under different schemes can be described or expressed in terms of trading attributes in such an architecture. As this involves costs, a preliminary question is whether it can be demonstrated empirically that price dislocations exist in the market as it stands, that warrant development of the architecture. In other words, is there a demand for NCM that will justify the cost of this work?
 - MV rating is expressed as an opinion—what level of confidence will need to be attached to the opinion to make it acceptable to the market?
 - MV rating is relative—as between schemes this is acceptable, but query need also to be against an empirical standard—and, if so, what is that standard?
 - MV rating should be capable of applying at any jurisdictional level, that is, national, provincial, local; it should be possible to have an MV rating of a jurisdiction irrespective of whether it engages in NCM trading
- MV raters:
 - should be subject to regulatory supervision;
 - rating methodologies should be accredited by the supervisory body and transparent;
 - there should be encouragement for multiplicity of MV raters;
 - ‘issuer pays’ problems should be avoided—payment for MV ratings should be structured to foster desired policy outcomes, rather than offering excessive arbitrage opportunities;
- The NCM model should be flexible enough to allow for policy adjustment, in other words, to allow for the management of the supply of carbon assets in the market to ensure policy goals, just as is the case with monetary policy. In this respect, the proposed International Carbon Asset Reserve is relevant, but how should it intervene in the market? Under what conditions?
- In terms of the trading mechanism, is it to be an exchange mechanism (i.e., based on an exchange of carbon assets between the schemes) or a price mechanism?
 - Under an exchange mechanism, since carbon assets move in both directions, the asset holdings of each scheme should be the same immediately after the transaction as before. Query the effect on the MV ratings of the jurisdictions engaged in such exchange? Also query what the effect is when the MV ratings of those jurisdictions fluctuate up or down subsequently: does that affect the rate at which those assets may be traded in the future?
 - Under the price mechanism, the movement of carbon assets is in one direction only. Hence, immediately after the transaction, the asset holding of one scheme will be less, and the holding of the other scheme more, than before

⁹⁵ Some of the issues that might arise in this context include banking and borrowing; grandfathering; the length of time a carbon asset can be held before it must be surrendered under one scheme or another (annual?); whether carbon assets based on allowances should be fully fungible with carbon assets based on project credits.

the transaction. Will this be material to the MV rating of those jurisdictions?

- There is also the possibility of the exchange mechanism being via a ‘vehicle’ carbon asset—would this be useful?
- MV rating should be based on a broad range of factors, being broader than the concept of “creditworthiness,” more akin to FX rate setting, and equally dynamic. As market confidence/sentiment derives from the MV rating, this process should be able to withstand rigorous scrutiny;
- Pegging of MV ratings—would this be possible? Desirable? What purpose would it serve?
- Market participants should include not only entities under the trading schemes, but also market makers and other investors (the application of KYC, anti-fraud and AML protocols being implicit);
- Trading contract wording should be standardised (e.g., ISDA);
- If it transpires that the carbon assets under different schemes cannot be described or expressed in terms of trading attributes in an electronic trading architecture, such as FpML or FIX, it may be possible to define standardised grades of asset which can.

Proposal for a Model

Elements of the proposed model might include:

- the MV rating and an empirical reference standard;
- the MV raters;
- regulatory supervision;
- carbon asset characterization;
- the Trading mechanism;
- infrastructure; and
- institutions.

1. The MV Rating and an Empirical Reference Standard

The MV rating lies at the heart of the NCM idea. The MV rating is a rating of the jurisdiction within which the carbon trading scheme is located. The jurisdiction issuing the carbon asset is evaluated as a whole, in terms of the mitigation value of the P&Ms—including the trading scheme which generates the carbon assets—it has in place to mitigate emissions from within its boundaries. Factors taken into account might include the profile of its

economy, levels of production, levels of emissions, level of ambition in setting targets to mitigate those emissions and so on. A broad range of factors.

The task of devising frameworks and methodologies for assessing MV is beyond the scope of this paper. For the purpose of this paper, it is assumed simply that there will be an MV rating. In terms of proposing a model for NCM, however, some further thoughts about the nature of MV ratings are as follows:

- (i) The MV rating is of the jurisdiction as a whole; by this it is meant, the jurisdiction in which the trading scheme operates—hence, if the scheme operates at a provincial level, then the MV rating is of the provincial jurisdiction;
- (ii) The MV rating will translate into the rate of exchange, or the price, or the ratio, at which a carbon asset generated by the trading scheme in that jurisdiction, will be exchanged or purchased;
- (iii) It will be relative to the MV ratings of other jurisdictions;
- (iv) The MV rating, or exchange rate, may be relative as between jurisdictions and their respective carbon assets, however, ultimately there needs to be an empirical standard against which they would be measured to impart sufficient confidence to the market and regulators. The ‘value’ in carbon assets comes from the degree of confidence there is that the reductions are being made, that the scheme is enforced so that the cap on a participant’s permitted emissions is not exceeded, that emissions permitted under the scheme will gradually be reduced and that the scheme will continue to be operated, managed and policed appropriately throughout its anticipated lifetime;
- (v) For illustration, two suggestions as a way to determine an empirical reference standard (the “Standard”) against which MV ratings, and hence the value of carbon assets, might be judged are:
 - Firstly:
 - based on international consensus to limit temperature increase to 2°C, which in turn translates into a specified level of global emissions per year (annual global emission cap);
 - the annual global emission cap is allocated on a per capita basis to give annual nation state emission caps (the per capita approach accords with various UN principles on equality and objections can be offset by

dropping the historical emissions argument from the debate);

- the ‘value’ is self-evident: scientists say that the 2°C cap is the level necessary to avoid serious climate disruption;

Or alternatively,

- Annual nation state emission caps are based on a country’s INDC (this might risk being considered as being too imprecise/susceptible to manipulation, and so as having less ‘value’, by the financial markets, on the basis of the proposition that the ‘value’ of the asset is what ultimately drives market sentiment—confidence that what is being purchased has a value that will be honoured);
- (vi) If the Standard were to be based on either of the two alternative approaches outlined above, then clearly, each nation state could have an MV rating. If the jurisdiction that housed the trading scheme were sub-national—provincial or local—then the MV rating methodology would need to be able to provide a rating at that sub-national level as a subset of the national MV rating. This would be analogous to the way in which credit ratings can be made at sovereign, provincial, or municipal levels of government. The MV rating of the sub-national jurisdiction would contribute to/be considered in reaching the MV rating of the national jurisdiction overall [or probably vice versa];
- (vii) Being the result of a large suite of variables, it is envisaged that the MV rating will be dynamic in nature, more akin to the daily rate settings of currencies for FX, in its fluctuations, than to the possibly longer timeframe settings of credit ratings;
- (viii) An MV rating could be ascribed to a jurisdiction, at any time, even without the jurisdiction opting into NCM. While the MV rating translates to an exchange rate, or ratio, of a carbon asset and be dynamic and subject to [daily/regular] fluctuations, in practice it will only be specifically relevant [in terms of its compliance value] at the time the carbon asset is surrendered or cancelled for compliance purposes, [or possibly also when it expires due to effluxion of time in accordance with the rules of the scheme by which it was created].

2. The MV Raters

There are a number of types of organizations that might serve as possible models for the MV raters: Designated Operational Entities (DOEs) under the Kyoto

Protocol; credit rating agencies; global consulting firms environmental economics consultancies.

The nature of the activity suggests that a cross between a DOE and a credit rating agency might produce an entity with the right mix of skills, resources and expertise.

The MV raters should be independent, private sector organizations, subject to regulatory supervision. The actual entities deemed suitable to provide MV ratings will be a matter for the supervisory body. This will be an important function, in view of the importance of the role performed by these entities, although it will be important not to elevate them to the special quasi-regulatory status which has been afforded credit rating agencies, leading to some of the problems identified in the fall-out from the global financial crisis. One way to address this issue would be to encourage a significant number of organizations to seek recognition as an MV rater. Greater numbers would operate against a small number having dominance in the market as well as offering other benefits, such as better, more diverse scrutiny and evaluation of jurisdictions’ mitigation efforts, the trading schemes and carbon assets.

How many entities are deemed suitable, in the end, will be up to the supervisory body. The entities seeking to be recognized as MV raters should satisfy minimum criteria, for example, in terms of technical and financial capacity; in terms of access to resources, governance, knowledge base, systems and personnel, training, etc. The methodologies applied by the MV raters should be accredited by the supervisory body and should be transparent—for instance, by being publicly available (at least to some degree which also takes in account commercial confidentiality issues to the extent relevant).

How the MV raters are remunerated for providing the MV ratings should be structured to foster the desired policy outcomes, rather than offering excessive arbitrage opportunities for parties. One possibility might be for payment setting to be based on a small levy on the transactions arising from NCM trading. This idea of a transaction levy has already been applied in the CDM in relation to the Share of Proceeds levies for administrative expenses and adaptation.

[For example, in the case of NCM, any number of MV raters could quote a particular rate (e.g., for Korean ETS-v-EUETS). The pool of funds generated by transactions Korean ETS/EUETS would then be shared between them, except for outliers, e.g., those MV raters whose quoted rates differ by more than a specified percentage from the [mean/mode/median] of quotes. This could encourage rate setting towards a norm, avoiding more extreme

assessments skewing the MV rating, and generate greater confidence in the rate applied. In cases where an MV rating is made for a jurisdiction, but it is not engaging in NCM trading, there could be an alternative mechanism, for example, a fixed amount payment, from the pool.]

3. Regulatory Supervision

Oversight of the MV raters might be exercised by the UNFCCC/COP through [a constituted body under a new protocol, possibly structured along similar lines to the CDM Executive Board]. As noted above, they would be recognized as MV raters if they satisfy minimum criteria, for example, in terms of technical and financial capacity; in terms of access to resources, knowledge base, systems and personnel, training, etc. The supervisory body might also specify methodologies, criteria, etc, to be applied, factors to be considered in carrying out the ratings. Alternatively, the MV raters might submit what they proposed as their methodologies, criteria to be applied, factors to be taken into account, to the supervisory body for certification, the supervisory body having published guidelines on what criteria it would apply in making that decision.

The methodologies should be transparent, for example, by being made publicly available (at least to some degree which also takes in account commercial confidentiality issues to the extent relevant). As noted earlier, the EU Regulation on Credit Rating Agencies might serve as a model.

4. Carbon Asset Characterization

How should carbon assets be characterised for the purposes of NCM? In one sense, they are more like a currency: the value derives from the integrity of the scheme that stands behind them. In another sense, they are more like debt securities or physical commodities: ultimately, the contract they represent needs to be honoured—there needs to be a mitigation of carbon emissions, tonnes of CO₂-eq not emitted or sequestered from the atmosphere—they need to be surrendered or cancelled against the compliance obligation of a regulated entity.

Carbon assets cannot be characterized as falling neatly into one or another financial market model. They have characteristics of all three considered. More important, perhaps, is whether the electronic trading architecture can be applied to them: whether the carbon assets under different schemes can be described or expressed in

terms of trading attributes in such an architecture. This will determine the extent to which they are fungible.

5. Trading Mechanism

How will trading take place? Is the trading mechanism an exchange mechanism (i.e., based on an exchange of carbon assets between the schemes) or a price mechanism?

Under an exchange mechanism, since carbon assets move in both directions, the asset holdings of each scheme should be the same immediately after the transaction as before. However, what might be the effect on the MV ratings of the jurisdictions engaged in such an exchange? Also query what the effect is when the MV ratings of those jurisdictions fluctuate up or down subsequently: does that affect the rate at which those assets may be traded in the future? This does not yet address the CV that might be attached by each jurisdiction to the exchanged assets, or what implications there may be for the MV rating of each jurisdiction by such determinations.

Under a price mechanism, the movement of carbon assets is in one direction only. Hence, immediately after the transaction, the asset holding of one scheme will be less and the holding of the other scheme more, than before the transaction. [Also query whether this change in asset holdings will be material to the MV rating of the jurisdiction]

There is also the possibility of the exchange mechanism being via a 'vehicle' carbon asset. Further consideration needs to be given as to whether this might be useful or desirable in the NCM context. However, what does seem clear is that the 'vehicle' carbon asset would need to be from a jurisdiction with a large over-supply for there to be sufficient carbon assets available at any time to perform this role. They would also need to have a reliably stable MV rating. [At this stage, it's hard to see what benefit there would be for any jurisdiction to have its carbon assets used in this capacity, however this issue might still be researched further.]

In the absence of a primary transaction, such as an international trading transaction in the case of FX, necessitating an exchange mechanism for carbon assets, a price mechanism seems simpler and more efficient. As the carbon assets will move only in one direction, there will be half the administrative adjustments in registries that would be required by the exchange mechanism. This may not be a

significant issue in an electronic age, nevertheless, less administration would mean less costs.

Trading should be through an exchange, with a central clearing counterparty to reduce counterparty default risk. There should be standardized wording for trading contracts used globally, with schedules attached according to which carbon asset was being traded into which other trading scheme. Parties wishing to trade should do so through brokers registered with the exchange (and it is implicit that appropriate KYC, anti-fraud and AML protocols would be applied). Whether there is a single exchange, in the form of the proposed International Settlement Platform, or a number of exchanges spread globally but linked electronically, will probably depend on the size of the NCM market. The exchange (or exchanges) will perform settlement and clearing and should be linked electronically to registries in the jurisdictions that have opted into the NCM, either directly or through a central registry such as, or modeled on, the ITL.

The exchanges and the brokers would all be regulated under applicable financial regulatory provisions. Whether all trading contracts for carbon assets would be regulated as financial instruments, or whether financial regulation would only apply to derivatives contracts, would need to be resolved, in the context of developments in financial regulation.

6. Infrastructure

Will the carbon assets across all the heterogeneous trading schemes be fungible and, if so, to what extent? To answer this question, the different schemes need to be evaluated to see whether an electronic trading architecture can be applied to them: whether the carbon assets under those different schemes can be described or expressed in terms of trading attributes in such an architecture. Standardised contract wording will be required for transactions involving those assets which do fit within the trading architecture. The other infrastructure required comprises the electronic links between exchanges (if more than one) and between the exchange(s) and registries, or the ITL-type central registry (if it is decided to establish one). [There would

be a need to develop cross-border [trading] rules and a crossing-platform.]

7. Institutions

As noted above, a supervisory body to recognise MV raters and accredit their MV rating methodologies should be set up and the proposal is that this be done by the UNFCCC/COP [as a constituted body under a new protocol, possibly structured along similar lines to the CDM Executive Board].

Whether an International Settlement Platform needs to be established as a central clearing and settlement institution is an open question. A determination would need to be made whether it may be simpler and more efficient to engage with existing exchanges—the majority of which do not have international reach—or create a new dedicated platform to clear trades via existing clearing bodies.

Whatever approach is taken to the exchange(s), they will need to be linked to the registries operated by the different trading schemes. In this context, it may be decided to establish a further institution in the form of a central registry, modeled along the lines of the ITL [or just use the ITL]. This institution would then have links to each of the registries in the different schemes.

The importance of NCM to global efforts to mitigate the effects of climate change may be considered such as to warrant the establishment of dedicated institutions as an exchange and as a central registry. If this were the case, then it would be more efficient for these functions to be carried out by the same institution.

The NCM proposals include the establishment of the International Carbon Asset Reserve which, as considered above, would perform a role analogous to that which central banks have in applying monetary policy. How the ICAR would be established and how, when and why it might intervene in the market are matters for further consideration beyond the scope of this paper.

Annex C

A glossary of key definitions is proposed as follows:

Concept/Expression/ Term	Definition	Explanatory Notes
administrator or regulator	the legal entity that operates, manages and has the legal power to enforce compliance with an ETS or cap-and-trade scheme	will most usually be an arm of government in the jurisdiction where the scheme operates
allowances	means a carbon asset that is: <ul style="list-style-type: none"> usually issued (either free or by auction) by a compliance scheme administrator to scheme participants ('compliance entities')—entities emitting GHGs who have obligations under the scheme to mitigate their emissions compliance entities will be required to surrender allowances equivalent to their GHG emissions for the compliance periods determined under the scheme (e.g. annually) 	usually measured in base units of a tonne carbon dioxide equivalent greenhouse gas (CO ₂ -eq GHG), whereby Global Warming Potentials of other GHGs are used to give the equivalent number of tonnes of CO ₂ , and GWP CO ₂ = 1
baseline	the emissions scenario that exists in the absence of the PPP	the starting point for measurement of the MV of a PPP
business-as-usual (BAU) scenario	the level of emissions that will occur if no mitigation action is taken	also can be the baseline against which to measure mitigation performance
cap-and-trade	an emissions mitigation scheme in which regulated entities' emissions are capped; they must surrender carbon assets against actual emissions; can trade units of carbon assets: selling if emissions below cap, buying if their emissions exceed cap	caps are reduced over time to send a price signal to the regulated entities as to when abatement is cheaper than paying for more carbon assets
carbon asset	an instrument generated as part of a scheme, project or program the purpose of which is mitigation of carbon emissions. In some jurisdictions, the legal system may classify a carbon asset as a 'chose in action', meaning that it confers a right enforceable at law. May be classified also as a 'financial instrument', depending on application financial regulations in the particular jurisdiction. Usually measured in base units of a tonne carbon dioxide equivalent greenhouse gas (CO ₂ -eq GHG), whereby Global Warming Potentials of other GHGs are used to give the equivalent number of tonnes of CO ₂ , and GWP CO ₂ = 1 Can take the form of an 'allowance' or a 'credit/offset': <ul style="list-style-type: none"> allowances: <ul style="list-style-type: none"> are usually issued (either free or by auction) by a compliance scheme administrator to scheme participants ('compliance entities')—entities emitting GHGs who have obligations under the scheme to mitigate their emissions 	carbon assets include: <ul style="list-style-type: none"> ETS allowances INDC units Credits/offsets carbon assets will be issued as part of a scheme that allows for trading in those assets, so that entities with compliance obligations can buy assets to make up any shortfall for compliance purposes, or sell any assets that are surplus to requirements, to derive a financial gain from having emissions below their limit

Concept/Expression/ Term	Definition	Explanatory Notes
	<ul style="list-style-type: none"> • compliance entities will be required to surrender allowances equivalent to their GHG emissions for the compliance periods determined under the scheme (e.g., annually) • credits/offsets: <ul style="list-style-type: none"> • are generated by projects which avoid or reduce emissions that would otherwise occur, or which sequester GHGs from the atmosphere, in both cases, compared to a baseline • need to be real, measurable and verifiable, as well as additional to BAU • can be surrendered on a voluntary basis, by entities that do not have compliance obligations; depending on the rules of the relevant compliance scheme, may also be able to be surrendered in respect of compliance obligations 	
carbon asset exchange rate (concept yet to be tested for feasibility)	the rate, or ratio, at which a carbon asset generated under a scheme in one jurisdiction might be traded into a scheme in another jurisdiction	the exchange rate may not exist as a separately defined metric, but rather simply be the price agreed by parties to a transaction, as informed by the MVs of the respective jurisdictions
carbon integrity risk (concept yet to be tested for feasibility)	<p>AM: the risk that a PPP will achieve its intended outcome</p> <p>IISD: the risk that emission reductions or removals reported for a PPP actually occurred and are attributable to the interventions implemented as part of it</p> <p>IISD: the risk that reductions or removals resulting from a PPP are not (i) real, measurable and verifiable and additional to what would have occurred in their absence; or not (ii) real, permanent, additional, verified, avoid double counting and achieve net decrease and/ or avoidance of GHGs to preserve environmental integrity</p>	CI risks are: characterization; governance and management; GHG assessment boundary; GHG estimation; GHG monitoring; reporting
central counterparty clearing	Federal Reserve, Chicago: a process by which financial transactions are cleared by a single (i.e., "central") counterparty who interposes itself between contract parties to become buyer to every seller and seller to every buyer	Clearing denotes all activities from the time a commitment is made for a transaction until it is settled. Clearing of payments is necessary to turn the promise of payment into actual movement of money from one bank to another. In trading, clearing is necessary because the speed of trades is much faster than the time for completing the underlying transaction. It involves the management of post-trading, pre-settlement credit exposures to ensure that trades are settled in accordance

(continued)

Concept/Expression/ Term	Definition	Explanatory Notes
		with market rules (even if a buyer or seller should become insolvent prior to settlement). Processes included in clearing are reporting, monitoring, risk margining, netting of trades to single positions, tax management and failure risk management
clearinghouse	a financial institution that provides clearing and settlement services for financial transactions	
compliance value (CV) (concept yet to be tested for feasibility)	the value ascribed by the administrator/regulator of an ETS, to a unit of a carbon asset, at the time it is surrendered for compliance purposes under that ETS	if the carbon asset has been issued by the administrator under that scheme, it would usually be given a value $CV = 1$; if the carbon asset has been issued under the scheme of another jurisdiction, the administrator might be guided by the MV of that other jurisdiction in ascribing a CV to that scheme's carbon asset at the time of surrender
credit	means a carbon asset which is: <ul style="list-style-type: none"> • generated by projects which avoid or reduce emissions that would otherwise occur, or which sequester GHGs from the atmosphere, in both cases, compared to a baseline; • need to be real, measurable and verifiable, as well as additional to BAU; • can be surrendered on a voluntary basis, by entities that do not have compliance obligations; depending on the rules of the relevant compliance scheme, may also be able to be surrendered in respect of compliance obligations; 	usually, but not necessarily, measured in base units of a tonne carbon dioxide equivalent greenhouse gas (CO_2 -eq GHG), whereby Global Warming Potentials of other GHGs are used to give the equivalent number of tonnes of CO_2 , and $GWP CO_2 = 1$
emissions trading scheme (ETS)	an emissions mitigation scheme, that usually operates as a cap-and-trade scheme	
exchange	a central location bringing together brokers and dealers/traders in commodities or financial instruments	can be either physical location or electronic location
financial value (FV)	the price a buyer is willing to pay for a unit of a carbon asset	will depend on a number of market factors, including demand and supply, market liquidity, and depth of the market; will also be influenced by the carbon asset exchange rate between the relevant jurisdictions

Concept/Expression/ Term	Definition	Explanatory Notes
Intended Nationally Determined Contributions (INDC)	national statement to be made by UNFCCC Parties setting out their mitigation goal which eventually can be transformed into a legally binding commitment, must be transparent, quantifiable, comparable, verifiable and ambitious, reflecting the principles of Arts. 4.1 and 4.2 re national circumstances, etc.	
INDC unit	carbon asset generated by an ETS introduced as part of the PPPs established by a country's INDC	
Index	statistical composite that measures changes in the economy or a financial market, often expressed as changes from a base year or a preceding month	each index has its own method of calculation; components may be weighted according to certain characteristics, e.g., stock index weighted for market cap
International Transaction Unit	the unit of a 'transaction currency' introduced for the purpose of facilitating trading between schemes in diverse, heterogeneous jurisdictions	
jurisdiction	means the relevant level of government, which may be national or sub-national; to be a jurisdiction there needs to be clear legislative and administrative control exercised over a geographic area with clearly defined and accepted boundaries	although some sub-national ETS are applied at provincial level, while others are at city or local level, these distinctions are unhelpful as not all countries apply province/city/ municipal distinctions in the same way
level of ambition	the intended target level of mitigation, sought to be achieved by all the PPPs implemented, as stated by a jurisdiction	
mitigation	means stabilising GHG concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system, which is the ultimate objective of the UNFCCC	can be achieved in two ways: (i) limiting or reducing anthropogenic GHG emissions by sources to the atmosphere, or (ii) preserving or enhancing sinks or reservoirs of GHGs
mitigation value (MV)	concept yet to be tested for feasibility	
mitigation value outcome	concept yet to be tested for feasibility	
mitigation value assessment agency	concept yet to be tested for feasibility	

(continued)

Concept/Expression/ Term	Definition	Explanatory Notes
Networked Carbon Markets (NCM) initiative	WBG initiative, inter alia, to facilitate fungibility of carbon assets between heterogeneous efforts to mitigate GHG emissions	
offset	same as a credit	
programs, policies and pledges (PPP)	means the policies, programs and pledges put in place by a jurisdiction to mitigate its GHG emissions	
settlement	delivery of the transacted financial instrument (carbon asset) against payment, usually simultaneously, and otherwise in accordance with the counterparties' contractual agreement	settlement comprises the 'physical settlement' (delivery) and the 'financial settlement' (the payment against delivery)
settlement platform	similar to a clearinghouse, a financial institution that performs the role of central clearing counterparty so as to minimise transactional risk of counterparty failure	these days the functions of exchange, settlement platform and central clearing counterparty might be bundled up into a single financial institution
unit of measurement	the base unit in which a carbon asset is measured, or in which emissions are measured	most often, a tonne carbon dioxide equivalent greenhouse gas (CO ₂ -eq GHG), whereby Global Warming Potentials of other GHGs are used to give the equivalent number of tonnes of CO ₂ , and GWP CO ₂ = 1



Annex D

This Annex sets out three example NCM transaction scenarios:

- the Foreign Unit converted model
- the Foreign Unit imported model
- the International Transaction Unit model

Example NCM Transaction Scenario: Foreign Unit Conversion Model

Jurisdiction A	Jurisdiction B
MV = A	MV = B
Trades A units	Trades B units
Compliance entity A wishes to sell 12,000 A units to Compliance entity B	Compliance entity B wishes to buy 12,000 A units from Compliance entity A
On xx/yy/zz date:	
e.g., MV A/B translates into an exchange rate of 0.67 (that is, 1.5 A units = 1 B unit)	
12,000 A units debited Compliance entity A's account in A registry	8,000 B units credited Compliance entity B's account in B registry

Transaction

- The respective MVs of the two jurisdictions translate into an exchange rate between them (how this is worked out will be critical, but assume for purpose of this example it can be)
- The counterparties agree how many of the seller's carbon units they wish to transact

- The applicable exchange rate, on the date of the transaction, determines the number of carbon units that are credited to the buyer's account in the buyer's registry in the carbon units of the buyer's jurisdiction: the regulator/scheme administrator in Jurisdiction B cancels the 12,000 A units received in the registry account and issues in their place 8,000 B units
- The transacted number of seller's carbon units are debited from the seller's account in the seller's registry: regulator/scheme administrator in Jurisdiction A doesn't need to do anything after the 12,000 A units have been transferred out of the A registry account

Compliance Value

- Jurisdiction A regulator/scheme administrator determines the CV of A units
- Jurisdiction B regulator/scheme administrator determines the CV of B units
- CV doesn't come into the transaction equation, because the units surrendered against compliance in any jurisdiction will always only ever be the domestic units of that jurisdiction

Financial Value

- The price reached by Seller A and Buyer B will be substantially influenced by the exchange rate on the date of the transaction, as in effect, this will determine the compliance value
- As the exchange rate derives from the respective MVs, the price should be a reflection of the relative MVs of the two jurisdictions.

Example NCM Transaction Scenario: Foreign Unit Imported Model

Jurisdiction A	Jurisdiction B
MV = A	MV = B
Trades A units	Trades B units
Compliance entity A wishes to sell 12,000 A units to Compliance entity B	Compliance entity B wishes to buy 12,000 A units from Compliance entity A
On xx/yy/zz date:	
e.g., MV A/B translates into an exchange rate of 0.67 (that is, 1.5 A units = 1 B unit)	
12,000 A units debited Compliance entity A's account in A registry	12,000 A units credited Compliance entity B's account in B registry

Transaction

- The respective MVs of the two jurisdictions translate into an exchange rate between them (how this is worked out will be critical, but assume for purpose of this example it can be)
- The counterparties agree how many of the seller's carbon units they wish to transact
- The applicable exchange rate, on the date of the transaction, is immaterial to the transaction as the number of carbon units that are credited to the buyer's account in the buyer's registry are the same as the number debited from the seller's account in the seller's registry: the regulator/scheme administrator in Jurisdiction B by agreement with Jurisdiction A, accepts A units and credits the 12,000 A units received in the registry account to Compliance entity (buyer) B

- The transacted number of seller's carbon units are debited from the seller's account in the seller's registry: regulator/scheme administrator in Jurisdiction A doesn't need to do anything after the 12,000 A units have been transferred out of the A registry account

Compliance Value

- Jurisdiction A regulator/scheme administrator determines the CV of A units.
- Jurisdiction B regulator/scheme administrator determines the CV of B units.
- CV becomes relevant on the date [aa/bb/cc] that Compliance entity (buyer) B wishes to surrender them to the Jurisdiction B regulator/scheme administrator against compliance obligations under Jurisdiction B ETS. On that date, Jurisdiction B regulator/scheme administrator determines what CV to give to the Jurisdiction A units. If the exchange rate has changed between the dates, xx/yy/zz and aa/bb/cc, then what the CV Buyer B gets for the 12,000 A units on aa/bb/cc may be different from that which would have applied on xx/yy/zz. Buyer B carries that risk.

Financial Value

- The price reached by Seller A and Buyer B will be influenced by the exchange rate on the date of the transaction, but only to the extent that: (a) the exchange rate is relevant to the CV on that date, which may be a function of the NCM arrangements, e.g., might be exchange rate on date of transfer converts directly to CV, or alternatively, might be left up to Jurisdiction B regulator/scheme administrator; and (b) the surrender date for compliance in Jurisdiction B is proximate to the transaction date.

Example NCM Transaction Scenario: International Transaction Unit 'Transaction Currency' Model

Jurisdiction A	Index ('II') based on e.g., all MVs of trading jurisdictions; Index has notional International Transaction Units (ITU)	Jurisdiction B
MV = A		MV = B
Trades A units		Trades B units
Compliance entity A wishes to sell 12,000 A units to Compliance entity B		Compliance entity B wishes to buy 12,000 A units from Compliance entity A
On xx/yy/zz date:		
e.g., MV A/II translates into an exchange rate of 0.67 (that is, 1.5 A units = 1 ITU)		
12,000 A units debited Compliance entity A's account in registry A	8,000 ITUs held in Seller A's pending account on International Settlement Platform	
	8,000 ITUs transferred from Seller A's pending account to Buyer B's pending account	
e.g., MV II/B translates into an exchange rate 1.2 (that is, 0.8 ITUs = 1 B unit)		
		10,000 B units credited Compliance entity B's account in registry B

Transaction

- The respective MVs of the two jurisdictions translate into an exchange rate between each of them respectively and the Index (how this is worked out will be critical, but assume for purpose of this example it can be);
- The counterparties agree how many of the Seller A's carbon units they wish to transact;
- The applicable exchange rate A/II, on the date of the transaction, determines the number of ITUs that are credited to the Seller A's pending account on the International Settlement Platform;
- On financial settlement, the ITUs in Seller A's pending account are transferred to Buyer B's pending account;
- The applicable exchange rate II/B, on the date of transaction (or on whichever date Buyer B decides to move them from its International Settlement Platform pending account to its account in registry B), determines the number of B units that are credited to the Buyer B's account in registry B.

Compliance Value

- Jurisdiction A regulator/scheme administrator determines the CV of A units;
- Jurisdiction B regulator/scheme administrator determines the CV of B units;

- CV doesn't come into the transaction equation, because the units surrendered against compliance in any jurisdiction will always only ever be the domestic units of that jurisdiction.

Financial Value

- The price reached by Seller A and Buyer B should be substantially influenced by the two exchange rates applicable on the date of the transaction, as in effect, this will determine the number of B units received by B;
- As the exchange rates derive from the respective MVs in relation to the Index, the price should be a reflection of the relative MVs of the two jurisdictions to the Index and ultimately, to each other;
- However, nothing above prevents the Buyer B from speculating on an improvement of the exchange rate II/B, by continuing to hold the ITUs in its pending account and only transferring them to its account in registry B as B units, when that more favourable rate applies or when it absolutely needs to, e.g., for compliance reasons. This would not impact in any way on the other elements, such as the CV, since it would just be the number of B units received in the B registry that might vary. The ITUs held in this way in the pending account would only be able to be converted into B units.



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