

2017

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Dale, L. (2017) 'To What Extent are the Economic and Environmental Aspects of Climate Change Regulation Actually Balanced?', Plymouth Law and Criminal Justice Review, 9, pp.115-140. Available at: <https://pearl.plymouth.ac.uk/handle/10026.1/9046>
<http://hdl.handle.net/10026.1/9046>

The Plymouth Law & Criminal Justice Review
University of Plymouth

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TO WHAT EXTENT ARE THE ECONOMIC AND ENVIRONMENTAL ASPECTS OF CLIMATE CHANGE REGULATION ACTUALLY BALANCED?

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Abstract

This paper explores current international and EU legal instruments to combat climate change, assessing their efficiency from an environmental and economic perspective. It attempts to decipher whether an obvious imbalance is present in relation to the growth of the economy overshadowing regulations imposed to reduce rapid environmental degradation. In the penultimate section a potential future instrument is considered that may alleviate the climate crisis and conquer the economic and environmental divide. This paper will conclude that the incorporation of business, industry and governments in the implementation of future climate regulation is critical to their success in climate stabilisation through substantial GHG emission reductions or climate modification methods.

Keywords: climate change, alternatives to regulation, Paris agreement, REDD+

Introduction

This paper explores current and future international and EU climate change regulations. It assesses whether economic growth negatively impacts current mechanisms, preventing the achievement of necessary greenhouse gas (GHG) emission reductions. The extent to which significant future reductions can be met through 'Climate Engineering' is also explored. International environmental law (IEL) has evolved since the nineteenth and early twentieth century, becoming more significant in the 1970s.² The EU's development of specific environmental regimes can be seen dating back to the 1970s.³ Both IEL and EU law should theoretically be capable of implementing efficient and sustainable measures to stem climate change, however this paper argues that instruments implemented thus far have failed to create the necessary transformation. In relation to IEL, Beyerlin and Marauhn⁴ have observed that there is a conflict between environmental protection and economic development. This has

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² Dupuy, P., Vinuales, J., *International Environmental Law*, (2015), p.3.

³ Scott, J., *Environmental Protection European Law and Governance*, (2009), p.1.

⁴ Beyerlin, M., and Marauhn, T., *International Environmental Law*, (2011), p.423.

been evident since the General Agreement on Tariffs and Trade 1947 (GATT)⁵ and its failure to mention environmental protection.⁶

A key influence in developing IEL is the *Trail Smelter Arbitration*⁷ case in which it was held that 'no State has the right to use or permit the use of its territory in such a manner as to cause injury by fumes in or to the territory of another.'⁸ This principle is an essential canon of IEL but in practice it appears that it is not strictly applied; and its incorporation mechanisms fail to integrate it effectively to prevent global environmental degradation. GHG emissions will undoubtedly have a transboundary effect as there is no current containment method.

The paper begins by discussing the United Nations Framework Convention on Climate Change (UNFCCC). Considering whether it is outdated, thus preventing new climate measures being sought. It assesses its environmental impact and offers three potential solutions for rectification or replacement: climate clubs, the contraction and convergence principle and incorporating stakeholder input into environmental policy agreements. Following discussion focuses on two key mechanisms that are currently in use and whether their proposed environmental purposes are fulfilled: Reducing Emissions from Deforestation and Forest Degradation and the Role of Conservation, Sustainable Management of Forests and Enhancement of Forest Carbon Stocks in Developing Countries (REDD+); and the European Union Emissions Trading Scheme (EU ETS). Finally, Climate Engineering is evaluated for its potential in stemming climate change by the intentional modification of the climate. Gaps between industry stakeholders, governments and climate change regulations, will be highlighted and the potential for realignment of the balance between environment and economics will be explored.

1 The UNFCCC and its True Purpose – Reform or Abolition

The UNFCCC⁹ must be assessed against a backdrop of a constantly evolving global economy with the negative effects of climate change ever present. The assessment considers whether it holds substantial legal status or merely possesses several loosely binding rules that cannot practicably be enforced. Bodansky et al¹⁰ stated that the increase in global temperature became an issue in the UN system at the end of 1990. The UN General Assembly established a Negotiating Committee for the UNFCCC under the Rio Convention, making it part of the

⁵ General Agreement on Tariffs and Trade (GATT 1947), as amended The General Agreement on Tariffs and Trade 1994 ('GATT 1994')

⁶ Beyerlin and Marauhn, *International Environmental Law*, p.424.

⁷ *Trail Smelter Arbitration (United States v Canada)*, RIAA, vol. III pp.1905-82.

⁸ Dupuy and Vinuales, *International Environmental Law*, p.4.

⁹ United Nations Framework Convention on Climate Change (UNFCCC), United Nations 1992.

¹⁰ Bodansky D., et al, *The Oxford Handbook of International Environmental Law* (2008), p.327.

negotiations for a legal document for the 1992 United Nations Conference on the Environment and Development.¹¹ The UNFCCC entered into force in 1994 with the objective to create an international structure to limit GHG emissions. Core principles include; stabilisation of atmospheric GHG concentrations, sustainable development, precaution and cost-effectiveness. The onus was placed on developed countries, in Annex I, to take primary responsibility to stabilise emissions, due to their historically higher emission levels.¹²

The final agreement contains four flexibility mechanisms.¹³ Article 4 permits two or more Annex I states to fulfil emission reduction targets jointly - meaning one state is able to be significantly above their reduction target if the other is substantially below. Article 17 of the Kyoto Protocol¹⁴ sanctions an international ETS in which permits are allocated to parties subject to emissions limits, and tradable between states. The final mechanism is the Clean Development Mechanism (CDM). Set out in Article 12, it is noteworthy as it allowed developed countries to support developing countries in emission reduction programmes. It is suggested that the motivation to create flexibility mechanisms was cost-effectiveness pursuant to Article 3 UNFCCC¹⁵. The mechanisms were adopted reluctantly, due to concerns that they provided developed states the means to avoid dealing with global climate change by 'exporting' their emissions¹⁶. Concerns also arose in relation to permit trading around monitoring and verification. Despite criticism the flexibility mechanisms represent a milestone in the development of IEL.¹⁷ In *Urgenda Foundation v The Netherlands*¹⁸ the Netherlands had an obligation to reduce their emissions by 25% by 2020. Freedom was granted in relation to the means sought, thus trading permits may have been a feasible option. The case demonstrates the relationship between international and domestic law and policy: the decision was made on the basis of the international policy framework accompanied by decrees of the Dutch Government.¹⁹ It may also be viewed as highlighting criticism of the UNFCCC and its difficulties in enforcement.²⁰

¹¹ *Ibid.*, p.328.

¹² *Ibid.*, p.328.

¹³ *Ibid.*, p.331.

¹⁴ The Kyoto Protocol 1997, Article 17.

¹⁵ Bodansky, *Oxford Handbook of International Environmental Law*, pp.331-332.

¹⁶ *Ibid.*, p.331.

¹⁷ *Ibid.*, pp.331-332.

¹⁸ *Urgenda Foundation v The Netherlands (Ministry of Infrastructure and the Environment)*, C/09/456689

¹⁹ Harrison, J., 'Significant International Environmental Law Cases: 2014-15', *Journal of Environmental Law*, (2015) 27 (3): 541

²⁰ This is evidenced by the court's acceptance that the current global emission and reduction measures implemented by the parties to the Convention remain insufficient to realise the 2 degree temperature reduction target.

Enforcement of the UNFCCC operates through a bottom-up approach. This makes it difficult to fulfil the main objective under Article 2 because all obligations are required to be met.²¹ The approach may be criticised due to the States' ability to determine their degree of participation in tackling global climate change.²² Meyer in the context of contraction and convergence (C&C) notes the 'UNFCCC approach reflects countries' own interests or their own group interests.' departing from its original intention of stabilising GHG concentrations based upon the 'principles of precaution and equity.'²³ To remedy this, Sagara endorses Meyer's C&C principle as a viable approach, and proposes that due to the Kyoto Protocol's inadequacies, the UNFCCC must become a Convention based upon unifying the C&C principle of truth and reconciliation. The Kyoto Protocol was formally adopted in 1997 at COP3 and enacted in 2005 and has been subject to two commitment periods.²⁴ Its purpose has been heavily criticised for its lack of enforceability and one viewpoint is demonstrated below²⁵.

Widerberg and Stenson identified several flaws within the UNFCCC resulting in subsequent scrutiny and critique. The consensus rule provides one example, which has led to 'agreements that have low, rather than ambitious, targets.'²⁶ Due to these defects it is submitted that at present it has failed to create global progress in agreeing reduction targets. Widerberg and Stenson offer an alternative to UNFCCC, in the form of Climate Clubs(CCs).²⁷ CCs have been polarised in presenting an alternative, however, there are positive benefits that have been identified: namely they

increase the benefits of working with a small group of 'climate-friendly' countries; specialize in topics which the UNFCCC are not able to cover as a whole; address the more contentious issues; and, mobilize support on a national level.²⁸

With a smaller number of countries, negotiations may be more prompt, leading to reduction targets being met efficiently. However criticism of CCs has focused on States creating them

²¹ Lawson, F., 'Obstacles on the Road to an effective legal agreement in Paris', (2015) 27(2) *ELM*, 43.

²² Leading to the assumption that the UNFCCC is at risk of 'becoming a legal instrument in name rather than in substance.' *Ibid*.

²³ Sagara, T., 'Are there realistic ways to improve the UNFCCC?', (Climatico 2009) http://www.climaticoanalysis.org/wp-content/uploads/2009/12/tsagara_interview.pdf, Accessed January 1st 2016

²⁴ Bodansky, *Oxford Handbook of International Environmental Law*, p.328.

²⁵ Lawson for example observes that a state's failure to meet emission reduction commitments brings no legal consequences. The history of environmental regulation is characterised by Conventions and mechanisms promising progressive core principles to stabilise the climate, which in practice have limited effect: perhaps surprising considering that the UNFCCC and Kyoto were ratified by a significant number of States. Lawson, 'Obstacles on the road to an effective legal agreement in Paris', 43.

²⁶ Widerberg, O., and Stenson, D., 'Climate clubs and the UNFCCC', (FORES Study, 2013) <http://fores.se/wp-content/uploads/2013/11/ClimateClubsAndTheUNFCCC-FORES-Study-2013-3.pdf>, Accessed 8 January 2016.

²⁷ Defined as 'one type of player in the emerging fragmented global climate governance architecture.'

²⁸ *Ibid*.

to reflect their own interests, avoiding reasonable emission reduction programmes. To advance State policy goals and fulfil their interests, parties engage in 'forum-shopping', allowing state actors to exit CCs.²⁹ Ultimately as CCs are formed by States to reflect national interests, they may negatively impact global GHG reductions.³⁰ Despite concerns with the use of CCs they could act as an effective step in climate change policy, and due to the current state of the UNFCCC it is 'likely to be dependent on initiatives occurring outside its processes.'³¹

Developments to the UNFCCC to date have been considered inadequate. The Copenhagen Climate Summit and the Copenhagen Accord were not formally adopted due to limited party and stakeholder support as to whether the UNFCCC was 'still able to provide meaningful results.'³² The CoP16 Cancun Agreements restored some faith in the process, however Bolivia's overt rejection evidenced the fragility of the process. Holzer and Sepibus writing in the context of the positive impact of business and industry, emphasise the need to incorporate business stakeholders into the climate process. Allowing them an active contribution could allow the UNFCCC goals to become more realisable.³³

The World Trade Organisation (WTO) directly influences business practices. The UNFCCC, by contrast 'has with the exception of the Clean Development Mechanism (CDM), failed to sufficiently mobilise this type of stakeholders.'³⁴ On this analysis it is necessary to create more specific environmental mechanisms that have a direct business link to prevent the UNFCCC conflicting with positive global climate measures. International economic law is mainly rooted, developed, implemented and supervised by the WTO, which originally developed from GATT 1947.³⁵ The formal incorporation of the WTO 'meant a paradigm shift in international economic law.'³⁶ The WTO could be subject to criticism due to its development arising through GATT³⁷, although Article XX did provide for the environment it is criticised due to the lack of clarity in

²⁹ Widerberg and Stenson, *Climate clubs and the UNFCCC*.

³⁰ For example, if a club had a 'global goal of increasing GHG intensity instead of capping total GHG emissions' it would be in direct conflict with the UNFCCC objective. *Ibid*

³¹ *Ibid*

³² Sépibus, J., and Holzer, K., 'The UNFCCC at a Crossroads - Can Increased Involvement of Business and Industry Help Rescue the Multilateral Climate Regime?' (2014) *CCLR* 1: pp.23-34.

³³ Due to the fact 'business and industry entities are responsible for the bulk of GHG emissions worldwide.' *Ibid*.

³⁴ *Ibid*.

³⁵ General Agreement on Tariffs and Trade (GATT 1947), as amended The General Agreement on Tariffs and Trade 1994 (GATT 1994), Article XX.

³⁶ Trade relations, provided for under of Article II (1) formed three main bodies; the Ministerial Conference, the General Council and the Secretariat. The organisation considers itself to be 'a rules-based and member-driven organisation.' Beyerlin and Marauhn, *International Environmental Law*, p.425.

³⁷ GATT 1947 as amended Article XX, paras.(b) and (g).

relation to necessary protection.³⁸ Despite criticism the WTO includes clauses that have carefully taken into account environmental considerations of world trade, and it is notable that a significant number of multilateral environmental agreements 'have internationally chosen economic means to pursue environmental objectives.'³⁹

Despite maintaining influence over businesses practices, it is clear that more could be done to form a proactive relationship between industry and the environment. A recent survey of business stakeholders⁴⁰ observed a consensus amongst respondents that business involvement was crucial in achieving UNFCCC goals. Involvement would ensure environmental mechanisms do not alter competition and 'remain economically reasonable.'⁴¹ Allowing businesses to have a proactive approach in climate agreements could encourage new opportunities that are ecologically friendly. At present the International Chamber of Commerce (ICC) creates the link between business industries and the UNFCCC Secretariat. However, 'For an enhanced participation of business stakeholders the actual structure is...clearly insufficient and should be upgraded.'⁴² Interested readers are invited to look at the reference below for a potential solution.⁴³

Sands and Peel address the UNFCCC main objective of stabilising GHG emissions as empirically flawed, making reference to Article 4 (2) (a) in which focus is drawn only to developed State limitation of emissions and fails to recognise 'stabilisation at a particular level or reduction'.⁴⁴ They propose that the provisions establish only 'soft targets and timetables with many loopholes.'⁴⁵ It is therefore necessary to establish the current state of the UNFCCC through discussion of COP21 in Paris, and whether this agreement has brought the UNFCCC closer to its original intentions. In Paris 195 nations agreed to measures for a low carbon, resilient and sustainable future. The agreement will enter into force post the signing and ratification of fifty-five states that account for at least 55% of all global emissions.⁴⁶ It contains

³⁸ Beyerlin and Marauhn, *International Environmental Law*, pp.426-427.

³⁹ *Ibid.*, p.437.

⁴⁰ Conducted by the World Business Council for Sustainable Development (WBCSD).

⁴¹ Sépibus and Holzer, 'The UNFCCC at a Crossroads', pp.23-34.

⁴² *Ibid*

⁴³ One solution would be for the Secretariat to set up specific departments under the Cancun Agreements, which would remain responsible in organising and sustaining relations with business. To create a bond between stakeholders and the implementation of climate regimes, it is recommended that formal arrangements may be possible, if informal means are sought and meetings occur on a consistent basis. These regular consultations could potentially change industry stakeholders from passive observers to active advisors within climate change regulation.

⁴⁴ Sands, P., et al, *Principles of International Environmental Law*, (2012), p.281.

⁴⁵ *Ibid*

⁴⁶ 'UN Climate Change NEWSROOM' <http://newsroom.unfccc.int/unfccc-newsroom/finale-cop21/>, Accessed: 5 January 2016

a number of key requirements which interested readers are invited to read below.⁴⁷ Overall it appears to strengthen adaptation, 'establishing a global goal of enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change.'⁴⁸ Bodansky's critical evaluation of COP21 affirms that the agreement's non-legal nature may positively impact climate change regimes, due to the transparency and accountability mechanisms included. Therefore, non-legally binding instruments may have a substantial impact on behaviour.⁴⁹ Making the Paris conference legally binding, should not depend on legal enforcement as the sole consideration. It is an important factor, due to the enhanced commitment and compliance principles implied. However, it is equally important to recognise that transparency and accountability may be just as effective in allowing the agreement to flourish. It is also important to note that the core nature of COP21 may be fundamental to the future of climate change. Bodansky addresses the fact that Paris builds on the Copenhagen Conference 2009 through formalisation and extension of key principles, such as the 2-degree Celsius decrease and NDCs. However, whilst a successful conference was held Bodansky recognises that Paris is not the end of climate negotiations, which will continue for the foreseeable future.

2 A Critical Evaluation of International responses to Climate Change REDD and REDD+

Reducing Emissions from Deforestation and forest Degradation⁵⁰(REDD) was launched in 2008 as amended in 2010 at COP-16 REDD+.⁵¹ Originally created under the UNFCCC, it has the potential to significantly reduce carbon emissions. Chapman writing in the context of benefit sharing and REDD+ describes it as a 'tool to address greenhouse gas emissions from changes in land use – in particular from deforestation and forest degradation.'⁵² The Stern review regarded it as promising due to its cost effective nature compared to alternative forms of mitigation.⁵³ REDD+ encourages the protection and conservation of sustainable forest management through financial incentives. As 20% of all CO₂ emissions are as a result of

⁴⁷ Including; the use of regular party reports on their emissions and implementation efforts made subject to international review and dependency upon transparency as a means of holding countries accountable: there are provisions in place to help developing countries meet new transparency requirements. Allowing them 'flexibility in the scope, frequency and detail of their reporting, and in the scope of review. Outcomes of The U.N. Climate Change Conference in Paris' <http://www.c2es.org/docUploads/cop-21-paris-summary-02-2016-final.pdf>, Accessed: 5 January 2016.

⁴⁸ 'Outcomes of The U.N. Climate Change Conference in Paris'.

⁴⁹ Bodansky points out, the Helsinki Declaration 1975 has been an incredibly successful human rights instrument despite its lack of legal authority.

⁵⁰ Reducing Emissions from Deforestation and forest Degradation (REDD).

⁵¹ Reducing Emissions from Deforestation and Forest Degradation and the Role of Conservation, Sustainable Management of Forests and Enhancement of Forest Carbon Stocks in Developing Countries (REDD+).

⁵² Chapman, S., 'Defining the Legal Elements of Benefit Sharing in the Context of REDD+', (2015) *CCLR* 3 pp.270-281.

⁵³ Stern, N., 'The Economics of Climate Change – The Stern Review', (2009), p.245.

global deforestation it is an issue that requires immediate attention. However, REDD+ has many critical flaws that may prevent it from fulfilling crucial objectives. Chapman criticised the UNFCCC approach as it 'emphasises the need for REDD+ implementation to enhance social and environmental benefits',⁵⁴ and fails to put forward an approach that countries are able to adopt in implementing the scheme. The lack of global policy direction in the application of key instruments such as REDD+ appears to be a recurring theme in academic literature focusing on climate change, due to global policy processes focusing on 'multilateral, inter-state negotiations'⁵⁵ under the UNFCCC. Despite the criticism it should be noted that it is incredibly difficult for international law to instruct States through such direct means.

To effectively reduce emissions, alternative means of enforcement must be sought. Current processes are unable to fulfil time-efficient and operational responses due to the current economic and political position.⁵⁶ These processes are based upon collective state action, the UNFCCC fails to address the fact that despite the Kyoto Protocol being extended in Doha there are a number of countries that refuse to participate meaning the protocol is only applicable to '15% of global emissions.'⁵⁷ The causal link between global economic growth and the destruction of natural resources is significant in relation to the ownership and control of those resources causing legal and political disputes between States, highlighting the North/South divide.

Oels considers that climate change is being 'framed as an economic problem'⁵⁸ rather than an environmental one, therefore regimes such as REDD+ are slanted through the notion of climate change being viewed as a cost-benefit analysis. A significant concern in its implementation centres on equality. REDD+ focuses on emission reduction in developing countries and therefore could be subject to abuse. Providing financial incentives to poverty stricken countries to maintain, rather than destroy, their forests are difficult to monitor and will ultimately lead to fraud. Although, technological advancements have created satellite monitoring resources making it an option to monitor REDD+ in the future. To be a viable regime it requires 'greater, more sophisticated regulatory frameworks than other PES types.'⁵⁹

⁵⁴ Chapman, 'Defining the Legal Elements of Benefit Sharing in the Context of REDD+', pp.270-281.

⁵⁵ *Ibid*

⁵⁶ Abbott, K., 'Strengthening the Transnational Regime Complex for Climate Change' (2014) 3(1) *Transnational Environmental Law*, pp. 57-88.

⁵⁷ *Ibid*.

⁵⁸ *Ibid*.

⁵⁹ 'IUCN – Legal Frameworks for REDD', <https://portals.iucn.org/library/efiles/documents/EPLP-077.pdf>, p.4, Accessed 15 October 2015.

Alongside this it is important to consider benefit sharing, monitoring and treatment of ownership and further discussion of this can be seen below.⁶⁰

Customary rights must be considered as 'it is necessary to comply with requirements set out by domestic and human rights law, especially in connection with indigenous peoples.'⁶¹ Due to the significance of indigenous people, the UN REDD+ programme has formally incorporated the rights of Indigenous peoples into policy.⁶²

The International Rights of Nature tribunal is a global movement based upon respect and recognition that nature is entitled to rights.⁶³ The general consensus was that mechanisms such as REDD+ hinder environmental protection rather than restores or and maintain it.⁶⁴ Presenters within the tribunal described REDD+ as 'the pillar of the 'Green Economy' which is itself a pillar of the financialization of Nature'⁶⁵; and in the view of others as being a crime against humanity 'resulting in Eco-cide⁶⁶ and Terra-cide.'⁶⁷

Despite an array of compelling evidence submitted to the tribunal it is important to note that nature as an entity does not in itself possess legal rights and therefore the arguments put

⁶⁰ It has been noted that in numerous developing countries forestland is under State ownership causing tension between large scale businesses whom are granted access and rights to forestland, and private citizens that are being restricted through these means when their livelihoods often depend on the use of such resources. *Ibid.*, p.21.

As a result of these restrictions corruption is, arguably, a more likely occurrence and therefore reforms such as an increase in local control of forestlands is vital for REDD+ to materialise into a functional mechanism.

⁶¹ Legal Frameworks for REDD', p.31.

⁶² *Ibid.* Therefore public participation, provided for in the Aarhus Convention and the Kiev Protocol on PRTRs is one approach that may enrich the relationship between States who implement REDD+ and local communities who depend on the forests. Public participation may allow for a sense of empowerment for those who rely on forestland and thus create more equal and balanced relationships that depend upon the distribution of control.

⁶³ The rights of nature international tribunal dismiss the concept of nature being legal property and instead defines it as having the vital right that 'nature in all its life forms has the right to exist, persist, maintain and regenerate its vital cycles.' 'Global Alliance for the Rights of Nature – What is Rights of Nature?' <http://therightsofnature.org/what-is-rights-of-nature/>, Accessed 6 January 2016.

⁶⁴ The tribunal was held in 2014 in Lima, Peru and heard 12 cases relating to environmental impacts that affect the protection of nature at its core, one of these being the implementation of legal instruments including REDD+.

⁶⁵ *Ibid.*

⁶⁶ Polly Higgins created the concept of ecocide in which she describes it as 'the extensive damage to, destruction of or loss of ecosystem(s) of a given territory, whether by human agency or by other causes, to such an extent that peaceful enjoyment by the inhabitants of that territory has been or will be severely diminished.' Ecocide has been submitted by Higgins to be implemented into the Rome Statute as an International Crime, if implemented International Law would have extensive powers over the protection of global ecosystems as the Statute remains 'one of the most powerful documents in the world.' - 'Eradicating Ecocide - What is Ecocide?' <http://eradicatingecocide.com/the-law/what-is-ecocide/> Accessed 17 January 2016.

⁶⁷ 'Global Alliance for the Rights of Nature – Final Verdict – Lima' <http://therightsofnature.org/final-verdict-lima/>, Accessed 6 January 2016

forward only hold theoretical value.⁶⁸ Cormac states that the tribunal's global impact will depend upon 'global social movements, local communities and organisations' support⁶⁹ to enable it to become more than just a creative vision. Further critiques have been posited by Adelman and French,⁷⁰ the latter focusing on state sovereignty and its impact. Interested readers are directed to the references below as constraints of space preclude a more detailed explanation.

The North-South Divide is central to the implementation of legal mechanisms stabilising the climate. The Stockholm Conference highlighted the significant divide as developing countries viewed environmental pollution as 'primarily the result of industrialisation and therefore only of concern for the developed states.'⁷¹ This sceptical view adopted by the South induced Indira Gandhi to make a poignant statement on the reasoning behind this position.⁷² The statement appears to reflect a lack of morals and social justice that divide the developing and developed world.⁷³ In this vein Natarajan has observed that it is critical to the sustainability of the global environment for the North to 'lead and bear a greater burden because of their greater economic and technological capacity.'⁷⁴ The assumption that the South is lacking in their environmental conscience is a deceptive notion.⁷⁵

⁶⁸ However, they do provide an understanding and insight into indigenous culture, and contextually highlight the tensions between the implementation of international legal mechanisms such as REDD+ and indigenous communities.

⁶⁹ 'Global Alliance for the Rights of Nature – Final Verdict – Lima' <http://therightsofnature.org/final-verdict-lima/>, Accessed: January 6th 2016

⁷⁰ It is necessary for balance to be sought in relation to a State's sovereignty and IEL due to the resistance that would occur if eradication of the principle was proposed. The development of IEL means that sovereignty must be treated as a 'flexible tool' and should not be viewed in opposition to environmental protection as it offers internal regulation and external negotiations which can 'conserve both its own and the global environment.' French, Duncan A. (2001) 'A Reappraisal of Sovereignty in the Light of Global Environmental Concerns', *Legal Studies: The Journal of the Society of Public Teachers of Law* 21(3) 376-399.

⁷¹ Beyerlin and Marauhn, *International Environmental Law* 2.2 Impacts of the North-South Divide on International Environmental Law

⁷² 'The Rich countries may look upon development as the cause of environmental destruction, but to us it is one of the primary means of improving the environment of living, of providing food, water, sanitation and shelter... We cannot forget the grim poverty of large numbers of people... How can we speak to those who live in villages and in slums about keeping the oceans, rivers and the air clean when their own lives are contaminated at the source? Environment cannot be improved in conditions of poverty. Nor can poverty be eradicated without the use of science and technology. Ibid.

⁷³ Therefore, without creating a more balanced and stable economic state globally, it will be difficult for legal mechanisms to substantially impact the climate.

⁷⁴ Natarajan, U., 'Locating Nature: Making and Unmaking International Law', *Leiden Journal of International Law*, 27 (2014), pp.573-593.

⁷⁵ A fairer evaluation would be to suggest that numerous developing countries have approached environmental protection schemes such as REDD+ in a variety of ways and therefore it is not possible to make an unmitigated statement that the South is failing in their environmental protectionist measures.

Allied to this there are a number of economic assessments of REDD+. Stern reflected that with 'the right policies and enforcement mechanisms in place, the rate of deforestation could be reduced and substantial emissions cuts achieved.'⁷⁶ Eliasch estimates the costs of mitigation for halving the emissions of deforestation by 2030 being between \$17-33 billion per annum.

According to Stern the 'bulk of emissions from deforestation arise when the land is converted to agricultural production.'⁷⁷ It is apparent that tropical countries are most vulnerable to the effects of deforestation due the demand for agricultural land accompanied by the lack of access to sustainable resources and mechanisms that would negate the use of 'slash and burn techniques.'⁷⁸ A recent *Guardian* publication on the effects of these techniques represents the severity of such action.⁷⁹ Thus REDD+ implementation will, in theory, 'compensate for avoided deforestation and degradation but should also incentivize sustainable forest management and enhancement of forest carbon stocks.'⁸⁰ This has the potential to eradicate deforestation techniques that are cheaper but create substantial harm.

In summary, for REDD+ to achieve its potential, it is clear a raft of issues must be addressed, to allow it, and other similar mechanisms to succeed.⁸¹ The future of REDD+ will depend upon the response of IEL in regards to the extent in which it is willing to resolve the issues raised. Subsequent discussion and critical analysis will focus on carbon trading and offsetting in light of its contribution to economic growth and the extent to which it has fulfilled its environmental aspirations.

3 EU ETS Encouraging Economic Growth or Stemming Global Climate Change?

⁷⁶ Stern, 'The Economics of Climate Change', p.236

⁷⁷ Eliasch Review: Climate Change: Financing Global Forests, (2008), https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/228833/9780108507632.pdf p.605.

⁷⁸ Ibid

⁷⁹ Indonesia is a large scale producer of palm oil and often uses slash and burn techniques, however in 2015 this method of clearing land potentially 'surpassed the average daily emissions of the entire US economy.' The Guardian Online, 'Indonesia's fires labelled a 'crime against humanity' as 500,000 suffer', <http://www.theguardian.com/world/2015/oct/26/indonesias-fires-crime-against-humanity-hundreds-of-thousands-suffer>, Accessed 25 January 2016.

⁸⁰ Lederer, M., 'From CDM to REDD+: What Do We Know for Setting Up Effective and Legitimate Carbon Governance?' (2011) 70(11) *Ecological Economics*, pp.1900–7.

⁸¹ Consideration must be given as to whether its purpose is to reduce emissions or in actual fact is a means by which corporations are able to reap the financial benefits from its implementation. REDD+ still requires significant evaluation, and additional guidance should be provided in defining its true purpose and future aims.

The European Union's Emissions Trading Scheme⁸² (EU ETS) is part of its response to climate change and a reflection of its position as a leader in international environmental policy. There are two principal economic instruments relational to climate change: emissions trading (ET) and emissions offsetting (EO). ET was a mechanism created by the Kyoto Protocol (KP) enabling States to trade in assigned amounts units (AAUs) if they meet the eligibility requirements.⁸³ Arup writing in the context of lessons to be learnt from carbon markets (CM), asserts that regulators must respond to three demands for success; commercial viability, environmental sustainability and political legitimacy. Substantial reliance is placed on private sector participation and engagement in the use of CM, nevertheless public regulation is still vital as without it commercial viability and environmental sustainability cannot be guaranteed.⁸⁴ Since 2003 the Clean Development Mechanism (CDM) provided for under Article 12 of the KP, has remained the central instrument for offsets. The CDM provides developing countries with the opportunity to earn certified emission reductions (CERs) if they are subject to emission reductions (ER) or removal, whilst at the same time allowing developed countries tractability in meeting ER targets.⁸⁵ The scheme has been criticised on the basis that the nature of offsets is fundamentally wrong, as developed states should not have the option 'to buy indulgences from their poorer neighbours.'⁸⁶ The CDM may consequently be causing unnecessary environmental harm and with its integrity damaged could collapse.⁸⁷

An early report on carbon trading highlighted CM as providing both obstacles and benefits in relation to environmental protection. A significant issue with CM lies within the fact that wealthy, developed States and stakeholders are able to manipulate the market which potentially introduces an array of additional complications.⁸⁸ Although perhaps a dated report, this evaluation of CM gives necessary insight into one viewpoint of the reasoning behind their implementation. The EU ETS, heralded as 'the world's first international trading system for

⁸² European Union Emissions Trading Scheme (EU ETS), DIRECTIVE 2003/87/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC.

⁸³ Hall, R., and Jones, B., *Burnett-Hall on Environmental Law*, (2009), p.381.

⁸⁴ Arup, C., 'Lessons from Regulating Carbon Offset Markets', *Transnational Environmental Law*, 4:1 (2015), pp.69-100.

⁸⁵ The CERs operate through being traded or sold on the CM to allow States to meet reduction targets. 'United Nations Framework Convention on Climate Change - The Kyoto Protocol Mechanisms', https://cdm.unfccc.int/about/cdm_kpm.pdf, Accessed 5 February 2016.

⁸⁶ Arup, 'Lessons from Regulating Carbon Offset Markets', pp.69-100.

⁸⁷ Although this may raise fears that the complete eradication of offsets would potentially harm the economy, in practice it may lead to a range of regulations being sourced domestically rather than on an international level, which could result in more balanced and successful outcomes.

⁸⁸ Such as 'centralised controls, and opportunities for fraud that it makes democratic scrutiny and oversight virtually impossible.' Lohmann, L., 'Carbon Trading, a critical conversation on climate change, privatisation and power', development dialogue no 48, (2006), p.329.

carbon dioxide⁸⁹ was founded in early 2005, pursuant to Directive 2003/87/EC which is implemented by the Greenhouse Gas Emissions Trading Scheme Regulations 2012⁹⁰. The scheme is renowned for its largescale initiative to limit GHG emissions, and provides the foundation for an eventual global trading regime.⁹¹

A cap and trade system was adopted. In its implementation, compromises were made that may have affected its efficiency from the outset. One of the system's key features is the allocation of free allowances, with 95% being free of charge in the trial period and 90% in the second trading period: reasoned on the basis of appeasement to industry. The system does not and cannot guarantee specified emission reductions, it instead assures the level of emissions emitted 'will be limited.'⁹² In practice these systems operate through a regulator determining an acceptable abatement, set below 'business as usual' levels to achieve its objective. Its proposed long-term aim is to reduce abatement below the original cap that is established and may be achieved through gradual reductions to prevent disengagement.⁹³ At present there are a number of key Directives that provide for the system in practice, with amendments made regularly to retain economic and environmental efficiency. Directive 2003/87/EC was first to establish an ET scheme for GHG emissions and therefore is most appropriate in understanding how the scheme operates.⁹⁴

Low points to definitional difficulties in the EU ETS arguing the major downfall lies in its inability to sufficiently define the fundamental nature of European Union Allowances (EUA).⁹⁵ Article 9 of Directive 2003/87/EC is evidence of the loose definition of allocation allowances: it succeeds only in stating that plans should be based on objective and transparent criteria but fails to expand beyond what is listed in Annex III leaving MS at a loss to the true meaning of EUA. Although Directive 2009/29/EC⁹⁶, changes Article 9 to cover community-wide quantity

⁸⁹ Monjon, S., and Quirion, P., 'Addressing leakage in the EU ETS: Border adjustment or output-based allocation?', *Ecological Economics* 70 (2011) 1957-1971, p.382.

⁹⁰ Greenhouse Gas Emissions Trading Scheme Regulations 2012 No. 3038.

⁹¹ Ellerman, D., et al, *Pricing Carbon: The European Union Emissions Trading Scheme*, (2010), p.1.

⁹² *Ibid* p.158.

⁹³ Low, K., 'Carbon Credits as EU Like It: Property, Immunity, TragiCO2medy?', *Journal of Environmental Law* (2015) 27 (3): 377.

⁹⁴ Article 11 places the obligation on MS to decide upon total allocation amounts for a trading period, highlighting one difficulty with the system due to MS retaining discretion which could result in abuses, for example through levels being purposely set too high, limiting the impact on stakeholders. Equally under Article 16 (1) the use of penalties for infringement are ambiguous as they are left at the MS discretion and fail to explain what is meant by 'effective, proportionate and dissuasive' penalties. The lack of detailed explanation allows for wide interpretation to suit MS own interests, meaning penalties could be disproportionate to the infringement that has occurred.

⁹⁵ Low, 'Carbon Credits as EU Like It: Property, Immunity, TragiCO2medy?', 377.

⁹⁶ Directive 2009/29/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009, OJ L 140/63.

of allowances it still fails in providing a clear definition of EUA. Equally Kreiser et al criticise the ambiguous nature of the scheme's results, discussion of which is below.⁹⁷ Despite its assets the scheme has been criticised due to the core nature of CM not being founded on sustainability criteria, therefore raising questions as to its true purpose.

Kreiser et al, put forward a number of recommendations for an effective, efficient and just ETS. First, CM's should comprehensively cover all GHGs.⁹⁸ Focus is placed on the impact of up and downstream accounting process, the detail of which is beyond the scope of this paper, although readers may wish to refer to the reference below for further discussion.⁹⁹

In application of the cap and trade system, and using the cost-benefit analysis approach to estimate a reasonable optimum pollution level, the cap must remain in line with the global climate reduction target of 2 degrees Celsius to satisfy environmental concerns, 'By using the Budget Approach...only 600 billion tons of emissions for the period 2010-2050'¹⁰⁰ remains, due to over half of the allowable emissions being used over a twenty-year period. Kreiser et al propose the use of Meyer's C&C principle as a means to effectively reduce emissions, as current allowances provided for in the Directive are unclear. This principle has the potential for the enforcement of a stringent absolute cap which would support 'intra and intergenerational justice'¹⁰¹ in ET and would equally take into account restrictions that would be caused to intra-generational justice as a result of the stringent caps. Despite criticism that the C&C principle may receive, it must not detract from the opinion that an absolute cap would favour inter-generational justice due to future generations not being subjected to 'dramatic changes in their livelihood.'¹⁰² After all the effect of climate change on future generations should remain a significant concern of environmental regimes. At present monitoring, reporting and verification (MRV) occurs on an annual basis however from an environmental, social justice and economic perspective, consistent monitoring throughout the year is crucial to

⁹⁷ Despite it being the first supranational CM, its first two trading periods were doubtful in relation to its efficiency, effectiveness and distribution, potentially as a result of extensive free allowance allocation. Kreiser, L., et al, *Carbon Pricing, Growth and the Environment*, (2012), p.167.

⁹⁸ However, if administrative costs of greater coverage exceed efficiency gains, then focus on the most harmful pollutants relational to global warming should be considered. Ibid., p.172.

⁹⁹ In regards to effectiveness and justice an upstream ETS approach is favoured over downstream approaches. This is due to upstream approaches accounting 'for up to 100 per cent of total emissions, while downstream ETS usually only cover about 50 percent.' Similarly, an upstream ETS fulfils the polluter pays principle to a greater extent which would favour environmental progress, yet economics would favour downstream ETS for competition reasons, as 'they provide a more liquid carbon market.' From an environmental perspective Kreiser et al advocate the necessity of legally binding trading schemes, as they allow for ambitious targets to be met with accuracy because emitters are obliged to engage in climate protection as failure to do so will result in the enforcement of heavy penalties. Ibid p.174.

¹⁰⁰ Ibid.

¹⁰¹ Kreiser, *Carbon Pricing, Growth and the Environment*, p174

¹⁰² Ibid., p.175.

ensure regulations are firmly complied with¹⁰³ Although MRV provides a compliance record, its annual review could allow for breaches to occur within the year that cannot be rectified.

Carbon leakage (CL) is an issue relevant to the efficiency of the scheme and is provided for under Article 10(a) of the Directive It is suggested that the economic crisis and the reduction in carbon price has lowered the risk of CL, however, to avoid domestic ETS being subject to leakage relies on State competitors to implement equally stringent caps on their GHG emissions. Yet, if this is not feasible there are several alternative measures which may prevent leakage, discussion of which can be found below.¹⁰⁴

In summary Kreiser et al, point to the fact that ‘many ecological, economic and justice based recommendations tend to point in the same direction.’¹⁰⁵ It is therefore possible to note that complexities with the creation of sustainable CMs do not arise from contradictory demands but instead are viable if appropriate recommendations are applied and met by State participants: implementation of absolute stringent caps, effective monitoring and enforcement amongst others.¹⁰⁶ They conclude that EU ETS in its current form fails to ‘fully comply with sustainability criteria’¹⁰⁷ principally due to political motives in which there remains a strong consensus in the reluctance of tight abatement caps being enforced.

Others have suggested that the issues faced by the scheme such as fraud and distributional effects could be rectified by ‘rethinking flexibility mechanisms and by adding some control over carbon price.’¹⁰⁸ The trading system has been subject to criticism from both economic and environmental agencies: the former on the grounds of competition; the latter on the basis that it commodifies the environment and is ineffective. Equally, it has been stressed that the success of the system is dependent upon MS participation and the Commission abandoning ‘its ideological opposition to the control of carbon price.’¹⁰⁹ Control over carbon price is opposed by the Commission due to fears that it will lead to CL. To effectively reduce

¹⁰³ Ibid., p179.

¹⁰⁴ One of these, although not favoured, would be the introduction of ‘protective measures such as border tax adjustments...implemented on the domestic level.’ The border tax would aim to raise import prices for products ‘originating from countries with less stringent environmental regulations.’ As a result, it would create a more balanced system for those countries covered by increasingly stringent ETS. Kreiser, *Carbon Pricing, Growth and the Environment*, p.180.

¹⁰⁵ Ibid.

¹⁰⁶ Ibid., pp.180-182.

¹⁰⁷ Ibid., p.182.

¹⁰⁸ Branger, F., et al, ‘The European Union Emissions Trading System: should we throw the flagship out with the bathwater?’, CIREN Working Papers No 48-2013, p.3, <http://www2.centre-cired.fr/IMG/pdf/CIRENWP-201348.pdf>

¹⁰⁹ Ibid

emissions, controlling price is necessary and if accompanied by strict EU-wide penalties the potential for CL should remain minimal.

Although abatement occurred in the first and second phases of the scheme, it was limited in the trial period and cannot be effectively calculated during the second period. The third phase highlights the emphasis placed on flexibility mechanisms in relation to the incorporation of offsets into the system, which was an unnecessary measure and hinders the environmental efficiency of the scheme.¹¹⁰ It makes an attempt to amend the rules on offsets but the complete eradication of foreign offsets would have furthered environmental efficiency and been a more suitable option.¹¹¹

The EU ETS has equally been criticised for its allowance of fraudulent activity including identity thefts by cyber-attacks (phishing) and the reuse of Certified Emission Reductions (CER) which have been noted as the most prominent in compromising the environment. The occurrence of CER, were a result of the EU ETS regulation failures, in which it was possible until 2010 for national installations to be used and then 'resold on the international market.'¹¹² The CER credits emitted by Hungary that subsequently resurfaced in the trading scheme altered 'the environmental integrity of the market'¹¹³ and highlighted the fraudulent reuse of installations. It is possibly the scheme's inefficiency which has promoted such frauds. They had not arisen through advanced techniques, rather, were opportunistic due to an inadequate legal framework.

The Commission's role in the scheme can be evidenced under Article 9 of the Directive. It is responsible for creating guidance on the implementation of criteria listed in Annex III: and notifying the Commission and other MS of allocation plans. Limited case-law highlights the potential ineffective nature of the scheme is partly due to the perception that the Commission's attempt of controlling emission allowances is ultra vires. *Poland v Commission*¹¹⁴ represents the lack of control the Commission maintains in relation to ET and abatement, the court suggested that it is the MS 'who play the central role in the implementation of the trading scheme.'¹¹⁵ It is therefore within their power to decide upon 'the total quantity of allowances to

¹¹⁰ Ibid p.9.

¹¹¹ This apparent ignorance may represent the scheme as upholding a lack of environmental conscious and integrity. Ibid

¹¹² Ibid

¹¹³ Ibid

¹¹⁴ *Poland v Commission* [2007] ECR II 152.

¹¹⁵ Bogojević, S., 'Litigating the NAP: Legal Challenges for the Emissions Trading Scheme of the European Union', (2010) *CCLR* 3 pp.219-227.

be allocated.¹¹⁶ Equally in *Estonia v Commission*,¹¹⁷ the court acknowledged that due to the EU being governed by the rule of law, despite the Commission putting forward the argument that individual national allocation plans (NAPs) are detrimental to global climate policy, the negative implications were not sufficient in the attempt to justify a breach from the MS in question.¹¹⁸ Case law appears to represent another inherent flaw, being if the Commission is unable to maintain control of a specified and consistent level at which allocation allowances are set, then a substantial EU-wide emissions decrease is doubtful.

Overall, the EU ETS perhaps falls short of efficiency targets in relation to economic expansion and environmental protection regulations. Although ETS have reduced emission levels, the impact remains limited due to several factors, however one of the most critical to the scheme is the concept that it is weak by nature, it did not form the necessary foundations to create a strong legally binding agreement from the outset. Abuses of the system coupled with its questionable environmental purpose and purportedly negative implications for competition, implies it would be desirable to absolve and replace it with what is described as 'sweeping public works programmes' that may recognise an 'infrastructure away from fossil fuel dependency in a way that pollution trading taxes are incapable of doing' or, failing that, to adopt pricing alternatives.¹¹⁹ The following discussion will present a more radical alternative mechanism: climate engineering.

4 Climate Engineering

As current instruments have failed substantially to reduce GHG emissions, now may be the appropriate time to consider the intentional modification of the climate through Climate Engineering (CE).¹²⁰ Although radical, CE may be the only option left that has a realistic chance of stabilising the climate. In assessing its potential it is necessary to define proposals and how they would operate in practice, including potential effects and likelihood of implementation.

¹¹⁶ Ibid

¹¹⁷ *Estonia v Commission*, Case T-263/07.

¹¹⁸ Bogojević, 'Litigating the NAP: Legal Challenges for the Emissions Trading Scheme of the European Union', pp.219-227.

¹¹⁹ Lohmann, 'Carbon Trading, a critical conversation on climate change, privatisation and power', p.331.

¹²⁰ Also referred to as Geoengineering

CE is not a new concept: in fact proposals date back to 1877.¹²¹ There are two principal CE methods: first, Carbon Dioxide Removal (CDR)¹²² which is regulated in accordance with the Energy Act 2008¹²³ in which the general licencing requirements do not apply. Under s.30A (1) the Secretary of State is able to 'designate an installation as an eligible CCS installation.'¹²⁴ However, Article 194 of The United Nations Convention on the Law of the Sea (UNCLOS)¹²⁵ places emphasis on the prevention and reduction of pollution, meaning carbon storage methods may be in direct conflict with IEL.¹²⁶ Although the CCS Directive¹²⁷ would suggest otherwise, as it provides for the safe geological storage of CO₂ and intends to mitigate the negative effects and risks associated to the environment and human health under Article 1.¹²⁸ It also provides for corrective measures and risk limitation, further discussion of which can be seen below.¹²⁹ CDR methods are subject to relatively strict regulations and Directives on their proposed use, consequently minimising the potentially hazardous effects.

Secondly, Solar Radiation Management (SRM) which has two direct means to modify the climate. The first is through stratospheric aerosols¹³⁰ and the second is placing reflectors either in space in a stable position between the sun and the earth or in earth's orbit to reduce the level of solar radiation reaching our planet.¹³¹ The first signs of CDR date back to 1977 and the

¹²¹ when Nathaniel Shaler suggested rerouting the Pacific's warm Kuroshio current through the Bering Strait to raise arctic temperatures as much as 30 degrees Fahrenheit Technology Assessment, U.S. Government Accountability Office, et al, 'Climate Engineering: Technical Status, Future Directions, and Potential Responses', GAO (2012), p.4.

¹²² Which creates direct-air capture systems, capturing CO₂ from the atmosphere and consequently storing it 'in deep subsurface geologic formations.' Ibid

¹²³ Energy Act 2008

¹²⁴ Ibid., s.30A (1)

¹²⁵ United Nations Convention on the Law of the Sea 1982 (UNCLOS), Article 194.

¹²⁶ Lee, R., 'Sub-seabed Carbon Sequestration: Building the Legal Platform' (2009) 30 *Liverpool Law Review*, pp. 131-46.

¹²⁷ DIRECTIVE 2009/31/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL of 23 April 2009 on the geological storage of carbon dioxide and amending Council Directive 85/337/EEC, European and Council Directives 2000/60/EC, 2001/80/EC, 2004/35/EC, 2006/12/EC, 2008/1/EC and Regulation (EC) No 1013/2006, OJ L 140/114.

¹²⁸ Ibid., Article 1.

¹²⁹ Corrective measures are provided for under Article 16 for the purposes of carbon leakage risk limitation. The Directive specifically requires storage permits to be authorised and obtained from MS before geological storage is possible under Article 6. The capture element of CDR may be regulated through existing Directives such as the IPPC and the transportation of CO₂ may be provided for under the EIA Directive as the most applicable platform. In relation to monitoring 'the amounts and quality of the carbon sequestered'. The EU ETS may act as an effective instrument. - Council Directive 85/337/EEC of 27 June 1985 on the assessment of the effects of certain public and private projects on the environment, OJ L 175, P. 0040 - 0048

¹³⁰ These would be injected into the stratosphere, cooling earth for short periods. - U.S. Government Accountability Office, et al, 'Climate Engineering: Technical Status, Future Directions, and Potential Responses', GAO (2012), p.33.

¹³¹ Ibid., p.37.

initial signs of SRM date back as early as 1929 both of these are radical measures,¹³² but as Reynolds affirms

the intensity of climate change as a function of greenhouse gas concentrations and its damage to humans and the environment as a function of climate change are not perfectly known.¹³³

Therefore, risks associated with CE and its implementation may be minimal and outweighed by its potential benefits.

CDR methods could potentially capture limitless CO₂ from the atmosphere, however the GAO report suggests 'large scale implementation...is currently neither cost-effective nor thermodynamically efficient.'¹³⁴ Its efficiency is dependent on the energy source used. Currently carbon-based fuels used such as coal, could highlight a counterproductive process as more CO₂ would be released than removed from the environment. Consequently it cannot be viewed as a long-term sustainable energy measure due to its dependence on fossil fuel and limited 'formations suitable for carbon storage.'¹³⁵ Alternatively if SRM technologies were implemented and consequently not sustained it could lead to a rapid rise in temperature causing severe environmental impacts.¹³⁶ For both technologies, it is crucial that efficient policy measures and regulations are sought, preventing deviation from these methods. This report uses Technology Readiness Levels (TRL) to assess whether it is practical to incorporate CE into an existing system.¹³⁷

The GAO report suggests that large scale CE methods could be tested and evaluated through general circulation models (GCM), and further discussion can be seen below.¹³⁸ The idea of CE replacing emission reductions has been environmentally opposed due to governments opting for CE as the 'easier' option in reducing global temperatures, instead of opting for unilateral emission reductions which are politically difficult to secure.¹³⁹ Equally, emissions trading makes an attempt to contain and discourage GHG emissions, whereas CE 'if successful, provides a pressure valve that creates a real danger that business may continue

¹³² Ibid., p.6.

¹³³ Reynolds, J., 'The International Regulation of Climate Engineering: Lessons from Nuclear Power', *Journal of Environmental Law* (2014) 26 (2) 269.

¹³⁴ U.S. Government Accountability Office, 'Climate Engineering', p.21.

¹³⁵ Lee, 'Sub-seabed Carbon Sequestration: Building the Legal Platform', pp.131-46.

¹³⁶ U.S. Government Accountability Office, 'Climate Engineering', p.14.

¹³⁷ Ibid., p.v.

¹³⁸ GCM's would only be beneficial if there was adequate scientific understanding of the method being evaluated. Therefore, research is necessary even if it is only used as an insurance policy. CE could lead to risk limitation to the climate if a quick response was required due to its rapid and significant impact. Ibid p.50.

¹³⁹ Ibid., p.54.

emitting as usual.¹⁴⁰ Creating further opportunities for corruption within the carbon trading market, hindering the concept of environmental justice.

Implementing CE requires public participation and understanding. Currently public understanding is limited. Both the impacts and the benefits need to be communicated effectively, to allow the level of public participation to be measured efficiently.¹⁴¹ The CCS Directive¹⁴² could be subject to criticism as the CO₂ storage relational to it 'counts as not emitted for the purpose of the Emission Trading Scheme.'¹⁴³ As a result, the rules surrounding the purchasing and selling of allowances and the requirements for them to be surrendered do not apply. Consequently, the Directive may indirectly allow for abuses of CDR methods as businesses may apply for storage permits to avoid being subject to the EU ETS. The London Convention¹⁴⁴ rejects the use of CE on the basis of limited scientific certainty. Leal-Arcas, writing in the context of ethical and technical considerations of CE, presents it as a method which could significantly reduce the speed of global warming 'while exploring the commercial potential of low carbon energy alternatives.'¹⁴⁵ This could imply that CE may be a solution to the prevention of environmental degradation whilst the economy continues to grow, leading to a long-term remedy to the economic and environmental divide. Constraints of space preclude further discussion but readers are invited to look at the reference below.¹⁴⁶ CE, according to Leal-Arcas could 'enable us to buy time...help us respond to a climate emergency and, in financial terms, it may be the most feasible option.'¹⁴⁷ However ethical questions are raised, including the uncertain nature of governments; and the potential for nations to take advantage of the progress of CE to avoid mitigation efforts¹⁴⁸. Equally those who advocate the use of CE

¹⁴⁰ Leal-Arcas, R., 'Geoengineering a Future for Humankind: Some Technical and Ethical Considerations', (2012) *CCLR* 2 pp.128-148

¹⁴¹ U.S. Government Accountability Office, 'Climate Engineering', p.61.

¹⁴² DIRECTIVE 2009/31/EC OF THE EUROPEAN PARLIAMENT AND OF THE COUNCIL.

¹⁴³ Jewell, S., and Senior, B., 'CO₂ Storage Liabilities in the North Sea - An Assessment of Risks and Financial Consequences', Summary Report for DECC 2012.

¹⁴⁴ Convention on the Prevention of Marine Pollution by Dumping of Wastes and other Matter, 13 November 1972, 11 I.L.M. 1291.

¹⁴⁵ Leal-Arcas, R., 'Geoengineering a Future for Humankind', pp.128-148

¹⁴⁶ It is submitted that for implementation to be successful, research is critical as CE would be heavily reliant on market mechanisms, capital investment and State actors all of which would expect substantial assurance to invest. Guidance on the governance structure and operation of these methods is crucial, however current legal instruments may be insufficient in incorporating CE, as they do not have the capacity to address it. Although the UNFCCC could be updated to include geoengineering it is unlikely to succeed due to its limitations. Therefore, adding CE into the agreement would only succeed in advancing complications. The UNFCCC is limited in its impacts, meaning it might not prove effective in furthering CE research, thus incorporation into the existing scheme would be incredibly unwise. In the context of the UNFCCC's performance in securing emission reductions, making effective use of CE is far from guaranteed. Leal-Arcas, *Ibid*.

¹⁴⁷ *Ibid*.

¹⁴⁸ CE presents the 'classic' technological solution to ensure the continuation of GHG emissions without seeking reductions and other emission mitigation efforts.

may impact decision-making, creating an unjust balance. The overriding impact of CE could distract from ‘the social and political reasons behind the climate crisis’¹⁴⁹ The impact of both strong support and opposition in its use must be considered as a potential flaw to implementation.¹⁵⁰ Therefore, a global conflict of interests is apparent due to imminent threats to some countries, whilst others would procure substantial benefits.¹⁵¹ The concept that ‘the governance of geoengineering may become monopolized by a handful of actors such as economically stronger States’¹⁵² and private companies, puts the interests of the international community at severe risk. In relation to the commercial use of CE technologies, GATT may apply, and further discussion of this can be seen below.¹⁵³

Leal-Arcas advocates the use of SRM as the most practical and efficient technology. It is accepted as being both cost-effective with a relatively rapid impact on global mean temperature.¹⁵⁴ SRM is advocated by the GAO report due to the ability to assess its effects.¹⁵⁵ Reynolds, writing in the context of a nuclear power (NP) and CE comparison, focuses on SRM as a potential CE technology, asserting it is a low cost but high risk strategy. It is suggested that over the past two centuries the concentration of carbon dioxide has risen by 40%, negatively altering the global climate and ‘harming humans and the environment in the process.’ Thus, although CE may raise questions of informed consent relational to those impacted, consent has not been considered when burning fossil fuels, which has had equally negative global impacts.¹⁵⁶ The link created between NP and CE relates to the significant and similar dangers both present.¹⁵⁷ A more detailed discussion of which can be seen below.¹⁵⁸

¹⁴⁹ Leal-Arcas, ‘Geoengineering a Future for Humankind,’ pp.128-148.

¹⁵⁰ For example, ‘In the case of the U.S. and China, they might, under some circumstances, support geoengineering so as to not have to reduce fossil fuel consumption. On the other hand, a possible threat to rainfall patterns may be of concern to China.’ Ibid.

¹⁵¹ This scenario is analogous to existing legal instruments that face exactly the same issue of State objection and willing incorporation.

¹⁵² Leal-Arcas, ‘Geoengineering a Future for Humankind,’ pp.128-148.

¹⁵³ Using Article XIV (b) in which the protection of human, animal and plant or life and health are provided for. This Article is relevant due to the potential violations that may occur with CE as it could be argued that techniques such as ocean fertilisation is not a violation as it protects as well as violates this particular provision.

¹⁵⁴ If successfully deployed, ‘solar radiation management may potentially lower temperatures by 2 degrees Celsius. Ibid.

¹⁵⁵As they suggest the effects of stratospheric aerosols can be reversed as they only remain in the stratosphere for one year, thus the long-term effects of this particular SRM technology may be less complicated to assess than others - U.S. Government Accountability Office, *Climate Engineering: Technical Status, Future Directions, and Potential Responses*, p.34.

¹⁵⁶This journal article is also a manifestation of the precautionary principle, Reynolds, ‘The International Regulation of Climate Engineering: Lessons from Nuclear Power’, p.269.

¹⁵⁷ Equally the fact that NP is both implemented and regulated on a large-scale implies that CE may be implemented through similar means.

¹⁵⁸ The risks posed by both CE and NP ‘re ultra-hazardous, in that they carry low probabilities of very high damage. Reynolds, ‘The International Regulation of Climate Engineering,’ p.269. Whilst NP has been in existence there have been few directly attributed deaths, however there are concerns over its

The form of which CE would be governed is yet unknown and it could take decades to create a specific convention to domestically and internationally regulate it.¹⁵⁹ CE uncertainties make it controversial and conflict exists with debates on emission reductions and adaptation, and advocates of action to reduce climate risk. The substantial challenges presented by CE require cooperation and engagement of stakeholders, including those currently opposing it, making this one of the most complex international regulatory developments of the era.¹⁶⁰

Long assesses CE from a regional perspective, suggesting that if successful regionally, global implementation is more likely to be effective. Intentional modification of the climate is becoming more likely due to uncertainties surrounding climate change impacts and the tension between current reduction methods and economic growth.¹⁶¹ Long suggests that the governance of CE is difficult due to current methods proposed either being slow and costly in the form of CDR, or fast, cost-effective and flawed, in the form of SRM. Deployment of either technology is the only effective process to test CE's viability.¹⁶² However once deployed definite harms or benefits would be difficult to quantify with certainty. The fundamental point to note is that once deployed 'geoengineering will not return the world to a prior state.'¹⁶³ Despite its uncertainty there may come a time when CE is a plausible solution to remedy the negative effects of climate change and therefore 'its use cannot be precluded.'¹⁶⁴

long term impacts and the waste it generates. Though, it does represent the feasibility of implementing and regulating high risk strategies. CE increases shared global knowledge of potential responses to climate change and costs are restricted to only a few. Although there are differences between CE and NP, such as the risks of NP are known and effects commonly remain regional, whereas CE effects are unknown and could cause impacts on a global scale. However, one of the main benefits of CE is that it would be clearer and more widely distributed. Due to NP being so closely linked to national security, international regulation of this form of energy has been 'soft in form and limited in substance.' Within the EU The Euratom Treaty 1957 governs civil use. Reynolds p.269. Drawing on particular conventions with wide participation but with vague targets, such as the Convention on Nuclear Safety (CONS) 1994.

¹⁵⁹ Such as NP which took decades to be regulated in CONS.

¹⁶⁰ Reynolds, 'The International Regulation of Climate Engineering,' p.269.

¹⁶¹ The governance of CE is more likely to be successful and occur at a regional domestic level and interventions against isolated natural disasters already occur, in the form of building dykes and sea walls, 'seed clouds to force rain out over the ocean versus the land...and conduct controlled burns of fire-prone forests.' As the climate crisis becomes more severe interventions will equally grow in force and significance and may consequently be in the form of regional CE. In application of regional CE methods, if individual countries were to set intervention goals, assess outcomes of interventions and then adapt them accordingly, and equally agree legal terms of enforcement in relation to compliance and damages, this could lead to regional participation, developing a global CE governance. Long, J., 'A Prognosis, and Perhaps a Plan, for Geoengineering Governance', (2013) *CCLR* 3 pp.177-186.

¹⁶² However, in doing so creates significant uncertainty of long-term risk to human life and the environment.

¹⁶³ Long, 'A Prognosis, and Perhaps a Plan,' pp.177-186. This perception of CE is in contrast to the GAO report that does suggest effects can be reversed in the form SRM.

¹⁶⁴ Ibid

Global CE requires the formation of a new regulatory body that can enforce and monitor its impacts. The UN Security Council may 'have the only plausible legal authority to deploy geoengineering'¹⁶⁵ despite its issues. It may do this through the monitoring of rogue actors deploying CE and during the process form a commission to 'recommend or make proactive decisions.'¹⁶⁶ For CE to be successful, Long suggests two key actions for implementation, which are discussed in detail below.¹⁶⁷ CE governance may emerge if small-scale national interventions are proved to be successful with participation and engagement, consequently global CE may engage more support, making it a long-term option.

It is noted by Michaelson that CE is highly favourable from an economic perspective as it 'lets the free market be free, uses technology rather than a restraint on behaviour, and avoids government regulation.'¹⁶⁸ For these reasons it is possible to identify why it is opposed by environmentalists. However, to ignore the potential success of CE in sustaining the climate is stated to be an issue of pride, due to current mechanisms failing to gain stakeholder participation.¹⁶⁹ Replacement of emission reductions with CE may be reasonable due to the current target being unrealistic of 'all power plants to have zero CO₂ emissions'¹⁷⁰ to meet the target of 450 ppm by 2030. An unachievable proposal in regard to economic growth which could negatively impact the developing world. CE is a feasible option with the highest success rate of any climate strategy to date due to it being 'the lowest-cost option that appeals to the widest range of political actors'¹⁷¹ and equally because those who have being historically against climate change mitigation have embraced the concept of CE.

Lin argues that 'the need for geoengineering governance, whether formal or informal is growing, but has yet to achieve critical mass.'¹⁷² Lin proposes the UNFCCC and the Convention on the Prohibition of Military or Any Other Hostile Use of Environmental

¹⁶⁵ Ibid., pp 177-186.

¹⁶⁶ Ibid.

¹⁶⁷ Firstly, the use of regional frameworks for collaboration. Collaboration could be facilitated by organisations such as the Red Cross or the UN. The United Nations Environment Programme (UNEP) 1972 may be another platform which could enhance collaboration of CE due to its history, meaning it could 'play an important role in facilitating international collaboration on interventions designed to counter climate impacts.' Secondly there is a need for researchers to develop potential interventions focused on relief from extreme events as a result of climate change. National research programmes funding local interventions to effectively deal with crisis as a result of climate change could be efficient. Long, 'A Prognosis, and Perhaps a Plan', (2013) pp.177-186.

¹⁶⁸ Burns, W., et al, *Climate Change Geoengineering – Philosophical Perspectives, Legal Issues, and Governance Frameworks*, (2015), p.84.

¹⁶⁹ Nevertheless, to neglect its potential benefits because it favours economics would be dangerous to the future global climate and should not be a factor in preventing its adoption.

¹⁷⁰ Burns, *Climate Change Geoengineering*, p.90.

¹⁷¹ Ibid., p.107.

¹⁷² Ibid., p.182.

Modification Techniques (ENMOD)¹⁷³ could extend to CE methods. However both SRM and CDR conflict with the UNFCCC as ‘they constitute dangerous anthropogenic interference with the climate system.’¹⁷⁴ Although, the precautionary principle found in Article 3.3 of the UNFCCC may be applicable and in support of CE methods.¹⁷⁵ Therefore if the uncertainties of climate change outweigh the uncertainty of CE, these methods may be deployed to mitigate the negative effects. For a more detailed discussion of applicable conventions see below.¹⁷⁶ A potentially strong argument in favour of the development of global CE through further scientific research is visible. Lack of scientific certainty accompanied by clear opposition might be an issue now, but it should be a consideration for the future. Despite fears surrounding climate intervention, it appears that it could be the most successful scheme to date, perhaps due to overriding political and industry cooperation. For it to be a success there must be a shift in current legal discourse: it requires serious consideration due to its substantial impact on climate stabilisation, and discussion around whether it favours economics over the environment is unhelpful. If it is able to sustain the climate, whilst not affecting economic growth it may be the only solution that will achieve global adoption. Equally it is possible that the environment is already ‘geoengineered beyond recognition’¹⁷⁷ consequently, making CE look comparatively insignificant. Perhaps CE could be a milestone in IEL, as it has the potential to bridge the divide between economics and the environment.

Conclusion

A detailed analysis of IEL and EU law relational to climate change has been provided. Consequently, a divide between economic growth and environmental protection has been established through extensive discussion of, the UNFCCC, REDD+ and the EU ETS.

¹⁷³ Convention on the Prohibition of Military or Any Other Hostile Use of Environmental Modification Techniques (ENMOD), 1977.

¹⁷⁴ Burns, *Climate Change Geoengineering*, p.183.

¹⁷⁵ As it states that the ‘lack of full scientific certainty should not be used as a reason for postponing measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects.’ *Ibid.*, p.184.

¹⁷⁶ ENMOD is an additional Convention that may apply to CE as it covers environmental modifications that have global and long-lasting effects. Due to its broad definition it may ‘encompass virtually any geoengineering techniques that might be developed.’ However, the main difficulty in using this treaty for the purposes of CE is the emphasis placed on military or hostile uses of modification of the environment, meaning alternative purposes are outside its remit. Although a number of multilateral agreements may be applicable to CE, none provide a specific ‘or direct response to the challenges raised.’ Therefore international law and general principles will play a predominant role in the governance of CE. It is stated that international governance of CE could occur through ‘existing treaties, new treaty instruments, or ad hoc responses to individual geoengineering proposals or projects.’ Although a governance structure would be favoured over ad hoc responses, the number of options represent that there are realistic and workable solutions provided to governing CE globally. Burns, *Climate Change Geoengineering*, pp.183-199.

¹⁷⁷ *Ibid.*, p.111. Over a relatively short span of time ‘most of the fossil fuel that took 300 million years of biological accumulation to make’ has been burned.

Arguably, current mechanisms have not accrued sufficient support to have a significant impact on the reduction of GHG emissions, alongside abuses which have tainted their potential positive impact. Three central influences that have remained consistent throughout this paper are; political disengagement, industry objection, and the high cost implications coupled with limited benefit for developing countries. Therefore, complete adoption and incorporation of these mechanisms globally has failed: for example the North/South divide was highlighted as one of the fundamental failures of REDD+ in its incorporation and non-compliance.

Although an imbalance between the environmental and economic aspects of climate change regulation has been established, environmental law domestically and internationally has limited influence due to excessive flexibility and discretion¹⁷⁸ and therefore it should not be assumed that climate regulation ultimately favours economic growth. This would oversimplify a far more complex situation. It would instead be more accurate to suggest that the relevant law is currently restricted in its scope of legal enforcement and punishment for non-compliance tends to be vague as evidenced in the EU Directives applicable to the EU ETS. It is therefore possible to identify that economic growth has continued to impact negatively on the climate by States using mechanisms such as REDD+ and the EU ETS to their advantage, manipulating their proposed intentions to suit personal needs. It has been considered that to rectify the law's limited influence, it is important to improve integration of both industry and governments into environmental decision making. This would be one way to ensure future mechanisms are implemented successfully due to wider support being sought and incorporated from those whom have historically been the central opposition to the adoption of environmental instruments.

Equally the environmental integrity of REDD, the EU ETS and the UNFCCC has been questionable and heavily criticised. Therefore, CE was explored as a potential option to significantly impact climate change through human intervention methods. CE appears to be the most suitable option for the future, despite the dangers associated, it is clear through academic debate that it could lead to a global stabilisation of the climate, as long as necessary research is undertaken to remove current scientific uncertainty. Equally sweeping industry and political cooperation suggests it could be the most successful instrument to date. Similarly, its positive impact on the economy and the climate indicates that genuine global adoption could be acquired and the global temperature reduction of 2 degrees Celsius could be met and potentially exceeded. It would be suitable to propose that future mechanisms, including CE, should be implemented regionally first before global implementation. This would allow

¹⁷⁸ Bell, S., et al, *Environmental Law*, (2013), pp.56-57.

individual governments to test the efficiency of instruments on a small scale and assess levels of support as well as their impacts before international deployment. It would equally allow for improvements and changes to be made if necessary to avoid abuses and non-compliance occurring on a larger scale.

The future impacts of climate change remain unknown to a degree, however the implementation of sufficient and effective legal instruments to tackle the crisis is crucial. The success of future mechanisms remains dependant on universal participation when implemented, which in turn becomes dependent on the integration of environment and business sectors. It is important for IEL and EU law to strengthen future mechanisms through clarity in Directives and instruments such as sufficient punishments for non-compliance and avoidance. This would ensure a fairer balance is struck between the economy and environment.