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Regulating Removals: Bundling to Achieve Fungibility in GGR 'Removal Units'

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Abstract

Reduction in the levels of anthropogenic greenhouse gas (GHG) emissions, while essential, alone will not be sufficient to avoid continuing, damaging climate change impacts. Once the remaining global carbon emissions budget for limiting temperature increase to 1.5°C above pre-industrial levels is exhausted, more GHGs will need to be removed from the atmosphere than are emitted if this target is still to be achieved. Predictions indicate the remaining carbon budget for this target could be exhausted in the next decade. In these circumstances, it is apparent that GHG removal (GGR) technology needs to be scaled up significantly, and development of a market for removal units from GGR projects is one way to do so. As with carbon markets to date, there will be issues to be addressed, not least of which concern the legal and financial nature of the removal units and how removal units generated by different technologies might be fungible. This paper explores these issues, arriving at conclusions that removal units need to be characterised as constituting property and be defined as a financial instrument for the purposes of financial regulation. Heterogeneity of technical characteristics demonstrated by the different GGR methods, which would translate to the units, make determination of parameters by which they might be considered fungible, more problematic. Ultimately, given the public policy issues raised by any GGR market, these will be questions for policymakers. All the same, to help ameliorate difficulties confronting policymakers attempting to frame a GGR market, this paper proposes an alternative of considering the various GGR methods on a pooled or 'bundled' basis, rather than individually. This approach imports a number of advantages that enhance the potential for positive public policy outcomes in scaling up the GGR sector.

Keywords

Greenhouse gas removals – negative emissions market – fungible units – legal nature – standardisation – Paris Agreement target

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Justin Macinante* and Navraj Singh Ghaleigh**

1. Introduction

Intergovernmental and national policies to address climate change, developed over the last forty years, have focused principally on the dual tracks of mitigation and adaptation, with a greater emphasis on reducing – mitigating – the level of GHGs being emitted. As scientific research and understanding develops, it is apparent now that continuing to reduce the level of emissions, while essential, on its own is not going to be sufficient to avoid damaging and unpredictable climate change impacts into the future.[1]

The rising concentrations of anthropogenic GHG emissions in the atmosphere are mirrored by corresponding increases in the average global surface temperature. If this temperature increase is to be contained at a level above the pre-industrial temperatures that avoids dangerous and unpredictable climate impacts, there is a finite volume of GHGs that can continue to be emitted. Once that remaining global budget has been exhausted and the target temperature increase overshot, more GHGs will need to be removed from the atmosphere than are emitted, in order to drawdown that overshoot.[2]

The Paris Agreement attempts, among other things, to constraint global heating. Readers will be familiar with Article 2's temperature targets which aim to hold '…the increase in global average temperature to well below 2°C above pre-industrial levels…' and to pursue '…efforts to limit temperature increase to 1.5°C above pre-industrial levels, recognizing that this would significantly reduce the risks and impacts of climate change.'[3] However, there is a scientific consensus that the remaining global carbon budget for this target could be exhausted well before the mid-century.[4]

In these circumstances, the need for GHG removal (GGR)/carbon dioxide removal (CDR)[5] technologies is apparent and governments are directing resources to its development.[6] GGR refers to processes which capture GHGs from the air and store or

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[1] Rogelj, J., et al., 2018: Mitigation Pathways Compatible with 1.5°C in the Context of Sustainable Development. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., et al.(eds.)]; Jan C Minx *et al* 2018 Negative emissions – Part 1: Research landscape and synthesis *Environ. Res. Lett.* **13** 063001, 13: evidence suggests need for large scale negative emissions technologies in 1.5°C scenarios.

[2] Ibid.

[3] Paris Agreement, Article 2.1(a).

[4] n.1 (IPCC).

[5] While GGR refers to a broader range of gases than CDR, both expressions have been used in publications to refer to the removals sector, the former is increasingly preferred. GGR is used herein, unless quoted sources use CDR. Carbon capture and storage (CCS) and Negative Emission Technologies (NET) are other cognate formulations.

[6] For example, Norway's Northern Lights project <https://northernlightsccs.com> accessed 31/01/22; Australia's Carbon Capture, Use and Storage Development Fund <https://business.gov.au/grants-and-programs/carbon-capture-use-and-storage-development-fund> accessed 31/01/22; UK government CCUS action plan <https://www.gov.uk/government/publications/the-uk-carbon-capture-usage-and-storage-ccus-deployment-pathway-an-action-plan> accessed 31/01/22.

chemically convert them with some degree of permanence over their life cycle. In order to reach the objective of limiting global warming to well below 2°C while pursuing efforts to limit to 1.5°C above pre-industrial levels, not only will mitigation need to be large-scale and rapid, but as the Intergovernmental Panel on Climate Change (IPCC) has observed:

> Unless affordable and environmentally and socially acceptable CDR becomes feasible and available at scale well before 2050, 1.5°C-consistent pathways will be difficult to realize, especially in overshoot scenarios.[7]

All the same, at present, apart from forestry-related projects, GGR methods are mostly yet to be shown as commercially and technically viable and only a small number have been rolled out at commercial scale.[8] The scaling up of the sector could be enhanced by developing a market for carbon credits generated by GGR projects: 'Trading of carbon credits from GGR methods could also be used to increase efficiency, lower costs and enhance development of GGR.'[9] The EU and UK governments, amongst others, are actively investigating how such markets might be implemented.

Building on the experience of carbon markets to date, one factor that will need to be explored in any GGR market development process is the nature of the 'removal units' that might come to be traded. Such consideration should properly include first, the legal nature; second, the financial nature; and third, technical nature of the units. For instance, in terms of the legal nature of the units, useful insight can be gained from the approach taken to this question as it concerned emission allowances in emission trading schemes (ETS). Second, the nature of removal units in a financial sense can be considered also in the light of how emission allowances are defined: in fact, both emissions allowances and some project generated credits are defined now as a 'financial instrument' to the extent that they are accepted for compliance purposes under the European Union Emissions Trading Scheme (EUETS).[10]

Third, in terms of technical characteristics, the nature of the units will be a function of the GGR methods applied to bring about the removals and, in this respect, GGR methods are diverse and exhibit a broad range of characteristics. In developing a GGR market, it will be necessary to find ways to value the units generated by GGR projects so that either they are all the same, or otherwise a value can be placed on the differences between them. How this diversity of characteristics might be accounted for in development of a GGR market, on the one hand, so as not to disregard some methods and their characteristics and, on the other, so that complexities do not impede the effectiveness with which the market, as a policy mechanism, can develop to promote greater scale in the GGR sector, will be an issue.

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[7] de Coninck, H. et al., 2018: Strengthening and Implementing the Global Response. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty*, 4.1 [Masson-Delmotte et al. (eds.)].

[8] The Royal Society and Royal Academy of Engineering, Greenhouse gas removal report, September 2018, <royalsociety.org/greenhouse-gas-removal> or <raeng.org.uk/greenhousegasremoval> accessed 17/01/22. An overview of GGR methods is provided in Chapter 2.

[9] Ibid 117.

[10] Directive 2014/65/EU of the European Parliament and of the Council of 15 May 2014 on markets in financial instruments and amending Directive 2002/92/EC and Directive 2011/61/EU, OJ L 173, 12.06.2014, 394, which took effect 3 January 2018 (MiFID II).

This paper sets out to explore this and other issues as they arise in developing a GGR market. It examines approaches that might resolve those issues. Section 2 outlines the GGR methods and how the removal units might be characterised. Section 3 delves into derivation of a common metric that might facilitate trading in the removal units generated by different methods; and section 4 explores an alternative approach based not on distinguishing different methods and their characteristics, but by bundling them into pools that can generate standardised units. Conclusions are drawn then in the final section.

Finally by way of introduction, it is worth noting what this paper is **not** addressing. There are a wide variety of 'cross-cutting issues' which, to précis one influential report on GGR, must be considered so as to minimise the adverse consequences of large scale GGR deployment.[11] These issues are not addressed at any length herein not because they are not important (they are) or interesting (they very much are), but because they are already subject to detailed and sophisticated analysis. Moreover, these debates do not displace any of our central arguments. Rather than simplify and do damage to these specialist debates, we merely note them for readers to explore. The ethics and justice implications of removals, including moral hazard (the concern that removals will deter emissions reductions), have long been addressed in cognate debates on geoengineering[12] and more recently in the dedicated removals literature.[13] Likewise, the economics and technological limits of removals are well surveyed.[14] More nascent but still well-developed are studies on the social acceptance of removals, not least in terms of public perceptions (including comparative studies),[15] and public support.[16] Traditional climate and environmental issues such as the assessments of removals by reference to the SDGs, and the relationship of emissions markets and removals markets are also emerging.[17]

2. GGR methods and their characteristics

This section begins by setting out the types of GGR methods and how they might be classified. It then considers how 'removal units' generated by a project based on a GGR methodology might be characterised legally and financially, before delving into a consideration of the range and variety of technical characteristics of the methods that translate to the removal units they generate.

2.1 GGR methods

[11] n.8 (TRS) 70.
[12] Adam Corner and Nick Pidgeon, 'Geoengineering, Climate Change Scepticism and the "Moral Hazard" Argument: An Experimental Study of UK Public Perceptions' (2014) 372 Philosophical Transactions of the Royal Society A: Mathematical, Physical and Engineering Sciences 20140063.
[13] Emily Cox and others, 'Blurred Lines: The Ethics and Policy of Greenhouse Gas Removal at Scale' (2018) 6 Frontiers in Environmental Science 38; David R Morrow and others, 'Principles for Thinking about Carbon Dioxide Removal in Just Climate Policy' (2020) 3 One Earth 150.
[14] Cameron Hepburn and others, 'The Technological and Economic Prospects for CO2 Utilization and Removal' (2019) 575 Nature 87.
[15] Emily Cox, Elspeth Spence and Nick Pidgeon, 'Public Perceptions of Carbon Dioxide Removal in the United States and the United Kingdom' [2020] Nature Climate Change 1; Emily Cox, Nick Pidgeon and Elspeth Spence, 'But They Told Us It Was Safe! Carbon Dioxide Removal, Fracking, and Ripple Effects in Risk Perceptions' (2021) Risk Analysis.
[16] Elspeth Spence, Emily Cox and Nick Pidgeon, 'Exploring Cross-National Public Support for the Use of Enhanced Weathering as a Land-Based Carbon Dioxide Removal Strategy' (2021) 165 Climatic Change 23.
[17] Matthias Honegger, Axel Michaelowa and Joyashree Roy, 'Potential Implications of Carbon Dioxide Removal for the Sustainable Development Goals' (2020) 0 Climate Policy 1; Stephen M Smith, 'A Case for Transparent Net-Zero Carbon Targets' (2021) 2 Communications Earth & Environment 1.

Notwithstanding the range of shapes and forms, GGR methods all involve two principal elements, namely (i) removal of the GHG from the atmosphere, then (ii) safe storage of the GHG for a significant period of time, thus the methods can be categorised by their removal method and by the storage mechanism.[18] The removal method might be through increased biological uptake; via natural inorganic reactions; or by engineered removal. The storage location might be in living land vegetation; in soils and dead land vegetation; geological; in oceans; or in the built environment.[19] In their 2018 report, The Royal Society and Royal Academy of Engineering listed twelve GGR methods, based on this approach: forestation; habitat restoration of peatlands or coastal wetlands; soil carbon sequestration; biochar added to soil; bioenergy with carbon capture and storage (BECCS); ocean fertilisation; building with biomass; enhanced terrestrial weathering; mineral carbonisation; ocean alkalinity; direct air capture and carbon storage (DACCS); and low-carbon concrete.[20]

All the same, there are other ways the methods might be classified and have been in the academic literature. An illustration of one such taxonomy, identifies seven technologies: afforestation & reforestation (AF); soil carbon sequestration (SCS); biochar (BC); BECCS; DACCS; enhanced weathering & ocean alkalinisation (EW); and ocean fertilisation (OF). They can be distinguished by approach to carbon capture (photosynthesis or chemistry); by the earth system to which they relate (land or ocean); and by storage medium (above ground biomass; soil; geological reservoirs; minerals; or marine sediment and calcifiers), as well as there being a range of implementation options for each.[21]

These distinguishing features between the technologies and how they might be implemented correspond to differences in characteristics such as, in relation to the cost (for example, cost per tonne GHG removed from the atmosphere); the speed with which they remove GHGs from the atmosphere (for example, tree growth versus direct air capture); the potential scale of GHG removal the technology might achieve; how permanent are the GHG removals (for instance, geological storage compared to the lifespan of forests); and the related positive benefits or negative impacts the technologies might have in addition to the level of GHG removal they achieve.

While the technologies all remove GHGs from the atmosphere, the cost and efficiency with which they do so will vary from one to another, as will a number of the other characteristics.[22] These characteristics and the implications they have for development of a GGR market for trading 'removal units' are considered in more detail in 2.4 below, after consideration is given to the legal nature and financial nature of removal units.

2.2 Legal nature of removal units generated by GGR projects

It is helpful to begin by briefly reviewing the context in which the legal nature of removal units will be relevant. The carbon market, comprised of the various fora where carbon units are traded, encompasses trading in allowances in ETSs, and in project-generated credits or offsets ('credits'), in both voluntary and compliance

[18] n.8 (TRS) Table 1, 22.
[19] Ibid.
[20] Ibid.
[21] n.1 (Minx *et al*) Figure 2.
[22] n.14 (Hepburn *et al*).

schemes. Allowances authorise the holder to emit an amount of GHGs, generally, one tonne carbon dioxide equivalent (CO_2-eq) per allowance, and are either allocated to entities that have obligations under the ETS (based, for instance, on their historical emission levels, a process called grandfathering) or are purchased by those entities at auctions.[23] 'In contrast to allowances, emission credits are generated privately.'[24] Credits represent avoidance, reduction or removal of an amount of GHGs (measured in tonnes CO_2-eq) by a project activity, and so are not allocated by governments.[25] To date, credits are based on standards established by standards bodies, such as Clean Development Mechanism Executive Board (CDMEB) for Certified Emission Reductions (CERs), VERRA Organisation for Voluntary Carbon Units (VCUs), or the Gold Standard Foundation.[26] Upon verification of compliance with the standard, the relevant standard body issues credits equal to the GHGs avoided, reduced or removed, usually into an account in the registry maintained by that standard body. Thus, there is a separate registry for each standard. This has been flagged as an issue for the development of the voluntary carbon market in a recent paper by the International Swaps and Derivatives Association (ISDA).[27] Separate registries mean that voluntary emission reductions certified under one standard, are not fungible with voluntary emission reductions certified under another standard. Consequently, the market remains fragmented and cannot realise the size, depth and breadth that it would if all reduction units were to be inter-tradable (that is, fungible).

In considering the legal nature of removal units from GGR projects, it is helpful also to review how the question of the legal nature of units traded in emissions markets has been approached to date. A principal issue in this respect has been whether or not emission allowances constitute property. An early example in relation to acid rain (due to sulphur dioxide emissions, so not GHG emissions) from the United States (US) specifically excluded allowances from constituting property rights. Similar formulations since then under US federal and state laws also specifically exclude allowances from being property. This is so as to avoid allowance holders invoking constitutional rights to protection of property from interference without compensation, for instance, when schemes change and values of the units are affected or when units are cancelled.[28]

Under the Kyoto Protocol, the units for each of the flexible mechanisms (Articles 6, 12, and 17) are described in terms of being '…equal to one metric tonne of carbon dioxide equivalent, calculated using global warming potentials defined by decision 2/CP.3 or as subsequently revised in accordance with Article 5',[29] thus avoiding altogether the question of whether they constitute property. More specifically, in addressing concern that significant legal uncertainties affect the EUETS, the Financial Markets Law Committee (FMLC) of the Bank of England observed:

[23] Matthieu Wemaere, Charlotte Streck, Thiago Chagas, 'Legal Ownership and Nature of Kyoto Units and EU Allowances', in David Freestone and Charlotte Streck (eds.), *Legal Aspects of Carbon Trading: Kyoto, Copenhagen and beyond*, (Oxford University Press, 2009), 42 et seq.; also on this point generally, see: Charlotte Streck, Moritz von Unger, 'Creating, Regulating and Allocating Rights to Offset and Pollute: Carbon Rights in Practice' [2016] *CCLR* 178.
[24] Ibid (Wemaere et al) 43.
[25] Ibid.
[26] These bodies can be both public and private. CDM EB is an intergovernmental body, constituted under the United Nations Framework Convention on Climate Change (UNFCCC); whereas VERRA and Gold Standard are NGOs that operate in the voluntary carbon market.
[27] ISDA, 'Legal Implications of Voluntary Carbon Credits', December 2021, <www.isda.org> accessed 25/01/22.
[28] See Justin D. Macinante, Effective Global Carbon Markets (Edward Elgar, 2020), 56 et seq.; n.23 (Streck and von Unger), 183 et seq.
[29] For instance, Decision 11/CMP.1, FCCC/KP/CMP/2005/8/Add.2, 17 <http://unfccc.int/resource/docs/2005/cmp1/eng/08a02.pdf#page=17> accessed 06/06/17.

> The central area of difficulty is that nothing in the EU-ETS provides any indication of the legal nature of emission allowances. Emission allowances have aspects of both administrative grants or licences and of private property, and it is understood that different conclusions as to their legal classification may already have been, or are in the course of being, reached in a number of Member States.[30]

This lack of harmonisation has resulted in an array of legal classifications in the EU Member States.[31] The main difference in legal treatment perceived by some observers was whether the allowances under the EUETS were classified as financial instruments (thus subject to financial regulation) or as commodities.[32] The FMLC perceived the ramifications to be more significant, since:

> …the legal nature of an emission allowance will be relevant in determining which law properly governs the creation, transfer and cancellation of that allowance, and whether (and if so, what) security rights can be created over that allowance. Further issues include how allowances should be treated for tax and accounting purposes, how allowances should be dealt with in the insolvency of a registered holder, whether and to what extent allowances, or derivative interests in allowances, should be treated as subject to regulation as an investment, and whether allowances are capable of being stolen, or otherwise being the subject of property-based criminal activity.[33]

The FMLC was concerned that lack of clarity over issues such as these could significantly impede market development. The European Court of Auditors (ECA) expressed similar concerns, observing that emissions markets need sufficient liquidity to function well, and that this could be improved were there to be an EU-wide definition of allowances and if they were to be more commercially interesting to voluntary market participants by, for example, supporting the ability to create and protect enforceable security interests.[34] The EUETS Directive does not define the legal status of allowances, describing them only as fungible, dematerialized tradable instruments, explaining only the way in which they can be used; their designation as a financial instrument only clarified their treatment for the purposes of financial regulation leaving the rights of a holder unclear and subject to differences across EU jurisdictions:

> In France and the United Kingdom, the characteristics of allowances are compatible with the legal attributes of property or are treated as such. However, in most of the Member States audited, there is no legal definition of emissions allowances.[35]

English common law is more likely to treat emission allowances as constituting property,[36] and so diverges from the approach in the US. Whether or not emission allowances are property and the implications of such has been a discussion point also in the academic literature[37] and, notwithstanding the seemingly overwhelming focus

[30] Bank of England, Financial Markets Law Committee, 'Issue 116 – Emission Allowances: Creating Legal Certainty', (October 2009), 1.4 <http://web.archive.org/web/20170108031056/http://www.fmlc.org/uploads/2/6/5/8/26584807/116e.pdf> accessed 11/05/17.
[31] n.23 (Wemaere et al) 50.
[32] Ibid. This issue has been addressed now by MiFID II – see n.10.
[33] n.30 (FMLC) 2.7.
[34] European Court of Auditors, 'The integrity and implementation of the EU ETS' Special Report, 2015, paragraph 25 <http://www.eca.europa.eu/Lists/ECADocuments/SR15_06/SR15_06_EN.pdf> accessed 23/06/17.
[35] Ibid paragraph 26.
[36] n.30 (FMLC) 3.4. See also n.28 (Macinante) 58 et seq.
[37] See for example: Andrew Hedges 'Carbon Units as Property: Guidance from Analogous Common Law Cases, [2016] *CCLR* 190; n.23 (Wemaere et al.); Sabina Manea 'Defining Emissions Entitlements in the Constitution of the EU Emissions Trading System', (2012) 1:2 *Transnational Environmental Law* 303; Andrew Hedges 'The Secondary Market for Emissions Trading:

on allowances, consideration has been given also to credits and whether they constitute property – to address the same sort of issues flagged by the FMLC in relation to European allowances.[38] It was concluded that CERs fall within tests laid down in applicable case law and so '…a CER is likely to be treated as property under common law.'[39]

Consideration given to credits generated from forestry projects is of particular relevance to the legal nature of removal units that may be generated by GGR projects. Establishing the legal situation of the land, project and the outcome of the project (in the form of the credits) under domestic law is essential not only for trading the credits but also in order to fulfil on-going monitoring and other project activities that support the credits.[40] In noting the legislative steps to recognise carbon storage as a transferable real property right taken in Australian states, it has been proposed that establishing a new real property right to forest carbon storage would not only facilitate the role of forest-based reductions in the market, but also enable the use of real property instruments, such as easements, profits and covenants to secure the permanence of the reductions.[41]

In the case of Australian state legislation:

> …each of the States has passed legislation to create a form of "carbon sequestration right", which landowners may register on title in favour of another party. This right is similar in law to an easement or a covenant, transferring the carbon rights and responsibilities associated with the land to a third party.[42]

The first such enactment was in New South Wales (NSW) under that state's 2002 Greenhouse Gas Reduction Scheme, which included amendment of conveyancing legislation to provide '…the legal title to carbon sequestered by a forest on a piece of land is defined as a *'profit a prendre'* and a type of forestry right.'[43] While this right did not operate as an encumbrance on the title, it did have the benefit of putting third parties interested in the land on notice; unless terminated, the right would 'run with the land'; and provided assurance to purchasers and regulators as to ownership of the right.[44]

The NSW scheme has been superseded by the Australian federal Carbon Farming Initiative (CFI) and Emission Reduction Fund (ERF) schemes. Projects under these policies include sequestration projects and emission reduction or avoidance projects, both land-based and for industry.[45] Lessons that can be taken from the example of the Australian and New Zealand forest schemes include the benefit that application of

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Balancing Market Design and Market Based Transactions', in David Freestone and Charlotte Streck (eds.), *Legal Aspects of Carbon Trading: Kyoto, Copenhagen and beyond*, (Oxford University Press, 2009), 314; n.23 (Streck and von Unger).

[38] Jolene Lin, 'Private Actors in International and Domestic Emissions Trading Schemes', in David Freestone and Charlotte Streck (eds.), *Legal Aspects of Carbon Trading: Kyoto, Copenhagen and beyond*, (Oxford University Press, 2009), 142: in this case, the legal nature of Certified Emission Reductions (CERs) being considered.

[39] Ibid 143. Two English cases in relation to waste management licences examined: Environment Agency v Stout [1999] Env LR 407; Re Celtic Extraction Ltd (in liq); Re Bluestone Chemicals Ltd (in liq) [2001] Ch 475, so while these cases are really more directly relevant to allowances than credits, it is valid to apply the same legal test to credits.

[40] Charlotte Streck 'Forests, Carbon Markets, and Avoided Deforestation: Legal Implications', [2008] *CCLR* 239, 246.

[41] Michelle Passero 'The Nature of the Right or Interest Created by a Market for Forest Carbon', [2008] *CCLR* 248, 251 et seq.

[42] Jennifer Crittenden and Martijn Wilder 'Bringing the Forest to Market: Structuring Avoided Deforestation Projects', [2008] *CCLR* 273, 275.

[43] Arjuna Dibley and Martijn Wilder AM 'Forest Carbon Rights: Lessons Learned from Australia and New Zealand', [2016] CCLR 202, 205. This article provides a detailed analysis of the Australian federal, NSW and New Zealand schemes.

[44] Ibid 206.

[45] <http://www.cleanenergyregulator.gov.au/ERF/Method-development-tracker> accessed 28/01/22.

property law concepts (for instance, definition of rights) can bring, in particular in terms of supporting permanence of the removals.[46]

To recap, this subsection has been looking at how the legal nature of removal units generated by GGR projects might be characterised. The context for this is the carbon market, where allowances and credits are traded and in relation to which a principal issue has been whether or not allowances are properly characterised as property. In the US, such characterisation is specifically excluded, while under English common law, allowances are more likely to be considered property. However, the absence of clear definitions of the legal nature of allowances, at the intergovernmental level of the Kyoto Protocol, the regional EUETS, and in national schemes, has been flagged as giving rise to legal implications that may impede market development.

In relation to credits, both parallels and distinctions can be drawn. Project-generated credits are just that: the physical removals are project-generated, independently of any scheme by which they may be commoditised and traded. They are not issued by administrative act, but generated as the outcome of the project investment.[47] Rights in and to the credits generated are determined on a contractual basis between the parties engaged in developing and funding the project.[48] More so than allowances under common law, they have a claim to be characterised as property. In the case of removal units from GGR projects, this claim would be even stronger as removal units represent something more tangible than a reduction/avoidance credit dependent on a counterfactual argument. The removal unit represents not only the cost of extracting the GHG from the atmosphere, but also the long-term cost of storing the GHG.

As such, it is argued that the legal nature of removal unit is as a form of property. Learning from the experience of allowance trading schemes, a clear definition of removal units from GGR projects as property would bring legal certainty in a number of respects, as flagged by the FMLC, including as to the law that properly governs the creation, transfer and cancellation of that removal unit; whether (and if so, what) security rights can be created over that removal unit; how removal units should be treated for tax and accounting purposes; and dealt with in the insolvency of a registered holder. Thus, it might facilitate – or at least not impede – GGR market scaling up and development.

Additionally, consideration of the examples of credits generated by forestry projects and earlier legislative approaches in Australia and New Zealand, noting the relevance principally to land-based GGR projects, point both to:

- the need to ensure clarity between land title rights, the rights to resources generated on the land (for example, forests, crops or other biomass) and the rights to removal units generated by those resources, noting that how one type of right is dealt with may affect the value of another; and
- the benefit derived by accessing land title or conveyancing concepts, by which notice of the interest in the removal unit rights can be given, without encumbering the land title; these run with the land, thus not only providing

[46] n.43 (Dibley and Wilder) 213-214.
[47] That is, the underlying physical removals are generated through the project investment; the instruments by which they are represented for trading purposes will be issued through a legislative or administrative scheme, or voluntary standard.
[48] In general, on this see: n.23 (Streck and von Unger) 186 et seq.

assurance to purchasers and regulators, but also a mechanism to support the permanence of the removals.[49]

2.3 Financial nature of removal units generated by GGR projects

Prior to the amendment of the EU Markets in Financial Instruments Directive (MiFID)[50] pursuant to which both emissions allowances and some project generated credits were defined as a 'financial instrument' to the extent that they are accepted for compliance purposes under the EUETS, the main difference across EU states was reported to be whether allowances were treated as a financial instrument or as a commodity under national law.[51] The relevance of this distinction was whether financial regulation applied to the allowances, and how they would be treated for taxation purposes. Thus, while Sweden treated an allowance as a financial instrument, Austria, Germany, France, Italy, Poland, Portugal and Spain treated an allowance as a tradable commodity.[52]

There were differences reported also in accounting treatment across EU states.[53] Some jurisdictions treated allowances as intangible assets or financial instruments, while others provided that they are recorded as tangible assets or inventory.[54] A recent study:

> …highlights the relevance of considering the role of carbon accounting in facilitating or impeding the operation of carbon markets by policymakers and calls for the development of adequate accounting guidance aligning with the regulatory framework of carbon markets to promote the achievement of their objective… … contributes to assessing the extent to which firms' carbon accounting practices offer a complete representation of the financial impacts of EUAs to evaluate the financial risks within the scope of carbon markets.[55]

Amongst other matters, the study found that carbon accounting was 'messy' and

> … that EU ETS market participants deliver highly heterogeneous information to users. Future research could investigate the extent to which the [accounting] standard-setting process, either locally or at an international level, may contribute to improving comparability among firms.[56]

While the context of this study was accounting treatment of EU allowances before and after the introduction of auctioning (which it found had not really changed), the need for clarity in accounting treatment would apply equally to removal units from GGR projects in a trading scheme. However, while clarity of treatment of removal units for accounting purposes would add transparency to the impact of measures on corporate finances, as well as providing an indication of measures being implemented to reduce corporate carbon footprints, its relevance to scaling up of the GGR sector would not be as directly relevant as bringing the removal units within the scope of financial regulation.

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[49] Potentially also other environmental benefits: n.34 (Crittenden and Wilder).
[50] n.10 (MiFID II).
[51] n.23 (Wemaere et al) 51.
[52] Ibid.
[53] Ibid.
[54] Ibid. Also see n.55 (Garcia-Torea et al.) post, Table 1.
[55] Nicolas Garcia-Torea, Sophie Giordano-Spring, Carlos Larrinaga & Géraldine Rivière-Giordano (2021): Accounting for Carbon Emission Allowances: An Empirical Analysis in the EU ETS Phase 3, Social and Environmental Accountability Journal, DOI: 10.1080/0969160X.2021.2012496, 2-3.
[56] Ibid 20.

It is submitted that defining removal units generated by GGR projects as financial instruments under financial regulation would be of greater relevance for scaling up the GGR sector. Irrespective of whether they were to be accepted or not for compliance purposes under the EUETS, or any other ETS, this seems the logical step to take, given that the removal units represent the outcome of the financial investment in the GGR project. Definition as financial instruments would put removal units from GGR projects on an equal footing for investment purposes with units accepted in the EUETS: such a step should, it is imagined, assist growth in the commercial value of the GGR market.

2.4 Technical characteristics of removal units generated by GGR projects

As mentioned earlier, each GGR methodology has a range of different characteristics such as timing to achieve removals, volume and rate of removals, cost, permanence of storage and risk factors, related environmental or social impacts, means of measurement and verification, sustainable development or other co-benefits.

For example, the cost of BECCS could be in a range from US$15-400 per tonne CO_2; DACCS US$25-1000/t$CO_2$; and AF in the range US$0-240/tCO_2.[57] In relation to permanence of storage and saturation, BECCS and DACCs both show high permanency for adequate geological storage, but need long-term governance of storage, while for BECCS there are limits on the rates of bioenergy production and carbon sequestration; for AF, saturation is a risk, they are vulnerable to disturbance, and forest management is essential.[58]

Some characteristics will be common to all methods ('common characteristics'). For example, cost, timing of removal, and permanence of storage, are characteristics relevant to consideration of each of the GGR methods. On the other hand, some characteristics may be considered not to translate across all methods. For instance, characteristics pertinent to land-based removals may not be applicable to BECCS or engineering-based methods, such as DACCS. The land-based methodology characteristics may be both positive, for example, by providing environmental or biodiversity co-benefits, or negative, such as by generating competing land-use conflicts, or potentially causing environmental impacts. In the case of AF, for example, positive benefits identified include employment, and local livelihoods (socio-economic); biodiversity, if native and diverse species are used (environmental); and improved soil carbon, nutrient and water recycling (biophysical); while negative impacts include less agriculture, higher food prices (socio-economic); biodiversity losses for monocultures (environmental); and albedo change (bio-geophysical).[59]

On the other hand, in the case of DACCs, positive benefits might include business opportunities (socio-economic); and potential indoor air quality improvement (environmental); while negative impacts include greater emissions as a result of continued fossil fuel use; high initial capital cost (socio-economic); and potential waste implications (environmental).[60]

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[57] Sabine Fuss *et al* 2018 Negative emissions – Part 2: Cost, potential and side effects *Environ. Res. Lett.* **13** 063002, Table 2.
[58] Ibid.
[59] Ibid.
[60] Ibid.

While it can be seen that apart from GGR removal and the common characteristics such as cost, timing of removals and permanence of storage, both AF and DACCS also have positive benefits and negative impacts. The extent to which these benefits and impacts are comparable, such that removal units from an AF project might be considered interchangeable with removal units from a DACCS project, is less clear: this issue is explored further in the next section.

3. Deriving a common metric

In order to scale up the development of GGR methods, it will be important to include them in carbon pricing mechanisms, such as carbon trading schemes.[61] In relation to project-generated credits traded in the voluntary carbon market, it has been noted that ensuring broad fungibility is key to driving deep, liquid markets:[62]

> Legally, fungibility is not a feature of the asset itself. Instead, it depends on the context in which it is being assessed….the issue is whether and in what circumstances the market is willing to treat different [voluntary carbon credits] as interchangeable for the purposes of settlement obligations.[63]

The question to be resolved is what are the minimum parameters necessary for the different units - in that case, voluntary project-generated carbon credits – to be considered equivalent for the purpose of discharging a contract obligation to transfer a credit in a trading context.[64] Thus, for removal units from GGR projects, the issue becomes how different GGR methods can be compared and valued for trading purposes and whether it is sufficient that only the common characteristics are taken into account.

3.1 Approach taken in other markets

Notwithstanding the recommendation above (in section 2.3), that removal units from GGR projects be defined as a financial instrument, as opposed to as a commodity, minimum parameters applied to make commodities interchangeable (or not) for the purposes of settlement, are instructive. For instance, the London Metals Exchange trades precious metals, base metals and ferrous metals and there are strict specifications as to quality, lot size and shape to which every metal traded must conform.[65] Copper is one example: it is usually specified as Grade A copper, which must conform to the chemical composition of one of three standards: BS EN 1978:1998 - Cu-CATH-1; GB/T 467-2010 - Cu-CATH-1; or ASTM B115-10 - cathode Grade 1;[66] another example is Aluminium, specification for which is:

> Primary aluminium with impurities no greater than the chemical composition of one of the registered designations:
> P1020A in the North American and International Registration Record entitled "International Designations and Chemical Composition Limits for Unalloyed Aluminum" (revised January 2018)
> Al99.70 in the GB/T 1196-2017 Standard entitled "Unalloyed aluminium ingots for

[61] n.8 (TRS), Recommendation 7.
[62] n.27 (ISDA).
[63] Ibid 16.
[64] Ibid.
[65] See: <https://www.lme.com/Metals/Non-ferrous/LME-Copper/Contract-specifications> accessed 03/02/22.
[66] Ibid.

remelting"
For warrants created up to and including 31 December 2009 primary aluminium of minimum 99.70% purity with maximum permissible iron content 0.20% and maximum permissible silicon content 0.10%.[67]

For oil there are two distinct markets: North America (West Texas Intermediate (WTI)) and Rest of the World (Brent – North Sea) crude production. The differences in specification relate not only to the source, but also to the composition of the commodity. Sulphur content for Brent crude is 0.37%, while for WTI it is 0.24%, which makes WTI lighter, described as being 'sweeter'.

As an example for soft (agricultural) commodities, US soybean futures '…are of "deliverable grade" if they are "GMO or a mixture of GMO and Non-GMO No. 2 yellow soybeans of Iowa, Illinois and Wisconsin origin produced in the U.S.A. (Non-screened, stored in silo)".[68] Type, source and GM-status are clearly important considerations for US buyers of soybeans. An even more specific definition is milling wheat on Euronext:

> Sound, fair and merchantable quality of;
> - the following minimum specifications:
>   Hagberg falling number: 220 seconds
>   Protein content: 11% dry matter
>   Specific weight: 76 kg/hl and
> - the following basis specifications:
>   Moisture content: 15%
>   Broken grains: 4%
>   Impurities: 2%
>
> Discounts apply to reflect any difference between the delivered and standard quality, in accordance with Incograin No.23 and the Technical Addendum No.2. Please also refer to the rules and regulation below for more details.
> Mycotoxins not to exceed, at the time of delivery, the maximum levels specified under EU legislation in force with respect to unprocessed cereals intended for use in food products.[69]

Clearly, not all wheat will satisfy the Euronext specification, although it does include the statement that 'Discounts apply to reflect any difference between the delivered and standard quality…' Crude oil sulphur content differs depending on its source, thus Brent and WTI crude would not be interchangeable for settlement purposes if sulphur content is important to the buyer. Similarly for contracts in Grade A copper, or for aluminium: either the standard/purity is satisfied, or it is not.

As noted by ISDA, fungibility depends on the context in which it is being assessed. The issue is whether and in what circumstances the market is willing to treat different grades of copper, purities of aluminium, crude oil sulphur content, or agricultural commodity specifications, as interchangeable for the purposes of settlement obligations in those respective markets. In some cases, it would seem, not at all: the soybean is either from the named US states or it is not, either GMO or non-GMO; the aluminium is either 99.7% pure or it is not; the crude is either Brent or WTI; while in the case of milling wheat, it might be a case of discounting to accommodate lower quality. It would seem that no hard and fast single rule applies across all markets; the

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67 <https://www.lme.com/Metals/Non-ferrous/LME-Aluminium/Contract-specifications> accessed 03/02/22.
68 <https://www.fixglobal.com/commodities-trading-with-fix>accessed 02/02/22.
69 <https://live.euronext.com/en/product/commodities-futures/EBM-DPAR/contract-specification>accessed 02/02/22.

minimum parameters for assets to be interchangeable being set by what each different market demands.

It is worth noting that in contexts related to GGR – namely, the international regime for the subsurface storage of CO_2 – regimes and standards for CO_2 purity have been developed.[70] The London Convention,[71] a global instrument regulating marine dumping, and its 1996 Protocol address not merely the water column, but also the seabed as part of the marine environment.[72] Accordingly, sub-surface storage of CO2 in the seabed would be a form of dumping inconsistent with the London Convention. CCS was first considered by the advisory Scientific Group of the London Convention in 2003 and by 2006 it had secured an amendment to the Annex I list such that CO_2 became a substance permitted to be dumped under the Convention.[73] Allowing the 'disposal of CO2 streams from CO2 capture processes for sequestration'[74] was to be done in accordance with the Risk Assessment Framework for CO2 produced by the Scientific Group. A key requirement of the amendment was that CO2 streams 'consist overwhelmingly of carbon dioxide' and do not contain 'wastes or other matters'[75] – a technologically ecumenical approach (as compared with stipulating purity levels) which allows for developments in technology. Note that the risk assessment procedure specified in the CO2 Specific Guidelines, which requires a consideration of inter alia site integrity, human health and marine environment impacts.[76] These approaches to purity have since been followed in the OSPAR[77] regime and the EU's CCS regime.[78]

What this will be for any future market in removal units from GGR methods is yet to be seen; what is clear is that, given that there is no natural demand for removing GHGs from the atmosphere, demand for removal units in any GGR market will be a function of public policy and its implementation.

3.2 Minimum parameters for removal units from GGR projects

How can public policy arrive at a set of minimum parameters for determining the equivalence (or not) of removal units from different GGR methods? If the basis of comparison of methods were to be limited to, say, the rate of removal per annum; the cost per tonne removed; and the average length of storage – that is, the common characteristics – and other factors such as the amount of land required for the methodology and its impact for competing land uses; or such as the value of the methodology in regenerating biodiversity, or its rehabilitative effect on degraded environments, were not taken into account, this might suggest speed and cost efficiency of GHG removal were the sole rationale, leaving biodiversity, social and

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70 See generally, Navraj Singh Ghaleigh, 'Carbon Capture and Storage As A Bridging Technology' in Daniel A Farber and Marjan Peeters (eds), *Encyclopedia of Environmental Law: Climate Change Law*, vol 1 (Edward Elgar Publishing Ltd 2016), and Nils Markusson and others, 'A Socio-Technical Framework for Assessing the Viability of Carbon Capture and Storage Technology' (2012) 79 Technological Forecasting & Social Change 903.

71 Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter (1972) 1046 UNTS 120.

72 Substances listed in Annex I of the Convention are exempted from the prohibition, provided they are permitted under the conditions in Annex II (such as EIAs) – see Tanaka (2015) 313.

73 LC 28/15 (6 Dec 2006) Annex 6. Protocol amendment adopted at the 28th Consultative Meeting on 2 Nov 2006, entry into force 10 Feb 2007. Dixon T, Greaves A, Christophersen O, Vivian C and Thomson J, 'International Marine Regulation of CO_2 Geological Storage. Developments and Implications of London and OSPAR' (2009) 1 Energy Procedia 4503.

74 Ibid.

75 LC/SG 30/14 (Jul 2007) Annex 3.

76 Ibid.

77 Convention for the Protection of the Marine Environment of the North-East Atlantic (1993) 2354 UNTS 67.

78 Directive 2009/31/EC of the European Parliament and of the Council of 23 April 2009 on the geological storage of carbon dioxide.

environmental quality considerations out of the equation. A risk of such an approach is that by not including all characteristics in the analysis, some methods (the ones that are slower and less cost efficient at GHG removal) would fail to gain financial support for development and simply fall away, resulting in the loss of the potential contributions and benefits they may have added to the overall suite.

The outcome of such an approach, that is, that the minimum parameters for considering removal units from different GGR methods are equivalent are based only on the common characteristics, would leave to the market whether and to what extent the other non-common characteristics were taken into account. Presumably, market participants would apply weightings to these factors (for example, relating to biodiversity, environmental or social impacts or benefits) according to their own preferences in arriving at the premium or discount on the price they would be willing to pay.

This begs the questions for policymakers of whether the characteristics not considered should be, are they important enough to be included, should they have a value placed on them and, if so, how to do so? Is the appropriate mechanism to do so via regulation, or is it better to leave the market to value those characteristics as it sees fit, in pricing removal units? The approach that is followed boils down to a question of what is desirable – or even acceptable – as a public policy outcome for promoting scaling up of the GGR sector.

3.3 Standardisation in the carbon markets

Two developments that have occurred relatively recently prompt the further question of whether standardisation is the direction of travel in the carbon markets? The first relates to proposals that form part of the Mark Carney inspired Taskforce on Voluntary Carbon Markets (TSVCM);[79] the second relates to the approach taken under the International Civil Aviation Organisation (ICAO) Carbon Offsetting and Reduction Scheme for International Aviation (CORSIA).[80]

First, the TSVCM governing body (Integrity Council) proposes to establish core carbon principles (CCP) that will act as a global benchmark for high quality carbon credits – notwithstanding that standards exist already that are applied in the voluntary carbon market (for example, Gold Standard, Voluntary Carbon Standard and so on). How the CCP interact with these will be an interesting aspect of the principles' application, particularly if the CCP purport to go beyond these existing standards by mandating a higher level of performance.[81] This may be unlikely, given that the CCP will probably need support from the existing standards in order to become established. A more understandable outcome would be for the CCP to look for common elements – common metrics – across the existing standards as a way of consolidating the existing standards under its aegis.

Second, the CORSIA scheme sets out Emissions Unit Eligibility Criteria. These comprise design elements that need to be met by eligible offset credit programs; and assessment criteria to determine carbon offset credit integrity (e.g., additionality;

[79] <https://www.iif.com/tsvcm/Main-Page/Publications> accessed 01/02/22.
[80] <https://www.icao.int/environmental-protection/CORSIA/Pages/default.aspx> accessed 01/02/22.
[81] Thereby having potentially awkward consequences for the business models of those existing standards.

realistic and credible baseline; MRV; transparent provenance; reductions must be permanent; must guard against leakage; are not double counted; and do no harm). CORSIA recognises units issued under certain existing standards as satisfying these criteria.

Both these developments appear to suggest a trend towards greater uniformity in terms of defining and valuing what types of offset unit are acceptable in carbon markets. While the carbon offset units under these initiatives relate to both emission avoidance and reduction, as well as to removals – in other words – an even broader and more diverse pool than GGR, they appear to be moving in the direction of greater standardisation.

3.4 Are removal units fungible with allowances and other offsets?

A final element to consider in this context is whether the minimum parameters for removal units from different GGR methods to be considered equivalent, might extend also to allowances issued under an ETS; and to carbon credits from emission reduction or avoidance projects, such as to enable all three to be traded under the same scheme (for instance, an ETS). However, the only parameter that would seem to apply to all three types of unit would appear to be the standard unit of measurement, namely '…one metric tonne of carbon dioxide equivalent, calculated using global warming potentials…'.

As noted earlier, allowances authorise the holder to emit an amount of GHGs, generally, one tonne carbon dioxide equivalent (CO_2-eq) per allowance, and are either allocated to entities that have obligations under the ETS or are purchased by those entities at auctions. Credits from emission avoidance or reduction projects represent the amount of GHGs (measured in tonnes CO_2-eq) avoided or reduced, by the project activity, carried out in conformity with a standard. The GHGs avoided or reduced are measured against a counterfactual of emissions that would have occurred without the project. Apart from the standard unit of measurement, it is difficult to see other parameters that might apply to all three types of unit indicating equivalence, so as to make them interchangeable for the purpose of contract settlement obligations.

Nevertheless, again it is noted any market where such contract settlement obligations might arise would be a function of public policy. Hence, notwithstanding the absence of parameters in common, it would be open to policymakers to define that removal units from different GGR methods; allowances issued under an ETS; and carbon credits from emission reduction or avoidance projects as being interchangeable within the same trading scheme arrangement, if they saw fit to do so.

4. An alternative approach

4.1 Bundling GGR projects into pools that generate standardised GGR units

All the same, to ameliorate the difficulties that could confront policymakers attempting to frame a GGR market, as an alternative, the various GGR methods might be considered on a pooled basis, rather than individually. To do so, a standard could be devised to define a set of minimum criteria for constituting the pool and outcomes the pool should achieve, taking account of the full range of possible methods and their characteristics. The standard could then be adopted by regulation. Thus, projects based on different individual GGR methods could be bundled together and, provided they satisfy the minimum requirements, as a bundle, could generate standardised removal units – as opposed to each separate project generating its own removal units that may not be truly fungible with units generated by other projects, due to differences in the methods.

This approach differs from derivation of a common metric across individual methods based on minimum parameters, because all characteristics – common and non-common – could be taken into account. The relative weighting of different characteristics may also be set out in the standard. By being inclusive, all methods would have an opportunity to be developed and contribute to beneficial outcomes; the relative weightings of characteristics could be adjusted, if necessary, based on experience over time.[82]

Further, this approach would allow for both a regulatory mechanism to determine the minimum requirements for a bundle of projects to generate standardised removal units, as well as for market input to value the standardised units, based on the actual mix of characteristics exhibited by any particular bundle from which the units are generated. For example, there may be two bundles of projects, both of which satisfy the minimum requirements and so are able to generate standardised removal units. The first bundle may be based around BECCS and have the capacity to generate higher volume but involve high cost and have fewer environmental characteristics. The second bundle may generate a lower volume than the first, but also have lower set-up cost and include more land-based project methods that restore environmental degradation and regenerate biodiversity, in addition to the removals. As a result, some actors in the market might value the units from the second project at a higher price to those from the first. Nevertheless, the removals units generated by each bundle are all standardised GGR removal units and thus, essentially, interchangeable for the purposes of settlement obligations and so would be fungible.

4.2 Proposed standard and regulation

This alternative approach proposes a standard be defined that sets out the minimum requirements for bundling GGR projects in order for the bundle to be eligible to generate standardised removal units.

It is proposed that the standard would be adopted by regulation. The regulation adopting the standard could specify the legal nature of the standardised GGR removal unit as a form of property right; it could also clarify that the rights in the removal unit would be distinct from rights in land/other place where the GGR project is carried out; and it could clarify that the rights in the removal unit would be distinct from any rights in other product off take generated by the project, such as timber, other biomass, crops, etc. The regulation might also define or specify co-benefits, such as biodiversity or environmental rehabilitation benefits and any rights attaching to them.

[82] n.11 (TRS). This would conform to Recommendation 2 of that report: 'Implement a global suite of GGR methods now to meet the goals of the Paris Agreement. This suite should include existing land-based approaches, but these are unlikely to provide sufficient GGR capacity so other technologies must be actively explored.'

Additionally, the regulation could also address permanence and long-term management of the GHG storage, by specifying that storage maintenance pertaining to the standardised removal units would 'run with' the project bundle from which the units have been generated and by which the removal units would be underpinned. This might be related to an obligation on the legal entity charged with long-term management of that bundle of projects.

4.3 Bundling

By way of illustration, a bundle might be required to consist of not less than a prescribed minimum critical threshold number of GGR projects. The bundle might need to include[83] at least one project from each of the removal methods (that is, increased biological uptake; natural inorganic reactions; engineered removal) and at least one project applying each of the different storage methods (that is, land vegetation (living); soils and land vegetation (non-living); geological; oceans; built environment).[84]

To some extent, the cost of financing projects will dictate the other minimum requirements that a bundle would need to meet. All the same, if appropriate to include minimum required characteristics in the standard, they might include for example:

- must generate minimum of [x] real, verified, permanent removals per annum;
- every year for minimum of [y] years bundle remains in existence (not less than minimum prescribed length of unit storage, e.g., 100 years);
- prescribed minimum management specification both physical and financial over bundle lifetime;
- minimum prescribed management measures for leakage/saturation/reversal risk demonstrated, maintained and annually audited;
- mix of projects in bundle not prescribed but minimum number of measured co-benefits (environmental/biodiversity/social) must be generated annually.

A final point concerning the approach of bundling projects to generate standardised GGR removal units is that such a structural approach could facilitate financing and refinancing of projects through financial mechanisms such as securitisation. This should also enhance governance of the GGR projects, since it would promote development of specialist managers and focus transparency and reporting by aligning the physical project monitoring and maintenance obligations with financial obligations.

5. Conclusion

There are clear signals coming from both the international climate science community and from policymakers around the globe that the response to worsening climate change impacts necessitates not only far greater emission reductions, but also requires scaling up of technologies to remove GHGs from the atmosphere. This scaling up of the GGR sector could be enhanced by developing a market for removal units generated by projects based on GGR methods.

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[83] Applying the TRS classification: n.11 (TRS) and related text.
[84] Ibid.

This paper has sought to explore some of the issues that will arise in developing a GGR market. In particular, it has proceeded by examining how removal units generated by projects based on different GGR methods might be characterised in terms of their legal nature, financial nature and, in terms of the characteristics pertaining to individual methods, parameters by which units might be considered fungible, or interchangeable for the purposes of settlement obligations, as this would enable deeper, more liquid markets, promoting GGR sector growth.

The conclusions drawn include that characterisation of GGR removal units as constituting property would provide a material benefit to development of the GGR market and scaling up of the sector, as would definition of GGR removal units as being financial instruments for the purposes of financial regulation. In both these respects, examination of the experience in the carbon market to date, and review of earlier legislative, judicial and academic engagement with issues in that context provides insight.

The heterogeneity of technical characteristics demonstrated by the different GGR methods, which would translate to the units generated by projects based on those methods, makes the identification of parameters by which units might be considered fungible, or interchangeable for the purposes of settlement obligations, less readily resolved. Limiting those parameters to characteristics the methods have in common, leads to a focus only on effectiveness and cost efficiency in GHG removal, to the potential exclusion of biodiversity, environmental and social factors. The fungibility of removal units, to which these parameters are directed, depends on the context in which it is being assessed and, in the case of the GGR market, demand will not arise naturally, but will be a function of public policy. Policymakers will need to determine what outcomes they seek to achieve in promoting the scaling up of the GGR sector – is cost effective GHG removal the sole objective, or should social and environmental outcomes be included and, if so, how do all these outcomes relate to each other.

In these circumstances, an alternative is proposed to address difficulties confronting policymakers attempting to frame a GGR market. The alternative proposes the various GGR methods might be considered on a pooled basis, rather than individually. GGR projects might be bundled together and, provided they satisfy minimum requirements as to the projects included and the outcomes the bundle can achieve, the bundled projects, together, could generate standardised GGR removal units. A standard could set out the requirements and be adopted by regulation.

Aspects of the two approaches, that is, first identifying common metrics across individual methods; and second bundling projects to take account of all characteristics, are listed in the following table:

Table 1: Comparison of approaches:

Examine project methods to identify a common metric to apply:	Apply standard for bundling projects to take account of all characteristics:

• Include only common characteristics in comparative assessment	• Includes all characteristics in bundle that generates standardised CDR units
• Readily applicable in the market	• Requires definition of a standard to be adopted by regulation
• Excludes some characteristics that are not common to all methods	• Formula to weight characteristics, adjustable based on evidence over time
• May result in some methods being discounted	• Inclusive
• Results in winner and loser methods	• Fosters all methods
• Does not require regulatory intervention	• Can facilitate application of financing techniques to help develop market (e.g., securitisation)

Finally, it is noted that if a standard were to be developed on a national basis, there would still be the potential for other national standards bodies to adopt it. Even better, the standard could be developed as an international standard under the auspices of the International Standards Organisation (ISO), which would open up the potential of international trading in standardised GGR removal units.