

Université de Montréal

Technology Development and Transfer in the Wake of the Paris Agreement: International Law
for Innovation in a Polycentric Climate Governance System

By
Charles Codère

Faculty of Law

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Summary and keywords

Since the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992, States Parties to the international climate regime, in parallel to their emissions reductions objectives, have committed to take action to promote and cooperate in the development and transfer of technologies that control, reduce or prevent anthropogenic emissions of greenhouse gases. The Paris Agreement, which entered into force on November 4th, 2016, reaffirms this commitment. The specific manner through which States Parties to the Paris Agreement are to translate these commitments into action is however still being implemented. Indeed, significant developments in the governance structure for climate technology development and transfer (TD&T) are being implemented in order to further improve its functioning as part of the Paris Agreement's bottom-up approach. An up-to-date understanding of these legal and policy tools is necessary to enable the different actors in the TD&T process, notably those from the private sector, to participate in this cooperative action to their full potential.

In this context, the thesis addresses the following two main research questions. First, in the wake of the Paris Agreement, to what extent can TD&T contribute to the overall objective of the UNFCCC regime? Second, what are the legal issues surrounding the effective implementation of climate TD&T? By analyzing the legal issues linked to the implementation of TD&T in the evolving international climate governance landscape, the main objective of the research project is to determine to what extent improved understanding of UNFCCC law could contribute to effective implementation of climate TD&T. The research project posits that effective TD&T is an essential component to the achievement Paris Agreement's overall mitigation goal. Its importance resides in its ability to contribute to developing country States Parties' sustainable socioeconomic

development, as well as to encourage greater participation of non-state actors, such as those from the private sector.

In order to answer its two research questions, the thesis first articulates its conceptualization of the Paris Agreement structure and of the role of law within it. It then focuses on TD&T to illustrate some issues at play within what it argues is an emergent polycentric governance system. It first does so by focusing on TD&T within the UNFCCC regime, before looking outwards to its interaction with other international legal and governance regimes. The analysis carried out in the thesis leads it to conclude that the normative basis for an improved contribution of TD&T to the UNFCCC's overall objective is present in the Paris Agreement. Several questions however remain regarding the successful implementation of this normative basis.

Keywords : International environmental law; climate change; technology development and transfer; innovation; polycentric governance; UNFCCC; Paris Agreement.

Résumé et mots clés

Depuis l'adoption de la Convention-cadre des Nations Unies sur les changements climatiques (CCNUCC) en 1992, les États membres au régime climatique international, parallèlement à leurs objectifs de réduction des émissions, se sont engagés à prendre des mesures pour promouvoir et coopérer au développement et au transfert de technologies qui contrôlent, réduisent ou préviennent les émissions anthropiques de gaz à effet de serre. L'Accord de Paris, entré en vigueur le 4 novembre 2016, réaffirme cet engagement. La manière précise à travers laquelle les États membres de l'Accord de Paris mettront ces engagements en pratique reste cependant toujours à déterminer. En effet, des développements importants dans la structure de gouvernance pour le développement et le transfert de technologies climatiques (TD&T) sont attendus afin de coordonner leur mise en œuvre conformément à l'approche décentralisée de l'Accord de Paris. Une compréhension à jour de ces mécanismes juridiques et politiques est nécessaire afin de maximiser la participation des différents acteurs du processus de TD&T, notamment ceux du secteur privé.

Dans ce contexte, la thèse aborde les deux principales questions de recherche suivantes. Premièrement, dans le sillage de l'Accord de Paris, dans quelle mesure le TD&T peut-il contribuer à l'objectif global du régime de la CCNUCC ? Deuxièmement, quelles sont les questions juridiques entourant la mise en œuvre efficace du TD&T climatique ? En analysant les questions juridiques liées à la mise en œuvre du TD&T dans le contexte d'une gouvernance internationale du climat en évolution, l'objectif principal de la thèse est de déterminer dans quelle mesure une meilleure compréhension des normes de la CCNUCC pourrait contribuer à une mise en œuvre efficace du TD&T climatique. La thèse postule qu'un TD&T efficace est un élément essentiel à la réalisation de l'objectif global d'atténuation de l'Accord de Paris. L'importance du TD&T réside dans sa

capacité à contribuer au développement socioéconomique durable des États membres en développement, ainsi qu'à encourager une plus grande participation des acteurs non étatiques tels que ceux du secteur privé.

Afin de répondre à ses deux questions de recherche, la thèse articule d'abord sa conceptualisation de la structure de l'Accord de Paris et du rôle du droit dans cette structure. Elle aborde ensuite plus précisément le cas du TD&T pour illustrer certains problèmes en jeu au cœur de ce qu'elle soutient être un système de gouvernance polycentrique en émergence. Elle se concentre initialement sur le TD&T dans le régime de la CCNUCC, avant d'ouvrir son champ d'analyse et d'aborder l'interaction du CCNUCC avec d'autres régimes juridiques et de gouvernance internationaux. L'analyse menée à travers la thèse l'amène à conclure que la base normative pour une meilleure contribution du TD&T à l'objectif global de la CCNUCC est présente dans l'Accord de Paris. Plusieurs questions demeurent cependant quant à savoir si cette base normative pourra être mise en œuvre à son plein potentiel.

Mots clés : Droit international de l'environnement; changements climatiques; transfert de technologie; innovation; gouvernance polycentrique; CCNUCC; Accord de Paris.

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List of abbreviations

AGBM	Ad Hoc Group on the Berlin Mandate
APEC	Asia-Pacific Economic Cooperation
AWG	Ad hoc working group
AWG-LCA	Ad hoc working group on Long-Term Cooperative Action under the Convention
BASIC Group	China, South Africa, India and Brazil group
BBNJ	Biological diversity beyond national jurisdiction
CBD	Convention on Biological Diversity
CBDRRC	Common but differentiated responsibilities and respective capabilities
CDM	Clean Development Mechanism
CDR	Carbon dioxide removal
CER	Certified Emissions Reduction
CHM	Clearing-house mechanism
CMA	Conference of the Parties serving as the meeting of the Parties to the Paris Agreement
CMP	Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol
COP	Conference of the Parties
CP	Commitment Period
CPA	Component project activity
CPR	Common pool resource
CPTPP	Comprehensive and Progressive Trans-Pacific Partnership
CRIB	Climate relevant innovation-system builder
CSP	Consortium of Scientific Partners on Biodiversity
CSR	Corporate Social Responsibility

CTCN	Climate Technology Center and Network
DNA	Designated national authority
DOE	Designated operational entity
EB	Executive Board
ECOSOC	United Nations Economic and Social Council
EGA	Environmental Goods Agreement
EGTT	Expert Group on Technology Transfer
ETS	Emissions trading scheme
GATT	General Agreement on Tariffs and Trade
GDP	Gross domestic product
GEF	Global Environmental Facility
HLPF	High-Level Political Forum
IATT	Inter-agency task team
ICJ	International Court of Justice
IEA	International Energy Agency
IMO	International Maritime Organization
INC	Intergovernmental Negotiating Committee
IOC	Intergovernmental Oceanographic Commission
IP	Intellectual property
IPCC	Intergovernmental Panel on Climate Change
IPR	Intellectual property right
IRENA	International Renewable Energy Agency
ISA	International Solar Alliance

ITMO	Internationally transferred mitigation outcome
JCM	Joint Crediting Mechanism
JI	Joint Implementation
LCIPP	Local Communities and Indigenous Peoples Platform
LDC	Least developed country
MDGs	Millenium Development Goals
MEA	Multilateral environmental agreement
MLF	Multilateral Fund
MRV	Measurement, review and verification
NAZCA	Non-state Actor Zone for Climate Action
NDC	Nationally Determined Contribution
NDE	Nationally Designed Entities
NGO	Non-governmental organization
NMA	Non-market approach
NSDS	National Sustainable Development Strategy
NSI	National System for Innovation
ODS	Ozone-depleting substances
OECD	Organization for Economic Co-operation and Development
OPEC	Organization for Petroleum Exporting Countries
PDD	Project design document
PoA	Programme of activities
PoA-DD	Programme of activities design document
QELRC	Quantified emission limitation and reduction commitment

RD&D	Research, development and demonstration
REEEP	Renewable Energy and Energy Efficiency Partnership
SBI	Subsidiary Body for Implementation
SBSTA	Subsidiary Body for Scientific and Technological Advice
SDGs	Sustainable Development Goals
SRM	Solar radiation management
STI	Science, technology and innovation
STIM	Science, Technology and Innovation Supporting and Enabling Mechanism
TAP	Technology Action Plan
TD&T	Technology development and transfer
TEAP	Technology and Economic Assessment Panel
TEC	Technology Executive Committee
TF	Technology Framework
TFM	Technology Facilitation Mechanism
TM	Technology Mechanism
TNA	Technology needs assessment
TOC	Technical options committee
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
TTF	Technology Transfer Framework
UNCLOS	United Nations Convention on the Law of the Sea
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNESCO	United Nations Educational, Scientific and Cultural Organization

UNFCCC	United Nations Framework Convention on Climate Change
UNGA	United Nations General Assembly
UNIDO	United Nations Industrial Development Organization
USMCA	United States-Mexico-Canada Agreement
VCLT	Vienna Convention on the Law of Treaties
VNR	Voluntary National Review
WCI	Western Climate Initiative
WIPO	World Intellectual Property Organization
WMO	World Meteorological Organization
WTO	World Trade Organization

Dedication

I would like to dedicate this thesis to my partner Mary. Thank you for your love, your encouragement and your calming presence through all the ups and downs that came along working on this PhD. I love you!

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1. Introduction

1.1 Background

Since the adoption of the United Nations Framework Convention on Climate Change (UNFCCC) in 1992 States Parties to the international climate regime, in parallel to their emissions reductions objectives, have committed to take action to “promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases”.¹ The Paris Agreement, which entered into force on November 4th, 2016, reaffirms this commitment. Article 10 of the Agreement indeed states that the Parties “share a long term vision on the importance of fully realizing technology development and transfer in order to improve resilience to climate change and to reduce greenhouse gas emissions”² and as such commit to “strengthen cooperative action on technology development and transfer”.³

The specific manner through which States Parties to the Paris Agreement are to translate these commitments into action is however still being determined. Indeed, significant developments in the governance structure for climate technology development and transfer (TD&T) are being implemented in order in order to further improve its functioning as part of the Paris Agreement’s bottom-up approach. An up-to-date understanding of these legal and policy tools is necessary to enable the different actors in the TD&T process, notably those from the private sector, to participate in this cooperative action to their full potential.

¹ *United Nations Framework Convention on Climate Change*, 9 May 1992, 1771 UNTS 107 at art. 4 (1)c) [UNFCCC].

² *The Paris Agreement*, 12 December 2015, UN Doc FCCC/CP/2015/L.9/Rev.1 at art. 10(1) [*Paris Agreement*].

³ *Ibid* at art. 10(2).

The greenhouse gas-emitting technologies part of our everyday lives, such as motorized transportation and energy-consuming electronics, are major contributors to the climate crisis that humanity now faces. In this context, the replacement of these technologies by less damaging alternatives is necessary. For these alternatives to replace current technologies on a global scale, TD&T from developed to developing countries must be maximized. Indeed, only with the contribution of TD&T can developing countries, whose first priority remains improving the quality of life of their current population through socioeconomic development, be expected to contribute to greenhouse gas reduction actions. International mechanisms for TD&T, if enacted to their full potential, can contribute to sustainable development by helping emerging technologies to establish themselves on the market through improved diffusion.

TD&T is not just a complementary component of climate action alongside mitigation and adaptation, but rather an integral prerequisite for both of them. An example of the importance of climate technologies is the fact that the Intergovernmental Panel on Climate Change (IPCC), in its different modeling scenarios, assumes, at varying levels, increased renewable energy use in replacement to fossil fuels.⁴ Accelerated diffusion of climate technologies is understood as an integral part of mitigation action, yet little progress has been made in implementing climate TD&T in the UNFCCC regime prior to the Paris Agreement.

⁴ Intergovernmental Panel on Climate Change, [Core Writing Team, Rajendra K. Pachauri & Leo A. Meyer, eds] *Climate Change 2014: Synthesis Report Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change* (Geneva: IPCC, 2015) at 20 [IPCC, *Climate Change 2014*].

The modalities under which UNFCCC States Parties are to achieve their commitments for TD&T are indeed still unclear. The lack of defined guidelines for implementation has led States Parties to treat TD&T as obligations of conduct rather than obligations of result: this has remained true in the wake of the adoption of the Paris Agreement.⁵ The Agreement as a whole has been criticized for its less traditionally legally binding nature when compared to its predecessor, the Kyoto Protocol.⁶ The thesis however argues that rather than being a flaw, the bottom-up approach preconized through the Paris Agreement is precisely what creates an opportunity for improved TD&T coordination. Its structure allows the flexibility needed for improved participation by non-state actors such as private sector developers and providers of climate technology, while also opening the door to more thorough measurement, review and verification (MRV) of TD&T commitments.

From its adoption until today, a number of political changes have affected the implementation of the Paris Agreement. The adoption of the Agreement itself in 2015 was celebrated as an unexpected breakthrough. Less than a year later however, the election of Donald Trump as president of the United States, one of the world's biggest per-capita emitters of greenhouse gases, cast doubt on the Agreement's future. The following years were marked by slow progress on the adoption of the implementation rules by the Conference of the Parties (COP), a possible consequence of the United States' decision to withdraw from the Agreement. Fortunately, other actors stepped up at the national level to fill the governance gap left by the United States federal

⁵ See Lavanya Rajamani, "The 2015 Paris Agreement: Interplay Between Hard, Soft and Non-Obligations" (2016) 28:2 *J Envtl L* 337 at 353.

⁶ See e.g. Raymond Cléménçon, "The Two Sides of the Paris Climate Agreement: Dismal Failure or Historic Breakthrough?" (2016) 25:1 *Journal of Environment & Development* 3 at 9.

government.⁷ The latest political developments have been positive, with newly-elected American president Joe Biden announcing the reintegration of the United States into the Paris Agreement as well as calling for a US-led climate summit in April 2021 to increase the ambition level of States Parties. These developments contribute to the positive momentum felt at the eve of COP26 in Glasgow, where key implementation rules must still be agreed upon.

In parallel to these global political ups and downs, the COVID-19 pandemic has affected the world on many levels since 2020, including in relation to climate change. The lower level of economic activity resulting from the pandemic led to lower greenhouse gas emissions in 2020 than in 2019, but experts predict that the pandemic's direct effect on emissions trends is likely to be negligible.⁸ The UN has called for increased climate action from States Parties as part of their recovery measures from the pandemic, but it remains to be seen if the international community will follow on this call. The pandemic has highlighted how effective private sector innovation can be at solving a global problem if given the proper resources and guidance by states and international organizations: the rapid development and deployment of the various COVID-19 vaccines is a telling example of this. It has however also highlighted that stronger leadership by states is required to ensure that the benefits of innovation are shared in a globally equitable manner. Effective and fair coordination for technology diffusion is a crucial part of the solution to global problems, be it the climate crisis or the COVID-19 pandemic. It is in this context that the thesis investigates the legal issues surrounding climate TD&T.

⁷ See Sam Ricketts et al, "States Are Laying a Roadmap for Climate Leadership" (2020), online: Center for American Progress <<https://www.americanprogress.org/issues/green/reports/2020/04/30/484163/states-laying-roadmap-climate-leadership/>>.

⁸ John M. Reilly, Y.-H. Henry Chen & Henry D. Jacoby, "The COVID-19 Effect on the Paris Agreement" (2021) 8:16 Humanities & Social Sciences Communications, online: Nature <<https://www.nature.com/articles/s41599-020-00698-2>> at 3.

1.2 Research question and theoretical approach

The thesis addresses the following two main questions. First, in the wake of the Paris Agreement, to what extent can TD&T contribute to the overall objective of the UNFCCC regime? Second, what are the legal issues surrounding the effective implementation of climate TD&T? By analyzing the legal issues linked to the implementation of TD&T in the evolving international climate governance landscape, the main objective of the research project is to determine to what extent improved understanding of the role of law could enable the UNFCCC regime to implement TD&T in a way that addresses the "urgent and immediate needs of those developing country Parties that are particularly vulnerable to the adverse effects of climate change".⁹ It posits that effective TD&T implementation plays a key role in enabling these States Parties' sustainable socioeconomic development, notably by encouraging the effective participation of non-state actors such as those from the private sector.

The two research questions formulated above will be addressed through the lens of the theoretical perspective elaborated upon in the first part of thesis. As its main theoretical foundation, the perspective relies on law and economics as applied to international environmental law. The law and economics theory conceptualizes the climate as a global public good, whose benefits are to be allocated in a way that maximizes the welfare of both current and future generations of humankind. Building on this theoretical foundation, the thesis posits that the main objective of a global environmental treaty regime such as the UNFCCC is to foster cooperation among State and non-state actors, which operate at various levels within in a governance system which can be

⁹ *Paris Agreement*, *supra* note 2 at art. 7(2).

understood as polycentric.¹⁰ The successful implementation of Paris Agreement norms and institutions for TD&T is crucial to coordinate the efforts of the various actors operating in this system. Only by doing so will they be able to jointly maximize innovation and diffusion of climate-friendly technologies in a manner that fulfills the climate treaties' objectives, while also enabling developing to countries to achieve socioeconomic progress in line with the concept of sustainable development. In analyzing norms and mechanisms for climate TD&T, the thesis engages with both "hard" and "soft" law as well as other non-legal governance mechanisms. By doing so, it follows the approach set forth in the Paris Agreement, which relies on these three types of provisions interchangeably.¹¹ As Brunée notes, "international environmental law is a relatively pragmatic discipline, focused on problem-solving, including through alternative standard-setting modes and compliance mechanisms. Seen from this vantage point, whether a given approach is 'law' in the traditional sense may be secondary."¹²

Climate TD&T was chosen as the focus of the thesis' research for several reasons. The first is that its governance, by nature, has always had a decentralized component, involving technology developers in the private sector in addition to UNFCCC institutions and States Parties. As such, TD&T stands out as having the potential to play a more important role in the wake of the Paris Agreement, a treaty which, this thesis argues, better reflects the polycentric character of climate governance than its predecessors. The head scientific body of the UNFCCC, the IPCC, has

¹⁰ See Vincent Ostrom, Charles M. Tiebout & Robert Warren, "The Organization of Government in Metropolitan Areas: A Theoretical Inquiry" (1961) 55 *The American Political Science Review* 831 at 831.

¹¹ Daniel Bodansky, Jutta Brunnée & Lavanya Rajamani, *International Climate Change Law* (Oxford: Oxford University Press, 2017) at 213-214 [Bodansky, Brunnée & Rajamani, *International Climate Change Law*].

¹² Jutta Brunnée, "Sources of International Environmental Law: Interactional Law" in Samantha Besson & Jean d'Aspremont, eds, *The Oxford Handbook of the Sources of International Law* (Oxford: Oxford University Press, 2017) 960 at 961.

underlined the importance of TD&T by dedicating a special report to it in 2000.¹³ TD&T has however long remained a marginal topic in policy circles, though its importance rose when negotiations towards what would become the Paris Agreement were launched in 2007.¹⁴ Since then, a number of new initiatives for it have been enacted, the most recent of which is the Paris Agreement Technology Framework (TF).¹⁵ Further implementation for TD&T is however still required in the wake of the Paris Agreement. One factor explaining the arduous implementation of TD&T norms is the complexity of the climate technology challenge: as Grubb notes, the wide array of technologies relying on fossil fuel combustion, as well as the even broader scope of technologies and processes emitting greenhouse gases in fields like agriculture, land use and direct industrial processes, require an equally broad array of technological solutions.¹⁶

Climate TD&T was also chosen as a topic because it appeared as a ripe topic for thesis-level research. Indeed, while there is no shortage of legal literature on the Paris Agreement, a review of this literature revealed that not much recent in-depth research appears to have been done on TD&T in the UNFCCC regime. Only one thesis-level legal analysis on the topic was found, which predates the Paris Agreement.¹⁷ Moreover, much of the Paris Agreement's legally binding procedural obligations were agreed upon in 2018 as part of the Katowice climate package: a review of the literature revealed that even in articles published after 2018, these most recent legal

¹³ Bert Metz et al, eds, *Methodological and Technological Issues in Technology Transfer: A Special Report of IPCC Working Group III* (Cambridge: Cambridge University Press, 2007).

¹⁴ Anne-Marie Verbeken, "Low-Carbon Technology Transfer Under the Climate Change Convention" in David G. Ockwell & Alexandra Mallett, eds, *Low-Carbon Technology Transfer: From Rhetoric to Reality* (London: Routledge, 2012) 143 at 143.

¹⁵ *Paris Agreement*, *supra* note 2 at art. 10(4).

¹⁶ Michael Grubb, "Technology Innovation and Climate Change Policy: An Overview of Issues and Options" (2004) 41:2 *Keio Economic Studies* 103 at 104 [Grubb, "Technology Innovation"].

¹⁷ Dalindyabo Shabalala, *Climate change, technology transfer and intellectual property: options for action at the UNFCCC*, (Maastricht: Maastricht University Press, 2014).

developments were only briefly addressed.¹⁸ For these reasons, an up-to-date, comprehensive analysis of the topic appears valuable.

The theoretical perspective of the thesis leads it to adopt an optimistic view of UNFCCC treaty law's ability to provide solutions to the climate crisis. It acknowledges the skepticism formulated in the law and social sciences literature towards the capacity of international environmental law generally, and the Paris Agreement specifically, to address global environmental crises.¹⁹ It concedes that the static and slowly evolving nature of international law often makes it ill-equipped to regulate global environmental problems. Rapidly evolving scientific knowledge forces law to play catch-up, while short-sighted political calculations by States make cooperation difficult to foster. This mismatch does not make international climate law useless, however. While international climate law does not have the normative power to constrain sovereign States into acting to preserve the globally shared climate resource, it can nonetheless play an important role in coordinating solutions to this global problem through consolidating progress and building strong, stable consensus. The thesis argues that in the face of the titanic challenge that is climate change, environmental law has and continues to play an important structuring role. It is true that limited progress has been achieved on actual mitigation of greenhouse gas emissions, the overarching goal of the climate regime, since the 1992 UNFCCC. We must however keep in mind that international climate change law has had the tall order of providing solutions to a global environmental problem on a scale never before seen. As elaborated upon in the first half of the thesis, this has been difficult: the UNFCCC regime's main objective is still ways away from being

¹⁸ See e.g. Monirul Azam, "A journey from Rio to Paris via Kyoto to facilitate technology transfer to the LDCs under the UNFCCC" (2020) 13:1 *Journal of Property, Planning and Environmental Law* 60 at 67.

¹⁹ See e.g. Louis J. Kotzé & Rakhyun E. Kim, "Exploring the Analytical, Normative and Transformative Dimensions of Earth System Law" (2020) 50:6 *Env Pol'y & L* 457.

fulfilled. Climate treaty law has nonetheless delivered significant progress in fostering cooperation among States Parties to address climate change. One of its unheralded successes has been to lead to a better scientific understanding of the problem, which is the fundamental first step towards successfully solving it through regulation.

Some scientists suspect that the unparalleled current human impact on the environment might be leading the Earth towards a new geological era, the Anthropocene, in which scientific assumptions based on past conditions cannot be relied upon to hold. This has led some legal scholars to evaluate the paradigm-shifting effect this change of geological era could have on international law.²⁰ Even in the face of a fundamental change such as the Anthropocene, casting aside the imperfect climate legal system developed over the last three decades to rebuild for this new paradigm, as some suggest,²¹ cannot be the solution when facing a problem as pressing as climate change. Rather, efforts should be deployed towards incrementally improving existing legal frameworks in a way to maximize law's strengths, such as legitimacy and stability, while improving on its weaknesses. The Paris Agreement, understood through the thesis' perspective, has the potential to improve on past climate treaties. Indeed, by combining flexible, nationally determined mitigation, adaptation and cooperation commitments with thorough, binding MRV obligations, it represents an attempt to strike a balance between flexibility and accountability.

The thesis' analysis of climate TD&T draws a detailed picture of the situation as it stands and suggests some possibilities for improved implementation within the UNFCCC regime. TD&T has

²⁰ See e.g. Davor Vidas et al, "International law for the Anthropocene? Shifting perspectives in regulation of the oceans, environment and genetic resources" (2015) 9 *Anthropocene* 1.

²¹ Kotzé & Kim, *supra* note 19 at 464.

however also been an important component of other international environmental treaty regimes. It has for example been central to the success of the international treaties for the protection of the ozone layer, while conversely having been a point of contention in the regime on biological diversity. The analysis of TD&T in other international legal regimes, with the objective of identifying potential synergies or normative conflicts, thus constitutes another interesting path for research. Indeed, improved understanding of this inter-regime interplay could be beneficial to the implementation of climate TD&T.

Many of the solutions presented as a result of the thesis' research are incremental: the objective of this is to identify useful insights that could be drawn upon by policymakers. The thesis' analysis also leaves several questions surrounding possible upcoming developments unanswered. This is unavoidable given that the implementation of the Paris Agreement, delayed by the COVID-19 pandemic, is still ongoing, with high hopes for progress at COP26. In this context, the thesis attempts to lay a solid foundation for further research as implementation progresses.

1.3 Outline and structure of the thesis

The thesis is organized into two parts. In the first part, which is divided in three chapters, the normative and theoretical foundation of the thesis are laid out. Chapter one outlines the evolution of international climate change law from its inception to the adoption of the Paris Agreement. It reviews the UNFCCC regime's agreements, institutions, norms and principles, shedding some light on the context of their adoption. Chapter two outlines the thesis' theoretical perspective. This perspective relies on the economic analysis of law as a starting point and further builds on this general foundation by integrating elements from three related theories, namely the new Chicago

school theory, the polycentric governance theory and the innovation and law theory. The chapter summarizes of these theories, explaining their relationship to each other and justifying their relevance to the topic at hand. Chapter three then applies the theoretical perspective elaborated to international climate law. In doing so, it highlights some of the climate regime's successes so far as well as some remaining obstacles, from the 1992 UNFCCC to the Paris Agreement. The application of the theoretical perspective to UNFCCC law is used as a starting point for further analysis of climate TD&T in the wake of the Paris Agreement.

Building on this theoretical foundation, the second part of the thesis then focuses on the legal issues for climate TD&T as they stand following the adoption of the Paris Agreement. The section is divided into two chapters. Chapter four presents a thorough analysis of TD&T provisions within the international climate regime, assessing past and current initiatives. It also discusses possibilities for improved climate TD&T through the implementation of new norms and mechanisms under the Paris Agreement. Chapter five ventures outside of the UNFCCC regime: it analyzes TD&T norms in other international treaties, identifying synergies between them and the Paris Agreement as well as assessing potential conflicts between UNFCCC norms and other international legal regimes. A summary of the insights gathered and an exploration of some paths for further research conclude the thesis.

2. The UNFCCC Climate Change Law Regime from 1992 to 2015: An Overview

This chapter will draw an outline of the UNFCCC regime and of its three main instruments, the 1992 UNFCCC, the Kyoto Protocol and the Paris Agreement. In doing so, it will both summarize the instruments' content as well as touch upon the context leading to their adoption, with the objective to provide an overall understanding of the current state of global climate change law. This will serve as the general factual starting point for the rest of the thesis.

2.1 Adoption of the UNFCCC

Even though the beginnings of international environmental law as a discipline can be traced back to the year 1972,²² it was only in the 1980s that anthropogenic climate change became a distinct legal and policy concern. A number of physical factors, notably the record-high temperatures²³ and the occurrence of extreme weather events like the drought in the Midwest of the United States during the summer of 1988, raised the issue's public profile.²⁴ In addition to this, important progress in the field of climate science, in particular the improved modelling and predictive work made possible by steadily more powerful computers, had increased the scientific community's certainty over the causes and consequences of the changing climate.²⁵

²² The year 1972 was indeed marked by the United Nations Conference on the Human Environment (also known as the 1972 Stockholm Conference), the first major UN conference on international environmental issues. See Peter H. Sand, "The Evolution of International Environmental Law" in Daniel Bodansky, Jutta Brunée & Ellen Hey, eds, *The Oxford Handbook of International Environmental Law* (Oxford: Oxford University Press, 2008) 31 at 33.

²³ Philip D. Jones et al, "Surface air temperature and its variations over the last 150 years" (1999) 37 *Reviews of Geophysics* 173 at 177.

²⁴ Allan D. Hecht & Dennis Tirpak, "Framework Agreement on Climate Change: A Scientific and Policy History" (1995) 29:4 *Climatic Change* 371 at 379.

²⁵ William W. Kellogg, *Mankind's Impact on Climate: The Evolution of an Awareness* (1987) 10 *Climatic Change* 128 at 128.

These factors compelled the international community to act. In 1988, the World Meteorological Organization (WMO) and the United Nations Environment Programme (UNEP) established the IPCC, whose initial objective was to “prepare a comprehensive review and recommendations with respect to the state of knowledge of the science of climate change; the social and economic impact of climate change, and potential response strategies and elements for inclusion in a possible future international convention on climate.”²⁶ The IPCC released its First Assessment Report in 1990, in which it pointed to a relation between greenhouse gas emissions resulting from human activity and changes in the climate system. It also recommended a global policy response to the problem, which they warned could present “formidable difficulties for policymakers”.²⁷

In response to the IPCC’s conclusions, the UN General Assembly (UNGA) launched formal negotiations towards a framework convention on climate change through a resolution at its 45th meeting. The negotiating process was to be led by an Intergovernmental Negotiating Committee (INC) and supported by the WMO and UNEP.²⁸ The INC’s first negotiation meeting was held in Washington D.C. in February 1991. In 1992 the INC adopted the UNFCCC,²⁹ which was opened for signature later that year during the UN Conference on Environment and Development, also known as the Rio de Janeiro Earth Summit. According to its Article 23, the Convention was to enter into force 90 days after the deposit of the 50th instrument of ratification, acceptance, approval or accession. This threshold was reached in December of 1993 and as such the UNFCCC entered

²⁶ *Protection of global climate for present and future generations of mankind*, A/RES/43/53, UNGAOR, 43rd Sess, Supp No 49, UN Doc A/43/905, (1988) 133 at 134.

²⁷ Intergovernmental Panel on Climate Change, *Climate Change: The 1990 and 1992 Assessments* (Geneva: IPCC, 1992) at 56.

²⁸ *Protection of global climate for present and future generations of mankind*, A/RES/45/212, UNGAOR, 45th Sess, Supp No 49, UN Doc A/45/851, (1990) 147 at 148.

²⁹ UNFCCC, *supra* note 1.

into force on 21 March 1994.³⁰ Today, 197 States have ratified the Convention, which constitutes near-universal membership.

2.2 The text of the UNFCCC

2.2.1 Main objective and guiding principles

The main objective of the UNFCCC can be found in its Article 2. It is worded as the “stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system”.³¹ No precise time frame is set in Article 2 for this stabilization to be reached, other than one “sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened and to enable economic development to proceed in a sustainable manner.”³² As Freestone notes, this relatively vague timeline as well as the wording of the Convention’s main objective, notably the goal of “stabilization” of greenhouse gas emissions instead of “reduction” or “reversal”, can be seen as reflecting States Parties’ preference for a precautionary but moderate approach at a time where scientific evidence of a correlation between anthropogenic emissions and climate change was less established than today.³³

Following the main objective, a number of principles that are to guide action under the Convention are listed at Article 3. In international law, principles can be defined as setting “forth general

³⁰ United Nations Treaty Collection, “7. United Nations Framework Convention on Climate Change”, online: UNTC <<https://treaties.un.org/doc/Publication/MTDSG/Volume%20II/Chapter%20XXVII/XXVII-7.en.pdf>> at 1.

³¹ UNFCCC, *supra* note 1 at art. 2.

³² *Ibid.*

³³ Alexander Freestone, “The United Nations Framework Convention on Climate Change—The Basis for the Climate Change Regime” in, Kevin R. Gray, Richard G. Tarasofsky & Cinnamon P. Carlarne, eds, *The Oxford Handbook of International Climate Change Law* (Oxford: Oxford University Press, 2016) 97 at 100.

standards that guide the application and future development of a treaty, but [without imposing] commitments or obligations on States to take any particular actions.”³⁴ As philosopher Ronald Dworkin further explains, legal principles and legal rules both point to particular decisions about legal obligation in particular circumstances, but they differ in the character of the direction they give. Rules are applicable in an all-or-nothing fashion, while a principle states a reason that argues in one direction but does not necessitate a particular decision. According to Dworkin, a principle, when relevant, is to be taken into account as a consideration inclining in one way or another, its relative importance weighed against other relevant principles.³⁵

At Article 3(1) is introduced the principle of common but differentiated responsibilities and respective capabilities (CBDRRC),³⁶ which marks its first textual reference in the body of an multilateral environmental agreement (MEA).³⁷ According to this principle, all States Parties share a common responsibility in reaching the Convention’s objective of stabilizing greenhouse gas emissions. At the same time, both the historic and current disparity in economic development between developed and developing countries must be taken into account when determining each of the States Parties roles in reaching the Convention’s objective: this is the “differentiated responsibilities and respective capabilities” component. Since, as noted in the Convention’s Preamble, “the largest share of historical and current global emissions of greenhouse gases has originated in developed countries”,³⁸ CBDRRC considerations imply that the largest share of the

³⁴ Daniel Bodansky, *The Framework Convention / Protocol Approach*, Framework Convention on Tobacco Control Technical Briefing Series No. 1 (1999), online: WHO <<https://apps.who.int/iris/handle/10665/65355>> at 20 [Bodansky, *Framework Convention / Protocol Approach*].

³⁵ Roland Dworkin, *Taking Rights Seriously*, (London: Duckworth, 1978) at 24-26.

³⁶ *UNFCCC*, *supra* note 1 at art. 3(1).

³⁷ Christopher D. Stone, “Common but Differentiated Responsibility in International Law” (2004) 98:2 AJIL 276 at 279.

³⁸ *UNFCCC*, *supra* note 1 at Preamble par. 3.

responsibility to stabilize these emissions also incurs to developed country Parties. As such, the concept of CDRRC colors many of the Parties' commitments under the Convention.

Mentioned alongside CDRRC at Article 3(1) is the principle of equity. Part of the greater philosophical concept of fairness, equity as a legal principle can be generally defined as "what is fair and reasonable in the administration of justice".³⁹ Although it has traditionally mostly been applied by sovereign states as part of domestic law, the rapid technological and scientific advances as well as the widening gap between rich and poor brought on by globalization have introduced important questions of equity at the international level.⁴⁰ Consequently, as Thomas M. Franck, one of the foremost legal experts on the subject, explains, equity is "developing into an important, redeeming aspect of the international legal system".⁴¹

In environmental law literature, equity is often discussed as part of the concept of environmental justice, which can be defined as "the equitable, or ethical, distribution across the population of the costs and benefits of industrialization".⁴² Over the last century, the rapid evolution of mankind's impact on the earth as a result of industrialization has led to strains on the environment and its resources. These strains are at the root of major global environmental problems such as ecosystem and biodiversity destruction, ozone layer depletion and climate change.⁴³ These large-scale environmental issues have in turn introduced their share of equity concerns, which the international

³⁹ Anne Peters, ed, *Max Planck Encyclopedia of Public International Law* (Oxford: Oxford University Press, 2013) "Equity in International Law" by Francesco Francioni, online: OPIL <<http://opil.ouplaw.com/view/10.1093/law:epil/9780199231690/law-9780199231690-e1399>> at para 1.

⁴⁰ *Ibid.*

⁴¹ Thomas M. Franck, *Fairness in International Law and Institutions* (Oxford: Clarendon Press, 1995) at 79.

⁴² David R. Keller, "Environmental Justice" in Deen K. Chatterjee, ed, *Encyclopedia of Global Justice* (Berlin: Springer, 2011) 298 at 298.

⁴³ Randall Curren, "Environmental Protection" in Deen K. Chatterjee, ed, *Encyclopedia of Global Justice* (Berlin: Springer, 2011) 303 at 303.

community has attempted to address through various international environmental legal instruments. The call for an equitable sharing of the costs of climate change is formulated at Article 3(1) *in fine*, where it is stated that “the developed country Parties should take the lead in combating climate change and the adverse effects thereof”.

The equitable distribution of the costs of climate change across States Parties at one point in time is one facet of climate equity. This first facet can be qualified as intragenerational since it takes into account the situation of different States Parties statically, as it stands in the present. A central claim of developing countries in regard to intragenerational environmental equity is the coexistence of their right to socio-economic development alongside their right to a healthy environment. The rationale behind this claim is that since the polluting industrialization causing environmental degradation is what allowed today’s rich countries to develop in the past, poorer countries should be allowed to benefit from industrialization in a similar manner in order to develop in the present. In the context of climate change, this implies the right of developing countries to not unduly bear the financial burdens associated with the transition to a less carbon-intensive economy. Developing countries’ line of argument here is that they should either be allowed to continue relying on cheaper but more polluting processes while developed countries reduce their reliance on them, or be assisted in their transition through financial and technological aid.

Climate equity also presents a second dimension, this one intergenerational. The intergenerational component of the principle of equity is underlined in the text of the UNFCCC in the first sentence of Article 3(1), which states that “Parties should protect the climate system for the benefit of

present and future generations of humankind”. Intergenerational equity dictates that the current generation as a whole has the responsibility to ensure that future generations will be able to benefit from the planet’s environment in the same way it presently can itself. In order to fulfill this responsibility, “every generation needs to pass the Earth and our natural and cultural resources on in at least as good condition as [it] received them”.⁴⁴ As Brown Weiss notes, failure to preserve the climate for future generations is likely to worsen the economic and social divisions which already exist between countries, leading to “not only problems of equity between generations but (...) [also] between members of any future generation”.⁴⁵ This is why the intra- and intergenerational aspects of equity should not be understood as distinct but rather as connected.

A third core principle of the UNFCCC, listed at Article 3(3), is the precautionary principle. In general terms, the principle can be understood as “enabling decision-makers to adopt precautionary measures when scientific evidence about an environmental or human hazard is uncertain or the stakes are high.”⁴⁶ References to a precautionary approach in domestic and international law date back to the 1970s, but it was its inclusion as Principle 15 of the Rio Declaration on Environment and Development⁴⁷ in 1992 that marked its emergence as a universally recognized principle of international environmental law.⁴⁸ In the text of the UNFCCC, the principle dictates that States Parties “should take precautionary measures to anticipate, prevent or minimize the causes of climate change and mitigate its adverse effects [and] where there are threats of serious or

⁴⁴ Edith Brown Weiss, “Climate Change, Intergenerational Equity and International Law” (2008) 9 Vermont Journal of Environmental Law 615 at 616.

⁴⁵ *Ibid* at 622.

⁴⁶ European Parliamentary Research Service, *The precautionary principle: Definitions, applications and governance* (Luxembourg: European Parliament, 2015), online: European Parliament

<[https://www.europarl.europa.eu/RegData/etudes/IDAN/2015/573876/EPRS_IDA\(2015\)573876_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2015/573876/EPRS_IDA(2015)573876_EN.pdf)> at 1.

⁴⁷ *Rio Declaration on Environment and Development*, UN Doc A/CONF.151/26 (vol. I) [*Rio Declaration*].

⁴⁸ Roberto Andorno, “The Precautionary Principle: A New Legal Standard for a Technological Age” (2004) 1:1 Journal of International Biotechnology Law 11 at 14.

irreversible damage, lack of full scientific certainty should not be used as a reason for postponing such measures”.⁴⁹ As most of the damaging effects of climate change are likely to be felt over years or decades rather than immediately, precaution should be exercised relatively to the longer term risks for future generations: this represents a link between the precautionary principle and intergenerational equity. The wording of Article 3(3) however restrains the reach of the principle by indicating that precautionary measures should be balanced against the costs they incur: it is indeed stated that “policies and measures to deal with climate change should be cost-effective so as to ensure global benefits at the lowest possible cost”.⁵⁰

While its value as a general concept is hard to fault, criticism about the precautionary approach’s precise implications and the resulting difficulty of applying it concretely has been put forward by some scholars in policy and economics circles. The absence of a single consistent definition of the principle is one such source of criticism. Montgomery and Smith, for example, frame two forms of the precautionary principle, strong and weak. They argue that the strong form of the principle, where a worst-case scenario of damage is taken into account in the case of uncertainty, cannot guide rational decision-making in practice since it gives too much importance to future risk relatively to present-day cost.⁵¹ Sunstein goes further, arguing that a strict application of the precautionary principle in its strong form, which doesn’t limit itself to cases of serious or irreversible damage and reverses the burden of proof on the proponent of the activity, would lead to regulatory paralysis, forbidding all courses of action including inaction. Indeed, restraining from a potentially harmful activity most often risks depriving society of important benefits, which can

⁴⁹ UNFCCC, *supra* note 1 at art. 3(3).

⁵⁰ *Ibid.*

⁵¹ W. David Montgomery & Anne E. Smith, “Global Climate Change and the Precautionary Principle” (2000) 6:3 Human and Ecological Risk Assessment 399 at 410.

in itself be harmful. In the context of climate change, for example, a strong precautionary approach forbidding all greenhouse gas emitting activities would risk harming present-day populations, who could otherwise benefit from the income generated through these activities by enjoying better living conditions leading to better individual health. This itself would go against a strict precautionary approach, leading decision makers into a dead-end. Thus, according to Sunstein, a strong precautionary approach cannot be applied because it self-contradictory. All decisions involving some risk of harm, “it is therefore impossible, in most real-world cases, to avoid running afoul of the principle”.⁵²

The wording of UNFCCC Article 3(3), notably its reference to “threats of serious or irreversible damage” as well as its cost-effectiveness component, point away from a strong interpretation and instead toward a weaker form of the precautionary principle. This form dictates that “a lack of decisive evidence of harm should not be a ground for refusing to regulate”⁵³ but does not impose any stricter requirements. This helps avoid the self-contradictory problem of the principle’s strong form. Montgomery and Smith agree that under this weak form, precautionary measures are easy to accept as the threshold for their application tends to align with common sense. According to them however a weak precautionary approach is not of much use in practice, since it is too vague to provide significant insights as to how decision-making should be guided when compared to other forms of decision analysis such as regular cost-benefit evaluations.⁵⁴

⁵² Cass R. Sunstein, “The Paralyzing Principle” (2002) 25:4 *Regulation* 32 at 37.

⁵³ Cass R. Sunstein, “Beyond the Precautionary Principle” (2002) John M. Olin Program in Law and Economics Working Paper No. 149, online: University of Chicago
<https://chicagounbound.uchicago.edu/law_and_economics/87/> at 8.

⁵⁴ Montgomery & Smith, *supra* note 51 at 411.

Some other authors however look past the strong/weak dichotomy and defend the principle's general usefulness. Dana, for example, argues that the precautionary principle is sometimes preferable to standard cost-benefit analyses since it can balance out some human biases that could skew such analyses in the context of climate change. He cites the human tendency to over-evaluate assured costs while under-evaluating less certain ones as well as "temporal myopia", which is the difficulty for humans to properly value consequences set in the future, as two such biases.⁵⁵ Quiggin similarly underlines the precautionary principle's advantages over standard risk analysis methods. He puts forth a middle-ground reformulation of the principle he argues would bypass the obstacles encountered by both aforementioned weak and strong versions of the principle: "where a proposed course of action in the management of a complex system may lead to unfavorable surprises, such as threats to environmental health, the burden of proof should be on the proponents of the course of action to demonstrate reasonable grounds for belief that it will not be harmful."⁵⁶ The reversal of the burden of proof makes this definition stronger than the weak form, but the "reasonable grounds" criteria makes it more flexible than the strong form.

Sustainable development, the concept set forth in the final paragraphs of Article 3, can be seen as the culmination of the abovementioned principles. First coined in the World Commission on Environment and Development's 1987 report *Our Common Future*, it can be defined as "development that meets the needs of the present without compromising the ability of future

⁵⁵ David A. Dana, "The Contextual Rationality of the Precautionary Principle", Northwestern Public Law Research Paper No. 09-27 (2009), online: SSRN <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1521802> at 15.

⁵⁶ John Quiggin, "Complexity, Climate Change and the Precautionary Principle", University of Queensland Climate Change Working Paper No. C07#3 (2007), online: Semantic Scholar <<https://pdfs.semanticscholar.org/c894/1c6e89225f77019b3d53da245e067fd9c045.pdf>> at 13.

generations to meet their own needs”.⁵⁷ Up until now, “it has hardly gained the status of a principle of customary international law, but it is a catalyst in the process of further development of international law”,⁵⁸ notably serving as the basis for other environmental legal principles and norms.⁵⁹ In the text of the UNFCCC, sustainable development is directly referred to in Article 3, paragraphs (4) and (5). The former states that “the Parties have a right to, and should, promote sustainable development”, while the latter states that they “should cooperate to promote a supportive and open international economic system that would lead to sustainable economic growth and development in all Parties, particularly developing country Parties”. It is also worth noting that the neighboring concept of sustainable economic growth is referred to in the Convention’s main objective at Article 2: it is stated there that climate stabilization should be achieved “within a time frame sufficient [...] to enable economic development to proceed in a sustainable manner.”

Voigt highlights the many mentions of the term ‘sustainable’ in the text of the UNFCCC⁶⁰ and argues that climate action and the concept of sustainable development are “directly and reciprocally linked”.⁶¹ As she explains,

“Sustainable development is inherently defined by ecological limits set by fundamental natural processes and functions, among which a stable global climate is arguably the most crucial. The ability of the global community to tackle the challenge of climate change by setting up a comprehensive and effective

⁵⁷ World Commission on Environment and Development, *Report of the World Commission on Environment and Development: Our Common Future* (New York: UN, 1987), online: UN <<http://www.un-documents.net/wced-ocf.htm>> , at c. 2 IV. 1).

⁵⁸ Anne Peters, ed, *supra* note 39, “Sustainable Development” by Ulrich Beyerlin, online: OPIL <<https://opil.ouplaw.com/view/10.1093/law:epil/9780199231690/law-9780199231690-e1609>> at para 24.

⁵⁹ *Ibid* at para 20. The author cites as an example the derived concept of “sustainable use”, which has become a legal rule in the context of the protection of biological diversity.

⁶⁰ Christina Voigt, *Sustainable Development as a Principle of International Law: Resolving Conflicts between Climate Measures and WTO Law* (Leiden: Martinus Nijhoff, 2009) at 92.

⁶¹ *Ibid* at 91.

international climate regime is giving an indication of the attempt to understand and implement sustainable development as a global concept.”⁶²

Interpreted holistically, the principles listed at article 3 can thus be seen as interlinked and forming a guiding set of concepts for the actions of States Parties under the UNFCCC. Intragenerational equity justifies the CBDRRC of the States Parties in the present. In parallel, intergenerational equity concerns call for a precautionary approach in order to preserve climate for future generations in a context where uncertainties regarding the resilience of the climate system remain. A complementary and balanced application of these two aspects of climate equity must be found in order to achieve the overarching objective of sustainable development. Alogna posits that taken together, “all these components of the ‘legal model’ of [sustainable development] give rise to a concept whose objective is even broader than environmental law itself. In fact, to reach its full application it has to be supported in its three typical dimensions or ‘three E’s’: Environment, Economy, and Equity.”⁶³

The inclusion of the main objective and guiding principles in the body of the text was a source of controversy during the drafting of the Convention. Bodansky explains that “ordinarily, the material included in these articles, which states the intent of the parties and the context of the Convention, would be contained in the Preamble. By instead placing these provisions in the operative part of the Convention, some states sought both to highlight these provisions and to elevate their legal status.”⁶⁴ Most developing countries were in favor of the inclusion of a “principles” article in the

⁶² *Ibid.*

⁶³ Ivano Alogna. “The Circulation of the Model of Sustainable Development: Tracing the Path in a Comparative Law Perspective” in Volker Mauerhofer, ed, *Legal Aspects of Sustainable Development: Horizontal and Sectorial Policy Issues* (Berlin: Springer, 2016) 13 at 19.

⁶⁴ Daniel Bodansky, “The United Nations Framework Convention on Climate Change: A Commentary” (1993) 18:2 *Yale J Int’l L* 451 at 497 [Bodansky, *UNFCCC*].

body of the Convention, while some developed states, in particular the United States, raised concerns in regards to the unclear legal force such an inclusion would confer to the principles.⁶⁵ The wording of the chapeau of Article 3 serves as a compromise between those two positions. There, the use of the term “guiding” implies that the principles listed do not introduce specific obligations, while the term “inter alia” implies that other principles of international law can also be drawn upon in interpreting States Parties’ commitments. This tempers the potential legal strength of the stated principles. The main objective and principles of the UNFCCC are a cornerstone of the climate regime: by being referred to in the preambles of both the Kyoto Protocol and the Paris Agreement, they also guide the interpretation of these two subsequent legal instruments.

2.2.2 Commitments

The commitments taken by States Parties under the UNFCCC are detailed in Article 4. Reflecting the principles listed at Article 3, these commitments vary in accordance with States Parties’ responsibilities and respective capabilities. Indeed, the Convention distinguishes between industrialized countries, which have historically emitted a greater share of global greenhouse gas emissions, and developing countries which have a lesser historical responsibility. The former group includes industrialized countries, namely the States Parties that were members of the Organization for Economic Co-operation and Development (OECD) in 1992. It also includes those States Parties whose economies were in transition at the time of the Convention’s adoption, such as the Russian Federation, the Baltic States and some other Central and European States. These

⁶⁵ *Ibid* at 501.

States are listed at Annex I of the UNFCCC. The other States Parties are collectively known as non-Annex Parties.

Some Article 4 commitments are to be enacted by all States Parties to the Convention. These include the development and publishing of national inventories of sources and sinks of greenhouse gases as well as the formulation of national mitigation plans and adaptation measures. Non-Annex Parties shall communicate these within three years of the entry into force of the Convention, while least developed countries can do so at their discretion.⁶⁶ Additionally, all Parties commit to promote and cooperate for technology development and transfer, as well as for the sustainable management, conservation and enhancement of greenhouse gas sinks and reservoirs. They also commit to the promotion of scientific, technical, socio-economic and other research as well as to the promotion of education, training and public awareness related to climate change.⁶⁷

Annex I Parties additionally subscribe to a number of more specific commitments. They shall adopt national policies to limit greenhouse gas emissions and to protect and enhance sinks and reservoirs.⁶⁸ To promote progress to this end, Annex I Parties shall communicate detailed information on these policies and measures, first within six months of the entry into force of the Convention, and periodically thereafter: the information communicated in this manner should take into account the best available scientific knowledge.⁶⁹ As Bodansky notes, Annex I countries'

⁶⁶ *UNFCCC*, *supra* note 1, at arts. 4(1) a) and b). The modalities for the communication of these inventories and plans are found at art. 12(1) and 12(5) of the Convention.

⁶⁷ *Ibid* at arts. 4(1) c), d), g) and i) respectively. Modalities for the promotion of climate research are found at arts. 5, 12(1) and 12(5) of the Convention, while modalities for education, training and public awareness can be found at art. 6.

⁶⁸ *Ibid* at art. 4(2) (a).

⁶⁹ *Ibid* at art. 4(2) b) and c). The modalities for the communication of these policies and measures are found at art. 12(2) and 12(5) of the Convention.

reporting requirements are thus more stringent, both in terms of timing and content, than the general ones imposed to all Parties under Article 4(1).⁷⁰

The European Community and the OECD Annex I States are also included in Annex II of the Convention and as such subscribe to other additional commitments relating to the transfer of financial and technological resources to other Parties. They are to provide “new and additional financial resources to meet the agreed full costs”⁷¹ of the developing country Parties’ reporting obligations and implementation measures enacted in accordance with Article 4(1). The Annex II Parties are also to assist the developing country Parties particularly vulnerable to the adverse effects of climate change in meeting the costs of adaptation to those adverse effects,⁷² as well as to take “all practicable steps to promote, facilitate and finance”⁷³ the transfer of environmentally sound technologies and know-how to other Parties, particularly developing country Parties. Information about measures taken in this regard is to be included in Annex II Parties’ Article 4(1) communications.⁷⁴

The use of the term “shall” in Article 4 indicates that the commitments set forth in the UNFCCC are legally binding,⁷⁵ although their rather general formulation gives States Parties significant leeway in implementing them. For example, the UNFCCC refers to a target, a return to 1990 emissions levels,⁷⁶ and a timeframe, “the end of the present decade”⁷⁷, effectively the year 2000.

⁷⁰ Bodansky, *UNFCCC*, *supra* note 64 at 511.

⁷¹ *UNFCCC*, *supra* note 1 at art. 4(3).

⁷² *Ibid* at art. 4(4).

⁷³ *Ibid* at art. 4(5)

⁷⁴ *Ibid* at art. 12(3).

⁷⁵ Freestone, *supra* note 33 at 103.

⁷⁶ *UNFCCC*, *supra* note 1 at art. 4(2) b).

⁷⁷ *Ibid* at art. 4(2) a).

The language used alongside these references (“with the aim to”, as well as verbs such as “would”, “should” and “may”) however introduces ambiguity as to the obligatory character of this target and timeframe. This leads Sands to conclude that “the most that can reasonably be said about [Article 4] provisions is that they establish soft targets and timetables with a large number of loopholes”.⁷⁸

2.2.3 Institutions

The UNFCCC establishes five main institutional bodies in order to supervise and coordinate action under the Convention. The “supreme body”⁷⁹ of the UNFCCC is the COP. It is responsible for keeping track of the progress by States Parties towards the goal of the Convention as well as taking the decisions necessary to promote this progress. One of its main tasks is to review the national plans, policies and emission inventories submitted by Parties with the objective of evaluating the global progress made towards the Article 2 objective of the Convention.⁸⁰ The COP is set to meet every year, unless it is decided otherwise by the Parties; additionally, there is a possibility for extraordinary sessions to be held pending certain conditions.⁸¹

Two permanent subsidiary bodies are established under the COP. The Subsidiary Body for Scientific and Technological Advice (SBSTA) guides the COP in regard to technical matters. Open to all States Parties and multidisciplinary in nature, it is formed of government representatives with

⁷⁸ Philippe Sands, “The United Nations Framework Convention on Climate Change”, (1992) 1 RECIEL 270 at 274, as quoted in Bodansky, *UNFCCC*, *supra* note 64 at 516.

⁷⁹ *UNFCCC*, *supra* note 1 art. 7(1).

⁸⁰ *Ibid* at art. 7(2). See also Climate Change Secretariat, *A Guide to the Climate Change Convention Process* (2002), online: UNFCCC <<https://unfccc.int/resource/process/guideprocess-p.pdf>> at 18.

⁸¹ *Ibid* at art. 7(4) and 7(5). As of 2019, regular meetings of the COP have been held every year, and no extraordinary meeting has been held.

relevant expertise.⁸² It has two main tasks: the first is to assess scientific and technical knowledge on climate change and on measures taken under the Convention with a view to improve the guidelines for preparing national communications and emission inventories.⁸³ The second is to promote the development and transfer of climate technologies.⁸⁴ The SBSTA is also responsible for “respond[ing] to scientific, technological and methodological questions that the COP and its subsidiary bodies may put to the body”.⁸⁵

The second permanent subsidiary body is the Subsidiary Body for Implementation (SBI). Its role is to assess the information communicated by States Parties through their national communications and emission inventories, as well as to assist the COP on the preparation and implementation of its decisions.⁸⁶ In addition, the SBI is responsible for reviewing the work of the financial mechanism and guiding the COP on matters related to it.⁸⁷

The two subsidiary bodies assist the COP by preparing draft decisions, which are then forwarded for consideration and adoption. They also adopt conclusions, which often pertain to procedural matters such as setting out schedules of work or requesting documents from the secretariat: these conclusions are also included in the bodies’ reports. The COP, as the supreme body of the Convention, is however the only body to formally adopt decisions.⁸⁸

⁸² *Ibid* at art. 9(1).

⁸³ *Ibid* at art. 9(2) a) and b).

⁸⁴ *Ibid* at art. 9(2) c) and d).

⁸⁵ *Ibid* at art. 9(2) e). For a more detailed outline of the functions to be carried out by the SBSTA, see *Functions to be carried out by the Subsidiary Bodies*, UNFCCCOR, 1st Sess, Annex I, Agenda Item 6, UN Doc FCCC/CP/1995/7/Add.1 at 23.

⁸⁶ UNFCCC, *supra* note 1 at art. 10(2).

⁸⁷ FCCC/CP/1995/7/Add.1, *supra* note 85 at 26.

⁸⁸ Climate Change Secretariat, *supra* note 80 at 42.

A financial mechanism is established to coordinate funding and financial matters. Its role is to provide financial resources for projects to address climate change, including for the transfer of technology, on a grant or concessional basis. While not directly under the authority of the COP, the financial mechanism functions under its guidance and is accountable to it: the COP decides on the mechanism's policies, program priorities and eligibility criteria, but delegates the decision-making authority on a project-by-project basis to the mechanism.⁸⁹ Article 11(1) stipulates that the UNFCCC financial mechanism is to be operated by "one or more existing international entities". The Global Environmental Facility (GEF), established jointly by the World Bank, UNEP and the United Nations Development Programme (UNDP) at the eve of the Rio Earth Summit, was chosen to become the organization managing it. After first doing so on an interim basis,⁹⁰ its role was confirmed through a memorandum of understanding⁹¹ in 1996, and in 1998 its mandate became a long-term one which is subject to review every four years.⁹²

Finally, a Secretariat is established to provide administrative support to the COP and the Subsidiary Bodies. Its main functions are listed at Article 8 and include making practical arrangements for sessions of the Convention bodies, assisting the Parties, particularly developing country Parties, in the implementation of their commitments as well as coordinating with the secretariats of other relevant international bodies. The UNFCCC secretariat is located in Bonn, Germany.

⁸⁹ Bodansky, *UNFCCC*, *supra* note 64 at 540.

⁹⁰ Philippe Sands & Jacqueline Peel, *Principles of International Environmental Law*, 3rd ed (Cambridge: Cambridge University Press, 2012) at 283.

⁹¹ *Memorandum of Understanding between the Conference of the Parties and the Council of the Global Environment Facility*, FCCC Dec 1/CP.2, UNFCCCOR, 2nd Sess, FCCC/CP/1996/15/Add.1. For a more detailed outline of the GEF and climate finance, see Alexander Thompson, "The Global Regime for Climate Finance" in Gray, Tarasofsky & Carlarne, *supra* note 33 at 137.

⁹² *Review of the financial mechanism*, FCCC Dec 3/CP.4, UNFCCCOR, 4th Sess, FCCC/CP/1998/16/Add.1.

2.2.4 Mechanisms

The Convention provides for two complementary mechanisms for the resolution of questions of implementation and disputes between States Parties. The first is a multilateral consultative process, available to the Parties on a voluntary basis, for the resolution of questions regarding the implementation of the Convention.⁹³ Parties can voice concerns about their own difficulties as well as those of other Parties: the objective of the consultative process is to promote a better understanding of the Convention as well as to prevent disputes from arising, by operating in a facilitative, cooperative, non-adversarial and non-judicial manner.⁹⁴ The modalities of the multilateral consultative process were adopted by the COP in 1998⁹⁵, although some details about the composition of its Committee could not be agreed upon: the mechanism has as such never been set into action.⁹⁶

Second, a dispute settlement mechanism is established for cases where a dispute between two or more Parties cannot be solved through the consultative process. The dispute settlement mechanism is more traditionally adversarial in nature than the Article 13 mechanism. Parties to a dispute must first seek to settle it through negotiation or other peaceful means.⁹⁷ If negotiation proves unsuccessful, one of the parties to the dispute may request the establishment of a conciliation committee, which renders non-binding “recommendatory” awards to be considered in good faith.⁹⁸

Alternatively, the dispute can be submitted to either the International Court of Justice or to

⁹³ *UNFCCC*, *supra* note 1 at art. 13.

⁹⁴ Laurence Boisson de Chazournes, *United Nations Framework Convention on Climate Change* (2008), online: UNFCCC <https://legal.un.org/avl/pdf/ha/ccc/ccc_e.pdf> at 4.

⁹⁵ *Multilateral consultative process*, FCCC Dec 10/CP.4, UNFCCCOR, 4th Sess, UN Doc FCCC/CP/1998/16/Add.1 at 42.

⁹⁶ Roda Verheyen & Cathrin Zengerling, “International Dispute Settlement” in in Gray, Tarasofsky & Carlarne, *supra* note 33 417 at 420.

⁹⁷ *UNFCCC*, *supra* note 1 at art. 14(1).

⁹⁸ *Ibid* at art. 14(5) and (6).

arbitration if these compulsory procedures were accepted in advance by all Parties to the dispute.⁹⁹ Like the multilateral consultative process, the Article 14 dispute settlement mechanism has so far never been used.¹⁰⁰

2.3 Unsolved aspects of the framework convention

The UNFCCC, as its name states, is a framework convention. A framework convention can be defined as “a legally binding treaty of international law that establishes broad commitments for its parties and a general system of governance, while leaving more detailed rules and the setting of specific targets either to subsequent agreements between the parties, usually referred to as protocols, or to national legislation.”¹⁰¹ Bodansky explains that the framework convention/protocol approach is useful in cases where “political consensus to take strong substantive measures is lacking, scientific understanding is still evolving or the problem itself is changeable”,¹⁰² by allowing States to address a problem in an incremental manner rather than all at once. Climate change as understood in the early 1990s and the political context around it fit all three of these criteria, making the framework convention/protocol approach appropriate. Besides providing a general system of governance which allows for incremental action and flexibility, framework conventions fulfill another significant role. They encourage the adoption of more specific commitments further down the road by promoting early agreement on the relevant

⁹⁹ *Ibid* at art. 14(2).

¹⁰⁰ Verheyen & Zengerling, *supra* note 96 at 420.

¹⁰¹ Anne Peters, ed, *supra* note 39, “Framework Agreements” by Nele Matz-Lück, online: OPIL <<https://opil.ouplaw.com/view/10.1093/law:epil/9780199231690/law-9780199231690-e703?rskey=CJVya8&result=1&prd=OPIL>> at para 1.

¹⁰² Daniel Bodansky, *Framework Convention / Protocol Approach*, *supra* note 34 at 17.

scientific facts as well as on the appropriate legal response to a problem: this is what Bodansky respectively calls “normative and cognitive consensus”.¹⁰³

With articles introducing general reporting obligations and establishing a number of institutional bodies, the UNFCCC contains more defined obligations than most other framework conventions in the field of international environmental law: the Vienna Convention for the Protection of the Ozone Layer, in comparison, leaves most substantial obligations and institutional procedures to be determined by the COP later in the process.¹⁰⁴ Despite its relatively elaborate form however, the modalities for many of the UNFCCC’s provisions remained to be agreed upon at the time of its adoption. A number of these were to be determined at the first session of the COP. These included the methodologies for calculations of emissions and sinks under Article 4(1) c), the modalities for financial support to developing States Parties in fulfilling their reporting commitments under Article 4 and Article 12, the criteria for joint implementation of emissions reductions commitments as per Article 4(2)d) and the rules of procedure of the Convention’s institutions. The emissions reduction commitments of Annex I Parties under Article 4(2)a) and b), which were at this point still quite vague, were also to be reviewed at the COP’s first session. Based on this review, “appropriate action, which may include amendments to the commitments”¹⁰⁵ was to be taken by the Parties. Thus, although the adoption of the UNFCCC laid the foundation for an international response to climate change, much was still to be done in order to ensure the effectiveness of this response.

¹⁰³ *Ibid.*

¹⁰⁴ *Vienna Convention for the Protection of the Ozone Layer*, 22 March 1985, 1513 UNTS 323 at art. 6 [*Vienna Convention*].

¹⁰⁵ *UNFCCC*, *supra* note 1 at art. 4(2) d).

2.4 COP1, the Berlin Mandate and the Kyoto Protocol

As stated in Article 7(4) of the UNFCCC, the first session of the COP was to be convened no later than one year after the Convention's entry into force: it was consequently held in Berlin in March-April 1995. The political conjecture leading up to COP1 did not bode well for the adoption of significant decisions at the first meeting, which could have jump-started action under the Convention. Indeed, neither the US nor the EU demonstrated the necessary leadership for progress on key questions during the INC meetings preceding COP1, which led to an absence of consensus on core issues such as quantified emissions reductions commitments.¹⁰⁶ Additionally, the first few national communications transmitted by industrialized States Parties outlined commitments which would likely be insufficient to reach the Convention's initial soft target of reducing emissions to 1990 levels by 2000, a target itself already widely considered as too weak.¹⁰⁷ Some progress on the modalities for the UNFCCC institutions, on joint implementation as well as for reporting and implementation review was however made in the months leading up to the Conference.¹⁰⁸

What was probably the biggest roadblock to progress at COP1 was the Parties' inability to adopt rules of procedure for the COP as per UNFCCC Articles 7(2)k) and 7(3). This step, which for most MEAs adopted so far had been a "pure formality",¹⁰⁹ became impossible as some States Parties, specifically the US, France and the members of the Organization for Petroleum Exporting Countries (OPEC) failed to agree on the majority requirements for the adoption of further decisions

¹⁰⁶ Sebastian Oberthür & Hermann E. Ott, *The Kyoto Protocol: International Climate Policy for the 21st Century* (Berlin-Heidelberg: Springer, 1999) at 43-44 [Oberthür & Ott, *Kyoto Protocol*].

¹⁰⁷ *Ibid* at 45.

¹⁰⁸ *Ibid*.

¹⁰⁹ *Ibid* at 46.

by fear of losing their respective veto powers.¹¹⁰ Lanchbery qualifies the OPEC countries' tactics in this regard as "disruptive",¹¹¹ arguing that they were led in cooperation with the Global Climate Coalition, an non-governmental organization (NGO) tied to the coal and oil industry, with the objective of undermining the Berlin Conference. As a result of this lack of agreement, the draft rules of procedure were not adopted at COP1 but instead "applied", with the exception of the voting requirements: all decisions thus had to be taken by consensus.¹¹²

Despite these hurdles, COP1 managed to deliver some progress towards concrete emissions reductions targets by adopting the Berlin Mandate.¹¹³ The Mandate confirmed that the targets set for Annex I countries in UNFCCC Article 4(2) were not adequate and set forth a process to strengthen them for the post-2000 period, with the objective of adopting a protocol or another legal instrument to this end.¹¹⁴ The process was to be led by the Ad Hoc Group on the Berlin Mandate (AGBM) with the goal of reaching completion as early as possible in 1997.¹¹⁵ The AGBM met over a total of eight sessions between 1995 and 1997¹¹⁶: although participating Parties managed to "narrow down the options"¹¹⁷ through the course of these meetings, a definitive draft Protocol still

¹¹⁰ Sebastian Oberthür & Hermann E. Ott, "The First Conference of the Parties" (1995) 25:4/5 *Env'tl Pol'y & L* 144 at 148.

¹¹¹ John Lanchbery, "What to Expect from KYOTO" (1997) 39:9 *Science and Policy for Sustainable Development* 4 at 8.

¹¹² *Report of the Conference of the Parties on its First Session, Held at Berlin from 28 March to 7 April 1995*, UNFCCCOR, 1st Sess, UN Doc FCCC/CP/1995/7 at para 10. For the text of the draft rules of procedure, see *Organizational matters: Adoption of the rules of procedure: Note by the secretariat*, UNFCCCOR, 2nd Sess, UN Doc FCCC/CP/1996/2 at 2.

¹¹³ See Alison Abbot, "Meeting agrees on need for new targets for greenhouse gas emissions" (1995) 374 *Nature* 584.

¹¹⁴ *The Berlin Mandate: Review of the adequacy of Article 4, paragraph 2(a) and (b), of the Convention, including proposals related to a protocol and decisions on follow-up*, FCCC Dec 1/CP.1, UNFCCCOR, 1st Sess, UN Doc FCCC/CP/1995/7/Add.1 at 4.

¹¹⁵ *Ibid* at 6.

¹¹⁶ For the reports of the eight AGBM meetings, see UNFCCC, *Reports of the Conference of the Parties, and the Subsidiary Bodies*, online: UNFCCC <<https://unfccc.int/cop5/resource/repcops.html#agbm>>.

¹¹⁷ Oberthür & Ott, *Kyoto Protocol*, *supra* note 106 at 57.

had not been produced at the end of the eighth session.¹¹⁸ Much was thus still to be done at the eve of COP3 in Kyoto.

In parallel to the slow progress made during the AGBM meetings, a coalition of ministers and other heads of delegations penned the Geneva Declaration at COP2 with the objective of channelling political will for the adoption of a Protocol.¹¹⁹ Through it, signatories officially endorsed the IPCC's Second Assessment Report released the previous year and instructed state representatives at the AGBM to "accelerate negotiations on the text of a legally-binding protocol or another legal instrument to be completed in due time for adoption at the third session of the Conference of the Parties".¹²⁰ Once again however, the problem of the COP's unsettled rules of procedure complicated the document's adoption: a minority group of countries composed of the OPEC states and Russia objected to it, which meant that a formal adoption by consensus would fail if attempted. The President of the COP and the majority of Parties in favor of the Declaration worked around this obstacle by "taking note of" the Declaration by "consensus minus x"¹²¹: although opposing Parties formally registered their objection,¹²² they were not able to prevent this recognition by the COP during the final plenary meeting. This showed that concrete progress in climate negotiations could be attained despite a minority's opposition, although the long-term political viability of an informal approach such as "consensus minus x" remained questionable.

¹¹⁸ AGBM, *Report on the First Part of its Eighth Session*, UNFCCCOR, 1997, UN Doc FCCC/AGBM/1997/8 at para 27.

¹¹⁹ *The Geneva Ministerial Declaration*, UNFCCCOR, 2nd Sess, Annex, Agenda item III (5), UN Doc FCCC/CP/1996/15/Add.1 at 71.

¹²⁰ *Ibid* at para 8.

¹²¹ Oberthür & Ott, *Kyoto Protocol*, *supra* note 106 at 54.

¹²² See *Statements made in connection with the Geneva Ministerial Declaration*, UNFCCCOR, 2nd Sess, Annex IV, UN DOC FCCC/CP/1996/15 at 47.

The process set forth in Berlin culminated in 1997, at COP3 in Kyoto. The AGBM had not managed to agree on a draft Protocol by the start of the Kyoto Conference: a number of disagreements between the Annex I and non-Annex groups of Parties, as well as between individual States Parties within both groups, prevented the adoption of a definitive draft.¹²³ As such, the AGBM concluded its work by transmitting a revised text under negotiation¹²⁴ to the COP at the start of the meeting. After over ten days of intense negotiations,¹²⁵ the Kyoto Protocol was adopted by the COP on December 11th, 1997, the last day of COP3.

The Kyoto Protocol represented an important step forward from the UNFCCC. One of its most prominent features was that it introduced legally binding quantified emission limitation and reduction commitments (QELRCs) for Annex I Parties. The modalities for these QELRCs can be found at Article 3: Annex I Parties jointly committed to reduce their overall emissions of the greenhouse gases listed in Annex A of the Protocol by at least 5% below 1990 levels for a first commitment period spanning 2008 to 2012 (CP1).¹²⁶ States Parties' individual QELRCs varied: the different individual commitments are listed at Annex B of the Protocol. Annex I Parties undergoing the process of transition to a market economy enjoyed increased flexibility in setting their QELRCs. If they used a base year other than 1990 in their communications prior to the adoption of the Kyoto Protocol, they could use that year for the implementation of their commitments, and if they had yet to submit their first national communication, they could notify

¹²³ Laurence Boisson de Chazournes, *Kyoto Protocol to the United Nations Framework Convention on Climate Change* (2008), online: UNFCCC <https://legal.un.org/avl/pdf/ha/kpccc/kpccc_e.pdf> at 1 [Boisson de Chazournes, *Kyoto Protocol*].

¹²⁴ *Adoption of a Protocol or Another Legal Instrument: Fulfilment of the Berlin Mandate*, UNFCCCOR, 3rd Sess, UN Doc FCCC/CP/1997/2.

¹²⁵ See Oberthür and Ott, *Kyoto Protocol*, *supra* note 106 at 77-91.

¹²⁶ *Kyoto Protocol to the United Nations Framework Convention on Climate Change*, 11 December 1997, UN Doc FCCC/CP/1997/7/Add.1, 37 I.L.M. 22 at art. 3 [*Kyoto Protocol*].

their intent to use a different base year.¹²⁷ The modalities for the communication of progress by Annex I Parties towards their QELRCs are listed at Article 7 of the Protocol: the required information was to be incorporated in their national communications submitted under Article 12 of the UNFCCC.¹²⁸ No new commitments were introduced for non-Annex I Parties, but existing commitments under UNFCCC Article 4(1) were reaffirmed.¹²⁹

A second major development introduced in the Kyoto Protocol was the establishment of three novel flexibility mechanisms, whose common goal is to reduce the costs for Annex I Parties to comply with the Protocol's targets. The first such mechanism was joint implementation (JI) under Article 6 of the Protocol. It enabled an Annex I country to invest in a project that reduces emissions in another Annex I country in order to acquire emission reduction units that can be counted towards its domestic QELRC.¹³⁰ The second, named the Clean Development Mechanism (CDM), allowed Annex I countries to collaborate with non-Annex countries on projects to reduce emissions on the latter's territory. The objective of the CDM was to allow non-Annex Parties to benefit from developed country investment in order to develop in a sustainable manner, while simultaneously allowing Annex-I Parties to achieve compliance with their Article 3 commitments by acquiring certified emission reduction credits through these projects.¹³¹ The third flexibility mechanism consisted in an emissions trading scheme between Parties listed at Annex B of the Protocol: under such as scheme, a country which reduces its emissions to a level below its Article 3 commitment

¹²⁷ *Ibid* at art. 3(5).

¹²⁸ *Ibid* at art. 7(2).

¹²⁹ *Ibid* at art. 10.

¹³⁰ *Ibid* at art. 6.

¹³¹ *Ibid* at art. 12.

could sell its excess reductions as emissions rights, which another Annex B country who hasn't met its commitment could then purchase.¹³²

As stated in Article 13, the UNFCCC COP served as the meeting of the Parties to the Kyoto Protocol: when operating in this capacity, it is referred to as the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol (CMP). Only States Parties to the Protocol enjoyed voting rights for decisions pertaining to it: UNFCCC States Parties which were not Parties to the Protocol could however participate in the proceedings of the CMP as observers.¹³³ The responsibilities of the CMP were similar to the ones of the COP in respect to the UNFCCC, and include assessing the implementation of the Protocol and periodically reviewing the obligations of the Parties under it. The UNFCCC's SBSTA and SBI, in their respective roles, served the Kyoto Protocol in an analogous manner to the COP.¹³⁴

In order to ensure effective implementation and transparency for both QELRCs and the flexibility mechanisms, a compliance mechanism was also established. Article 18 of the Protocol set forth a general commitment for the establishment of this mechanism, whose precise modalities were approved at the first session of the CMP. The compliance mechanism was formed of two branches, namely the facilitative branch and the enforcement branch.¹³⁵ The role of the facilitative branch was to provide advice and facilitation to Parties in implementing the Protocol, with the objective of promoting compliance and warning against potential non-compliance by Parties.¹³⁶ To this end,

¹³² *Ibid* at art. 17.

¹³³ *Ibid* at art. 13(2).

¹³⁴ *Ibid* at art. 15.

¹³⁵ *Procedures and mechanisms relating to compliance under the Kyoto Protocol*, UNFCCCOR, 11th Sess, Annex, Dec 27/CMP.1, UN Doc FCCC/KP/CMP/2005/8/Add.3 at 93.

¹³⁶ *Ibid* at IV.

it could provide technical and financial assistance as well as formulate recommendations to the Parties concerned.¹³⁷ The enforcement branch was responsible for determining the non-compliance of an Annex I Party with its QELRC targets, its methodological and reporting requirements or its eligibility requirements under the Protocol's flexibility mechanisms.¹³⁸ Once it had determined non-compliance, the enforcement branch could impose additional emissions reductions to Parties that hadn't respected their initial targets, as well as suspend Parties' eligibility to the flexibility mechanisms.¹³⁹

As was the case for the modalities of the compliance mechanism, many of the Kyoto Protocol's more detailed modalities, rules and guidelines were to be subsequently elaborated and then adopted by the CMP at its first session. This session was to be held in conjunction with the first session of the COP after the entry into force of the Protocol.¹⁴⁰ The political context in the years following the adoption of the Kyoto Protocol was however such that it entered into force only in 2005, eight years after its adoption. Indeed, the entry into force of the Protocol was dependent on its ratification by a minimum of 55 Parties, whose combined emissions had to account for at least 55% of the total 1990 emissions of Annex I Parties.¹⁴¹ The ratification of many Parties that had signed the Protocol and signified their intention to ratify was in turn dependent on the rules and guidelines that were still to be agreed upon: the Kyoto Protocol introduced significant commitments and Parties were reluctant to be bound to them until their modalities were clear.¹⁴² This led to a period of difficult negotiations over the following COPs, which nearly broke down in December 2000.¹⁴³

¹³⁷ *Ibid* at XIV.

¹³⁸ *Ibid* at V.

¹³⁹ *Ibid* at XV.

¹⁴⁰ *Kyoto Protocol*, *supra* note 126 at art. 13(6).

¹⁴¹ *Ibid* at art. 25(1).

¹⁴² Climate Change Secretariat, *supra* note 80 at 11.

¹⁴³ Boisson de Chazournes, *Kyoto Protocol*, *supra* note 123 at 2.

In 2001, the United States, who was at the time the largest greenhouse gas-emitting State, announced its intention to withdraw from the Kyoto Protocol process. While this came as bad news for the overall objective of the Protocol, the withdrawal paradoxically appeared to motivate the remaining signatory Parties. They successfully concluded the negotiation of implementation procedures that year, which were agreed upon at COP7 under the name of the Marrakesh Accords.¹⁴⁴

The adoption of the Marrakesh Accords opened the door to ratification of the Protocol, which reached its Article 25 threshold in 2004 and as such entered into force on February 16, 2005.¹⁴⁵ The first session of the CMP was then held jointly with COP11 in Montreal at the end of 2005. Over CP1, which spanned from 2008 to 2012, the 36 Annex B countries who fully participated to the Kyoto Protocol (this excludes the US, who did not ratify it, as well as Canada, who withdrew in 2011) fulfilled their collective commitment.¹⁴⁶ From this standpoint, the Kyoto Protocol CP1 can thus be considered as successful in reaching its objective although it introduced commitments only to a limited number of States Parties.

2.5 From Kyoto to Paris

From the moment of the Kyoto Protocol's adoption, it was understood that a new round of negotiations would be required for the post-2012 period, at which time States Parties' first

¹⁴⁴ *The Marrakesh Accords*, Dec 2/CP.7 – Dec 14/CP.7, UNFCCCOR, 7th Sess, UN Doc FCCC/CP/2001/13/Add.1 at 5.

¹⁴⁵ United Nations Treaty Collection, “Kyoto Protocol to the United Nations Framework Convention on Climate Change”, online: UNTC <<https://treaties.un.org/doc/Publication/MTDSG/Volume%20II/Chapter%20XXVII/XXVII-7-a.en.pdf>> at 1.

¹⁴⁶ Igor Shishlov, Romain Morel & Valentin Bellassen, “Compliance of the Parties to the Kyoto Protocol in the first commitment period” (2016) 16:6 *Climate Policy* 768 at 779. See also Michael Grubb, “Full legal compliance with the Kyoto Protocol's first commitment period – some lessons” (2016) 16:6 *Climate Policy* 673.

commitments were to end. Parties to the Protocol decided already at CMP1 in Montreal to launch a process towards further commitments for that period. The work was to be conducted by an ad hoc working group (AWG) of Parties with a goal to determine an outcome “as early as possible and in time to ensure that there is no gap between the first and second commitment periods”.¹⁴⁷ The work of the AWG culminated in the adoption of the Doha Amendment at CMP8 in 2012. Through it, participating Parties notably agreed to increase their aggregate emissions reduction commitment to at least 18% below 1990 levels by adopting new QELRCs for a second commitment period spanning from 2012 to 2020 (CP2).¹⁴⁸ To facilitate the adoption of more ambitious reduction targets, a new simplified QELRC adjustment procedure was established:¹⁴⁹ its goal was to bypass the lengthy original Kyoto Protocol procedure, where such adjustments qualified as amendments to an annex and thus were required to be agreed upon by consensus or by three-fourths majority.¹⁵⁰ The list of greenhouse gases regulated under the Protocol was also amended to include an additional substance, nitrogen trifluoride.¹⁵¹

In accordance with Kyoto Protocol rules, the Doha Amendment was set to enter into force on the ninety days after the receipt of instruments of acceptance by three-fourths of the Parties to the Protocol, which amounts to 144 Parties.¹⁵² In addition to the United States, who did not ratify the Kyoto Protocol, and Canada, who withdrew from it in 2011, Japan, Russia and New Zealand had indicated that they would not take on any new commitments for CP2. The threshold of 144

¹⁴⁷ *Consideration of commitments for subsequent periods for Parties included in Annex I to the Convention under Article 3, paragraph 9, of the Kyoto Protocol*, UNFCCCOR, 11th Sess, Annex, Dec 1/CMP.1, UN Doc FCCC/KP/CMP/2005/8/Add.1 at 3.

¹⁴⁸ *Doha Amendment to the Kyoto Protocol*, UNFCCCOR, 18th Sess, Annex, Dec 1/CMP.8, UN Doc FCCC/KP/CMP/2012/13/Add.1 at para C [*Doha Amendment*].

¹⁴⁹ *Ibid* at paras D and E.

¹⁵⁰ *Kyoto Protocol*, *supra* note 126 at art. 21(4).

¹⁵¹ *Doha Amendment*, *supra* note 148 at para B.

¹⁵² *Kyoto Protocol*, *supra* note 126 at art. 20(4).

instruments of acceptance was reached in October 2020 and as such, the Amendment entered into force on December 31st 2020.¹⁵³ Parties however agreed for it to be provisionally applicable before its entry into force, in accordance with the Vienna Convention on the Law of Treaties (VCLT) rules.¹⁵⁴ Parties could opt in to provisionally apply the amendment; Parties that did not opt in were required to “implement their commitments and other responsibilities [...] in a manner consistent with their national legislation or domestic processes”.¹⁵⁵

Despite measures for its provisional application, the Doha Amendment’s late entry into force and its lack of binding legal character, combined with the non-participation of several major emitters, casts doubt towards whether the Kyoto Protocol CP2 will have been able to achieve significant success in regard to the objective of greenhouse gas emission reductions. In a context where international negotiations for what would become the Paris Agreement were at a critical juncture however, the adoption of the Doha Agreement succeeded in providing stability and building confidence towards future progress.¹⁵⁶

Indeed, in parallel to the negotiation and adoption of an amendment for the Kyoto Protocol’s CP2, work was also underway to determine an outcome for long-term cooperative action beyond 2020. This represented the second half of the “two-track process”¹⁵⁷ launched at CMP1. The initial Montreal Dialogue on long-term cooperative action¹⁵⁸ was followed upon two years later at COP13

¹⁵³ United Nations Treaty Collection, “7. c) Doha Amendment to the Kyoto Protocol”, online: UNTC <<https://treaties.un.org/doc/Publication/MTDGS/Volume%20II/Chapter%20XXVII/XXVII-7-c.en.pdf>> at 1.

¹⁵⁴ *Vienna Convention on the Law of Treaties*, 23 May 1969, 331 UNTS 1155 at art. 25 [VCLT].

¹⁵⁵ *Amendment to the Kyoto Protocol pursuant to its Article 3, paragraph 9 (the Doha Amendment)*, UNFCCCOR, 18th Sess, Dec 1/CMP.8, UN Doc FCCC/KP/CMP/2012/13/Add.1 at paras 5 & 6.

¹⁵⁶ Bodansky, Brunnée & Rajamani, *International Climate Change Law*, *supra* note 11 at 205.

¹⁵⁷ Boisson de Chazournes, *Kyoto Protocol*, *supra* note 123 at 4.

¹⁵⁸ *Dialogue on long-term cooperative action to address climate change by enhancing implementation of the Convention*, UNFCCCOR, 11th Sess, Dec 1/CP.11, UN Doc FCCC/CP/2005/5/Add.1 at 3.

by the Bali Action Plan. Through this plan, Parties agreed to work towards agreeing on an outcome and adopting a decision in this respect at COP15, which was to be held in Copenhagen in 2009. This process was to be led a new subsidiary body, the AWG on Long-Term Cooperative Action under the Convention (AWG-LCA),¹⁵⁹ and would address five main topics: (i) a shared vision for long-term cooperative action, (ii) mitigation, (iii) adaptation, (iv) technology development and transfer and (v) provision of financial resources and investment.¹⁶⁰ An important issue introduced in the process was the question of mitigation for developing country Parties: while the discussion of legally-binding “mitigation commitments” was still limited to developed country Parties, the AWG-LCA was to consider the introduction of “nationally appropriate mitigation actions” for developing Parties as well.¹⁶¹

COP15 in Copenhagen was the subject of high expectations by the public, but a lack of progress in the negotiations leading up to it cast doubt towards whether or not a concrete outcome would be reached. Coming into the conference, it was notably not clear if an eventual outcome would be complementary to a second Kyoto commitment period or if it would bring the two tracks together from 2012 onwards.¹⁶² Once in Copenhagen, core negotiations on emissions reductions proved difficult. Compared to the ones leading to the Kyoto Protocol, which were mostly led by developed States Parties with legally binding commitments under the UNFCCC, the Copenhagen negotiations brought a number of new major developing country Parties to the table, namely China, South Africa, India and Brazil (collectively known as the BASIC group of countries). Even though

¹⁵⁹ *Bali Action Plan*, UNFCCCOR, 13th Sess, Dec 1/CP.13, UN Doc FCCC/CP/2007/6/Add. 1 at para 2.

¹⁶⁰ *Ibid* at para 1.

¹⁶¹ *Ibid* at para 1b) i) and ii).

¹⁶² Daniel Bodansky, “The Copenhagen Climate Change Conference: A Postmortem” (2010) 104 AJIL 230 at 233 [Bodansky, “Copenhagen”].

these countries' share of global emissions had become major and was still growing, their views on the historic responsibility of the developed world for climate change made them very reluctant to accept any kind of international emission reduction commitments.¹⁶³

On the final day of COP15, faced with the risk of seeing the conference conclude without a tangible outcome, a group of 28 Parties which included the United States and the BASIC group produced an agreement after intense negotiations, which were conducted separately from the rest of the conference.¹⁶⁴ The agreed outcome, the Copenhagen Accord, contained some significant elements: it put into text an objective for keeping emissions to a level that would amount to an increase in temperature of well below 2°C¹⁶⁵ and set out the basis for a global MRV scheme for national mitigation actions.¹⁶⁶ It also laid the groundwork for the establishment of new institutions for finance as well as for technology transfer, respectively the Green Climate Fund¹⁶⁷ and the Technology Mechanism (TM).¹⁶⁸ From a political standpoint, the accord marked the return of the US on the international climate stage, which was a significant positive development. All of this was however overshadowed by the fact that the Copenhagen Accord was not formally adopted by the COP but merely “taken note of” as a political agreement. This was partly the result of a few Parties once again taking advantage of the UNFCCC consensus voting rules to block formal adoption.¹⁶⁹ The fact that the accord was elaborated between a minority number of States parties and then presented as a finished product to the rest of the COP was also criticized, some negotiators

¹⁶³ *Ibid* at 232.

¹⁶⁴ Bodansky, Brunnée & Rajamani, *International Climate Change Law*, *supra* note 11 at 110.

¹⁶⁵ *Copenhagen Accord*, UNFCCCOR, 15th Sess, Dec 2/CP.15, UN Doc FCCC/CP/2009/11/Add.1 at para 2.

¹⁶⁶ *Ibid* at paras 4 and 5.

¹⁶⁷ *Ibid* at para 10.

¹⁶⁸ *Ibid* at para 11.

¹⁶⁹ Bodansky, “Copenhagen”, *supra* note 162 at 231.

saying the process made it “not recognizable”¹⁷⁰ by delegations who had not participated in the closed meetings. Given this absence of formal adoption, Parties agreed to continue negotiations and extended the mandate of the AWG-LCA, which was to present the outcome of its work the following year at COP16.¹⁷¹ Because of the high expectations leading to the Copenhagen COP and the limited results achieved there, further progress towards a formal universal outcome beyond 2020, at least in the short-term, appeared uncertain in the wake of COP15.

Possibly fueled by their will to turn the page on the disappointment felt at Copenhagen, progress was however made by UNFCCC States Parties in the years that followed. At COP16 in Cancun, a set of decisions were collectively adopted under the title of the Cancun Agreements.¹⁷² The Agreements reiterated and further developed several elements of the Copenhagen Accord, such as the 2°C/1.5°C target¹⁷³ and the eventual modalities for the MRV of developed and developing States Parties’ mitigation actions.¹⁷⁴ They also formally established the Green Climate Fund¹⁷⁵ and the TM,¹⁷⁶ as well as adopted a new Cancun Framework for adaptation.¹⁷⁷ At COP17 in Durban, Parties agreed, through the Durban Platform for Enhanced Action, to launch negotiations towards

¹⁷⁰ Harald Winkler & Judy Beaumont, “Fair and effective multilateralism in the post-Copenhagen climate negotiations” (2010) 10:6 *Climate Policy* 638 at 639. It is however to be noted that a total of 141 UNFCCC States Parties expressed their intention to be listed as agreeing to the Accord, which represents a relatively widespread agreement. For a list of these Parties, see UNFCCC, *Information provided by Parties to the Convention relating to the Copenhagen Accord*, online: UNFCCC <<https://unfccc.int/process/conferences/pastconferences/copenhagen-climate-change-conference-december-2009/statements-and-resources/information-provided-by-parties-to-the-convention-relating-to-the-copenhagen-accord>>.

¹⁷¹ *Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention*, UNFCCCOR, 15th Sess, Dec 1/CP.15, UN Doc FCCC/CP/2009/11/Add.1 at para 1.

¹⁷² *The Cancun Agreements: Outcome of the work of the Ad Hoc Working Group on Long-term Cooperative Action under the Convention*, UNFCCCOR, 16th Sess, Dec 1/CP.16, UN Doc FCCC/CP/2010/7/Add.1.

¹⁷³ *Ibid* at para 4.

¹⁷⁴ *Ibid* at paras 40-46 and 53-66 respectively.

¹⁷⁵ *Ibid* at para 102.

¹⁷⁶ *Ibid* at para 117.

¹⁷⁷ *Ibid* at para 13.

a “protocol, another legal instrument or an agreed outcome with legal force”,¹⁷⁸ to be adopted no later than 2015 and to come into effect from 2020. It was also in Durban that Parties to the Kyoto Protocol formally agreed on a second commitment period beginning in 2013:¹⁷⁹ as touched upon earlier in this chapter, the modalities for this period were determined a year later at COP18 in Doha. Progress towards the outcome to be reached in 2015 was a focus of COP19 in Warsaw and COP20 in Lima, and after meeting 15 times over four years,¹⁸⁰ the Ad Hoc Working Group on the Durban Platform for Enhanced Action produced a draft negotiating text of that outcome in February 2015.¹⁸¹ The draft submitted then was however still very open in form, leaving many alternative outcomes on the table¹⁸²: uncertainty still loomed at the eve of the Paris COP.

2.6 The UNFCCC’s latest milestone: the Paris Agreement

Once in Paris however, the effort put in by States Parties through the previous four years appeared to pay off. The conference was attended by a record number of participants and the atmosphere there was characterized by “a remarkable spirit of cooperation and a determination among governments to reach agreement”.¹⁸³ The Presidency of COP21, led by Laurent Fabius, France’s Minister of Foreign Affairs and International Development at the time, also played an important role in the conference’s success, running the conference in a tightly controlled manner while being perceived as fair and inclusive by States Parties’ delegations. Indeed, it was able to foster progress

¹⁷⁸ *Establishment of an Ad Hoc Working Group on the Durban Platform for Enhanced Action*, UNFCCCOR, 17th Sess, Dec 1/CP.17, UN Doc FCCC/CP/2011/9/Add.1 at paras 2 to 4.

¹⁷⁹ *Outcome of the work of the Ad Hoc Working Group on Further Commitments for Annex I Parties under the Kyoto Protocol at its sixteenth session*, UNFCCCOR, 17th Sess, Dec 1/CMP.7, UN Doc FCCC/KP/CMP/2011/10/Add.1 at para 1.

¹⁸⁰ Bodansky, Brunnée & Rajamani, *International Climate Change Law*, *supra* note 11 at 115.

¹⁸¹ *Negotiating Text*, ADPDR, 2nd Sess, Agenda Item 3, UN Doc FCCC/ADP/2015/1.

¹⁸² Lukas Hermwille et al, “UNFCCC before and after Paris – what’s necessary for an effective climate regime?” (2017) 17:2 *Climate Policy* 150 at 158.

¹⁸³ Richard Kinley, “Climate change after Paris: from turning point to transformation” (2017) 17:1 *Climate Policy* 9 at 10.

on contentious issues by restricting negotiations to key actors for each such issue and then releasing the results to other Parties in the final hours of the Conference, when there was no time left for reopening major debates.¹⁸⁴ While a similar approach had been attempted and failed to be recognized as legitimate in Copenhagen, it succeeded there because it produced results and embodied compromise between a larger number of Parties: it represented the right combination between secrecy and legitimacy.¹⁸⁵ On December 12th, 2015, the closing day of COP21, the outcome of these negotiations was adopted by consensus by all 195 Parties to the UNFCCC. The resulting COP decision effectively adopted the Paris Agreement, the much-anticipated new legal agreement for long-term action, and also covered action for the pre-2020 period.¹⁸⁶ The Paris Agreement was met with great optimism upon its adoption. Ban Ki-Moon, UN Secretary-General at the time, notably hailed it as a “triumph”.¹⁸⁷

The Paris Agreement represented a significant change in approach from the Kyoto Protocol. Indeed, the Protocol had imposed emission reduction obligations only to developed country States Parties in what can be described as a top-down manner. States Parties’ commitments were internationally negotiated at the onset and were subsequently enforced by a centralized compliance mechanism. In contrast, the Paris Agreement is characterized by a hybrid approach. On one hand, it sets forth a top-down, quantitative goal of limiting the increase in global average temperature to well below 2°C with a view to further limiting the increase to 1.5 °C.¹⁸⁸ In order to do so, Parties

¹⁸⁴ See Radoslav Dimitrov, “The Paris Agreement on Climate Change: Behind Closed Doors” (2016) 16:3 Global Environmental Politics 1 at 6.

¹⁸⁵ *Ibid* at 6-7.

¹⁸⁶ *Adoption of the Paris Agreement*, UNFCCCOR, 21st Sess, Dec 1/CP.21, UN doc FCCC/CP/2015/10/Add.1 at 2.

¹⁸⁷ UN News, “COP 21: UN chief hails new climate agreement as ‘monumental triumph’” (12 December 2015), online: UN News <<https://news.un.org/en/story/2015/12/517982-cop21-un-chief-hails-new-climate-change-agreement-monumental-triumph>>, as cited in Kinley, *supra* note 183 at 10.

¹⁸⁸ *Paris Agreement*, *supra* note 2 at art. 2(1) a).

collectively commit to reach peak emissions as soon as possible and thereafter undertake rapid emission reductions in order to achieve emissions neutrality between the year 2050 and 2100.¹⁸⁹ On the other hand, the way these emission reductions are to be achieved is through the formulation of Nationally Determined Contributions (NDCs) to the reduction objective by each State Party.¹⁹⁰ These NDCs constitute the main bottom-up component of the Paris Agreement. As their name implies, they shall be elaborated at the national level and submitted by every individual Party every five years, with the requirement that each Party's successive NDCs represent progression beyond its previous objectives.¹⁹¹ States Parties' NDCs can take various forms: they can have quantitative (such as Canada's economy-wide absolute emission reduction targets)¹⁹² as well as qualitative components (such as India's more generally formulated NDC goals),¹⁹³ and can be either unconditional or conditional to certain factors such as the provision of international support.¹⁹⁴ No matter the form they take, NDCs must nevertheless be accounted for by Parties, in a way that promotes "transparency, accuracy, completeness, comparability and consistency".¹⁹⁵ Through their NDCs, Parties "shall pursue domestic mitigation measures, with the aim of achieving the objectives [of their NDCs]":¹⁹⁶ this introduces a legal obligation of conduct rather than of result.

¹⁸⁹ *Ibid* at art. 4(1).

¹⁹⁰ *Ibid* at art. 4(2).

¹⁹¹ *Ibid* at art. 4(3) and 4(9).

¹⁹² Government of Canada, *Canada's 2017 Nationally Determined Contribution Submission to the United Nations Framework Convention on Climate Change* (2017), online: UNFCCC <<https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Canada%20First/Canada%20First%20NDC-Revised%20submission%202017-05-11.pdf>>.

¹⁹³ Government of India, *India's Intended Nationally Determined Contribution: Working Towards Climate Justice* (2015), online: UNFCCC <<https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/India%20First/INDIA%20INDC%20TO%20UNFCCC.pdf>> at 29.

¹⁹⁴ See e.g. Government of Bangladesh, *Intended Nationally Determined Contributions (INDC)* (2015), online: UNFCCC <https://www4.unfccc.int/sites/ndcstaging/PublishedDocuments/Bangladesh%20First/INDC_2015_of_Bangladesh.pdf> at 9.

¹⁹⁵ *Paris Agreement*, *supra* note 2 at art. 4(13).

¹⁹⁶ *Ibid* at art. 4(2).

In order to ensure the effective implementation of Parties' NDCs and of the Agreement's provisions more generally, a number of legally binding MRV obligations are established. First, a transparency framework is established under Article 13. Parties shall regularly provide a national inventory report of anthropogenic emissions by sources and removals by sinks of greenhouse gases, as well as information necessary to track progress in implementing and achieving their NDCs.¹⁹⁷ This information shall undergo a technical expert review, which shall consider implementation and achievement of Parties' NDCs as well as identify areas of improvement and review the consistency of the information provided in Parties' national reports.¹⁹⁸ Complementarily to these expert reviews, a global stocktake assessing the collective progress towards achieving the purpose of the Paris Agreement shall be undertaken periodically: a first such stocktake shall be undertaken in 2023, with a updated stocktake undertaken every five years thereafter.¹⁹⁹

In addition to the above-described provisions for mitigation, the Paris Agreement also contains provisions on adaptation, climate finance, capacity building, technology transfer as well as loss and damage.²⁰⁰ The two major new mechanisms that had previously been introduced in the Kyoto Protocol, namely the flexibility mechanism and the compliance mechanism, were integrated to a varying degree in the Agreement's provisions. Article 6 provides for different market and non-market approaches for cooperation: these approaches are expected to resemble the Kyoto flexibility mechanisms. Article 15 establishes an implementation and compliance mechanism, but

¹⁹⁷ *Ibid* at art. 13(7).

¹⁹⁸ *Ibid* at art. 13(12).

¹⁹⁹ *Ibid* at art. 14.

²⁰⁰ *Ibid* at art. 7 to 11.

contrarily to its Kyoto counterpart, it is strictly “non-adversarial and non-punitive”.²⁰¹ Lastly, the main UNFCCC institutions, namely the COP, the Secretariat, the SBSTA and the SBI, shall all serve as the respective equivalent bodies to the Paris Agreement.²⁰² According to its Article 21, the Paris Agreement was to enter into force once 55 Parties accounting in total for at least 55 percent of global greenhouse gas emissions deposit their instruments of ratification, acceptance, approval or accession. It was open for signature on April 22, 2016 and was signed by 175 Parties on that first day.²⁰³ The Agreement reached its ratification threshold a few months later and entered into force on November 4, 2016.²⁰⁴

As with the UNFCCC and the Kyoto Protocol, the specific modalities of many of the Paris Agreement’s articles were left to be agreed upon and implemented subsequently to its adoption. This implementation process began at the first part of the first meeting of the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement (CMA1), which was held alongside COP22 in Marrakesh in November 2016. There, Parties agreed on continuing work the implementation process, the Paris Agreement Work Programme, with a view to complete it by the third part of CMA1, which was to be convened in conjunction with COP24 in Katowice:²⁰⁵ CMA1 had indeed been divided into three annual sessions because of the large number of tasks assigned to UNFCCC institutions for this meeting.²⁰⁶ Two years later, rules for many of the Paris Agreement’s provisions, including mitigation, adaptation, the Article 13 transparency framework

²⁰¹ *Ibid* at art. 15(2).

²⁰² *Ibid* at arts. 16 to 18.

²⁰³ United Nations Treaty Collection, “7. d Paris Agreement”, online: UNTC <<https://treaties.un.org/doc/Publication/MTDSG/Volume%20II/Chapter%20XXVII/XXVII-7-d.en.pdf>>.

²⁰⁴ *Ibid*.

²⁰⁵ *Matters relating to the implementation of the Paris Agreement*, UNFCCCOR, 23rd Sess, Dec 1/CMA.1, UN Doc FCCC/PA/CMA/2016/3/Add.1 at para 5.

²⁰⁶ Environmental Law and Policy Editorial Board, “Halting Steps Toward Paris Implementation” (2018) 48:2 *Envl Pol’y & L* 113 at 116-117.

and the Article 14 global stocktake were adopted as part of what was dubbed the “Katowice Rulebook”.²⁰⁷ Parties however failed to agree on the modalities of the flexibility mechanisms under Article 6, and negotiations towards these were postponed to COP25.²⁰⁸ A year later in Madrid, Parties once again failed to agree on rules for Article 6 during what was described as a “disappointing”²⁰⁹ COP25. The SBSTA was mandated to deliver further progress on the draft rules with a view to recommending draft decisions on the matter at COP26, to originally planned in November 2020 in Glasgow but pushed back to 2021 because of the COVID-19 pandemic.²¹⁰ This deadline is important. It was indeed seen as crucial to have rules for the operationalization of the entire Paris Agreement as soon as the Kyoto Protocol’s CP2 ended. COP26 is also important because it is where many States Parties are expected to communicate enhanced NDCs, five years after their initial 2015 submissions. The outcome of COP26 in Glasgow is thus set to be of great importance for the future of the Paris Agreement.

2.7 Conclusion

This chapter drew an outline of the evolution of the UN regime for international climate change law and described its three main instruments, namely the UNFCCC, the Kyoto Protocol and the Paris Agreement. It also described the context surrounding their adoption and implementation. In doing so, the chapter underlined how in the three decades since the inception of the climate regime, development of international climate law has followed a cyclic: after what has been described as

²⁰⁷ For the full set of decisions forming the Katowice Rulebook, see *Decisions adopted by the Conference of the Parties serving as the meeting of the Parties to the Paris Agreement*, UNFCCCOR, 24th Sess, UN Docs FCCC/PA/CMA/2018/3/Add.1 and FCCC/PA/CMA/2018/3/Add.2.

²⁰⁸ *Matters relating to Article 6 of the Paris Agreement and paragraphs 36–40 of decision 1/CP.21*, UNFCCCOR, 25th Sess, Dec 8/CMA.1, UN Doc FCCC/PA/CMA/2018/3/Add.1 at para 3.

²⁰⁹ UN News, “Important opportunity lost as COP25 ends in compromise, but Guterres declares ‘we must not give up’” (15 December 2019), online: UN News <<https://news.un.org/en/story/2019/12/1053561>>.

²¹⁰ *Matters relating to Article 6 of the Paris Agreement*, UNFCCCOR, 25th Sess, Dec 9/CMA.2, UN Doc FCCC/PA/CMA/2019/6/Add.1 at para 2.

a first “constitutional phase”,²¹¹ during which the foundational UNFCCC was negotiated and adopted, came a “regulatory phase”²¹² where more specific commitments and mechanisms were elaborated and enacted as part of the Kyoto Protocol. Partially overlapping with this first cycle, the period spanning the negotiation and adoption of the Paris Agreement can be seen as a second constitutional phase²¹³ during which States Parties worked towards a new instrument of international climate law which would not be operate under the UNFCCC but rather succeed to it in order to reorient international climate action in an evolving world.

Through these two cycles, climate law evolved in a non-linear fashion: the approach to global governance as well as the legal strength of each instrument’s respective norms varied from instrument to instrument. The UNFCCC can indeed be seen as a hybrid between hard and soft law, combining legally binding commitments with a soft overall target and timetable. The adoption of the Kyoto Protocol marked an evolution towards hard law and a top-down approach, with the introduction of quantified emission reduction commitments for developed States Parties and of a legally binding enforcement mechanism. Following the limited success of the Kyoto approach, the regime then reoriented itself towards soft law and a bottom-up approach from the Copenhagen Accord onwards: this resulted in a second hybrid instrument, the Paris Agreement, which combines a quantified target, the NDC process and binding MRV obligations.

Five years after the adoption of the Paris Agreement, the UNFCCC regime is currently at a crossroads. Its latest legal instrument is promising in theory but the political climate through the

²¹¹ Bodansky, Brunnée & Rajamani, *International Climate Change Law*, *supra* note 11 at 102.

²¹² *Ibid* at 105.

²¹³ *Ibid* at 108.

years 2016 to 2020, marked by the announced withdrawal of one of the world's largest greenhouse gas emitters, the United States, cast doubt on its successful implementation. The election of Joe Biden in 2020 has however given new momentum to the Paris Agreement process. In chapter four, the thesis will lay out the argument that the Paris Agreement, in this context, has what it takes to effectively enable States Parties to reach their collective climate stabilization goal. Before this argument can be made however, the theoretical perspective relied upon must be outlined: this will be the subject of the next chapter.

3. Theoretical perspective

Following the overview of UNFCCC climate law done in the previous chapter, the theoretical perspective of the thesis will here be elaborated. This perspective draws upon one established theory of legal analysis, namely the law and economics theory. From this theoretical starting point, three other related theories will be drawn upon for the additional insights they provide to the economic analysis of international climate law. These three theories are respectively the new Chicago school theory, the polycentric governance theory and the innovation and law theory. The four theories will thus be outlined, parallels and links between them highlighted, and their respective relevance to the thesis' subject matter justified. Before doing so however, four core concepts will be defined and delineated in the first section of this chapter. These concepts' broad meaning and use in various fields of research makes them potentially ambiguous. The first part of this chapter will thus attempt to dissipate this ambiguity and define these core concepts' precise scope for the use of the thesis.

3.1 Climate law, regulation, policy and governance: core concepts and definitions

Climate law, as well as environmental law more generally, can be characterized as both fragmented and multifaceted. It is fragmented in the sense that its norms are developed and enforced across different levels of government: the norms and mechanisms of the UNFCCC can be said to form the international (or global) level of climate governance, while other norms, such as carbon taxes and other rules aimed at corporate actors or citizens, can be enacted either at the national, subnational or local levels. Some norms and mechanisms, while not quite global in scope, have a

transnational reach: the European Union's Emissions Trading Scheme (ETS)²¹⁴ and the Western Climate Initiative (WCI),²¹⁵ in which participate both the Canadian province of Quebec and the U.S. state of California, are two examples of this.

Climate law is also fragmented within these different levels of government. At the international level, it is split across a number of different international regimes or fora. For example, international climate law interacts with other international environmental legal regimes (such as the regimes for the protection of biodiversity and of the ozone layer) as well as with the trade law regime of the World Trade Organization (WTO). At the national level, environmental lawmaking is often split across the respective responsibilities of various ministries. In federal states, this fragmentation is further complicated by the separation of legislative powers between the national and subnational levels. In Canada for example, the fragmentation thus occurs at the federal level between (amongst others) the ministry of environment and ministry of natural resources, as well as with the provinces who have their own exclusive legislative competences touching on climate matters.²¹⁶ Another aspect of climate law's fragmentation lies in the fact that its norms vary in their legal nature, ranging from traditional "hard" law, to intermediary soft law and non-legal norms and instruments. The content of the UNFCCC treaties illustrates of the varying legal nature of climate norms: some articles in the treaties introduce clear legal obligations to states, while

²¹⁴ European Commission, *Directive 2003/87/EC of the European Parliament and of the Council of 13 October 2003 establishing a scheme for greenhouse gas emission allowance trading within the Community and amending Council Directive 96/61/EC*, [2003] OJ, L275/32.

²¹⁵ Western Climate Initiative, *Design for the WCI International Program* (July 2010), online: MELCC <<http://www.environnement.gouv.qc.ca/changements/carbone/documents-WCI/cadre-mise-en-oeuvre-WCI-en.pdf>>.

²¹⁶ For a recent article touching on the fragmentation of climate change law within Canada, see Hélène Trudeau & Charles Codère, «À la recherche d'une tarification pancanadienne du carbone : les enjeux juridiques de la coopération intergouvernementale pour protéger le climat», in Nicolas Levrat et Johanne Poirier, eds, *Les jeux du droit et le fédéralisme coopératif*, (2018) 18 *Fédéralisme Régionalisme*, online : ULiège <<https://popups.uliege.be/1374-3864/index.php?id=1756>>.

others are instead formulated with a less stringent wording, recommending for example that States parties “should” fulfill certain obligations.

At the root of the fragmentation of climate law lies its fundamentally multifaceted nature. As a planetary phenomenon, climate change must be properly scientifically understood in order to be addressed. The fact that the UNFCCC lawmaking follows the scientific data of the IPCC illustrates this. Since many of our everyday actions as humans, including our general patterns of consumption and transport, contribute to our greenhouse gas emissions and thus to the climate crisis, climate law must also take into account the political and economic realities of our contemporary societies in order to be effective.

Before further discussing the theoretical perspective that this thesis will rely upon however, it is necessary to define a number of core concepts in order to properly delimit the thesis’ subject matter. One important conceptual disambiguation pertains to the four concepts of law, regulation, public policy and governance. Indeed, at both the national and international levels of climate governance, law is one tool to orient behaviour in order to reach the goal of solving the climate crisis. The related tools of regulation and policy are also relied upon in the UNFCCC governance regime as well as at other levels. Regulation and policy are measures enacted by ministries, government agencies and even private actors which are not law per se but often share the same objective. In climate law and policy literature, a certain ambiguity sometimes surrounds the terms law, regulation, policy and governance: the interrelation and distinctions between the terms is not always made clear. The fact that this literature spans many academic disciplines no doubt contributes to this ambiguity. As the theoretical foundations of this thesis require a clear

understanding of these four related but distinct concepts in order to be properly articulated, the current section will attempt to define them succinctly. In doing so, the analysis will focus on defining the concepts as used in the field of climate change law in a functional and straightforward manner; an in-depth explanation of their meaning as concepts of legal philosophy lies outside the scope of such an analysis.

3.1.1 Law

Law is defined in the Oxford dictionary of law as the “enforceable body of rules that govern any society”, or “one of the rules making up the body of law”.²¹⁷ The UNFCCC and its related instruments, which have been the focus of this thesis’ analysis so far, are part of the body of international environmental law, a branch of public international law. Public international law can be defined as “the system of law regulating the interrelationship of sovereign states and their rights and duties with regard to one another.”²¹⁸ The Oxford dictionary goes on to mention that in addition to states, “certain international organizations (such as the United Nations), companies, and sometimes individuals (e.g. in the sphere of human rights) may have rights or duties under international law.”

The sources of international law are listed in Article 38 (1) of the Statute of the International Court of Justice (ICJ). They are “a. international conventions, whether general or particular, establishing rules expressly recognized by the contesting states; b. international custom, as evidence of a general practice accepted as law; [and] c. the general principles of law recognized by civilized

²¹⁷ Jonathan Law, *A Dictionary of Law*, 9th ed (Oxford: Oxford University Press, 2018) *sub verbo* “law”.

²¹⁸ *Ibid*, *sub verbo* “international law”.

nations.”²¹⁹ Although not formal sources of international law themselves, “judicial decisions and the teachings of the most highly qualified publicists of the various nations”²²⁰ can also be relied upon as subsidiary means for the determination and interpretation of rules of law.²²¹ International treaties are often seen as the primary source of international law, and this holds true in the field of international environmental law as well. However, as Redgewell notes, the relationship between the three types of sources in the field of environmental law is characterized by its fluidity: “treaties may codify or generate custom; general principles may be articulated in treaty texts, reflect custom [or] fit within the Article 38(1) (c) category of general principles”.²²²

From the adoption of the ICJ Statute up to today, public international law has evolved: developments such as the adoption of new international agreements, the establishment of new international organizations and institutions through these agreements as well as new dynamics in State practice are signs of this evolution. As a result of these developments, questions have been raised in academic circles regarding the emergence of possible new sources of international law, which could be complementary to the Article 38 sources. Two such potential new sources are particularly relevant in the field of international environmental law. The first encompasses the acts of international organizations and the related decisions by organs set up under certain MEAs, such as the UNFCCC COP.²²³ Even though these decisions are not legally binding in a strict sense, they

²¹⁹ *Statute of the International Court of Justice*, June 26 1945, 33 UNTS 933 at art. 38 (1).

²²⁰ *Ibid* at art. 38 (1) d.

²²¹ A prime example of a judicial decision fulfilling this interpretative role in regard to a norm of international environmental law is the ICJ’s advisory opinion in the *Legality of the Threat or Use of Nuclear Weapons Case*, in which the Court addresses the principle of intergenerational equity. See *Legality of the Threat or Use of Nuclear Weapons Case*, Advisory Opinion, [1996] ICJ Rep 226 at 244.

²²² Catherine Redgewell, “Sources of International Environmental Law: Formality and Informality in the Dynamic Evolution of International Environmental Law Norms”, in Besson & d’Aspremont, *supra* note 12 939 at 943.

²²³ Maglosia Fitzmaurice, “The History of Article 38 of the Statute of the International Court of Justice: The Journey from the Past to the Present”, in Besson & d’Aspremont, *supra* note 12 179 at 195.

have been referred to as “de-facto law making”, since they bypass the traditional step of state consent while sometimes introducing new or more specific obligations. These obligations stem from the original MEA text but not included in it, which States still accept and work to implement. This gives them some characteristics of legal norms.²²⁴

The second potentially emerging new source of international law relates to the legal status of soft law instruments, which have greatly grown in number and importance over the last decades. The term soft law defies easy definition to this day, with some scholars, such as law professor Prosper Weil, making the case that it is a *non sequitur*. According to him, instruments or provisions are indeed either legal and or non-legal, with no in-between.²²⁵ Other scholars have since gone past this dichotomy and attempted to define and study soft law. One definition of the term is “a variety of non-legally binding instruments used in contemporary international relations by States and international organizations.”²²⁶ Soft law cannot be seen as a new source of law per se,²²⁷ but its growing influence, especially in environmental treaty regimes, cannot be denied. The fact that it plays an important role “in the development of international environmental norms and [has a] clear contribution to regime building, [notably] in the climate change context [...] reflects a view of [international environmental law] not in binary terms but as a continuum, with some blurring of the line between hard and soft law, and between formal and informal sources of [international environmental law].”²²⁸

²²⁴ *Ibid.*

²²⁵ Prosper Weil, “Towards Relative Normativity in International Law?” (1983) 77:3 AJIL 413 at 414.

²²⁶ Alan Boyle, “Soft Law in International Law-Making”, in Malcolm Evans, ed, *International Law* (Oxford: Oxford University Press, 2018) 118 at 119-120.

²²⁷ Fitzmaurice, *supra* note 223 at 197.

²²⁸ Redgwell, *supra* note 222 at 958.

3.1.2 Regulation

Regulation is a concept whose precise nature can vary depending on the context of its use. Social scientists Baldwin, Cave and Lodge point to Selznick's general definition of the term: he defines regulation as "sustained and focused control exercised by a public agency over activities that are valued by a community"²²⁹. From this central definition, they also identify three different dimensions of regulation, which go from narrow to broad. The first and narrowest is regulation "*as a specific set of commands*—where regulation involves the promulgation of a binding set of rules to be applied by a body devoted to this purpose"²³⁰. This definition is commonly associated to the field of legal analysis as it limits itself to binding rules, a defining characteristic of legal norms, and does not consider other regulation mechanisms.

The second definition, broader than the first, is regulation "*as deliberate state influence*—where regulation has a more broad sense and covers all state actions that are designed to influence business or social behaviour"²³¹. This definition is often linked to economics and includes "softer" mechanisms used by the State, such as taxes or subsidies, in addition to the binding command-type mechanisms of the previous definition.

The third and broadest definition is regulation "*as all forms of social or economic influence*—where all mechanisms affecting behaviour—whether these be state-based or from other sources

²²⁹ Philip Selznick, "Focusing Organisational Research on Regulation", in Roger G. Noll, ed, *Regulatory Policy and the Social Sciences* (Berkeley: University of California Press, 1985) 363 at 363, as quoted in Robert Baldwin, Martin Cave and Martin Lodge, *Understanding Regulation: Theory, Strategy, and Practice* (Oxford: Oxford University Press, 2011) at 3.

²³⁰ Baldwin, Cave & Lodge, *supra* note 229 at 3.

²³¹ *Ibid* at 4.

(e.g. markets)—are deemed regulatory.”²³² This definition is often used in the field of social sciences since it takes into consideration the actions of both state and non-state actors. All actions which have regulatory effects are also included in this definition, whether these effects are central or secondary to the action and whether they are intended or not.²³³ It must be noted that the above-described three dimensions should not be understood as opposed to one another but rather as complementary, and as a result should all be taken into account when assessing regulation.

Two different types of regulation can be distinguished relatively to their objective. The first, social regulation, is designed to counterbalance information asymmetries as well as externalities in a broad sense, which are two economic terms describing the undesirable effects of certain actions to third parties.²³⁴ An example of externality would be the damage caused to the neighbour of a polluting factory by that factory’s emission of polluting substances in the air: the neighbour, while not benefitting from the factory’s polluting, must bear the cost of it, either by suffering its effects or by adapting to it in some way or other. The objective of social regulation in this case would be to pass on this cost to the polluting factory, in other words internalizing the externality. With this objective in mind, social regulation is thus usually used in the context of safety, health, environmental and consumer protection.²³⁵

The second type, economic regulation, limits itself to market economies. It is used to rebalance markets which are not sufficiently competitive. According to Ogus, this can either be done by

²³² *Ibid.*

²³³ *Ibid.*

²³⁴ Anthony Ogus, “Regulatory Institutions and Structures” (2002) 73:4 *Annals of Public and Cooperative Economics* 627 at 630.

²³⁵ *Ibid.*

encouraging the emergence of competing firms through the application of competition law, or, in situations where natural monopolies exist, through other measures such as public ownership or price and quality regulation.²³⁶

In regard to its geographical scope, regulation has traditionally been understood as enacted at the subnational and national levels, operated by local or national governments. International regulation has however begun to emerge, notably because of the internationalization of markets. In a context where actors such as corporations operate internationally, international regulation can be used to ensure a level playing field with common standards that apply across boundaries: this allows governments to keep some control over their economic markets while also providing stability to the actors operating internationally.²³⁷ The enactment and enforcement of regulation at the global level is however sometimes problematic as the hierarchal structure necessary to do so does not exist: states are not inclined to accept the limits to their sovereignty resulting from binding international regulation.

Theories from a number of different fields have been put forth to explain the rationale behind regulation. Two important ones from the field of economics are the opposed public interest and public choice theories. According to public interest theory, regulation is to be interpreted as a “benevolent political intervention (used) to preserve public interest”²³⁸ and maximize public welfare. Conversely, public choice theory posits that regulation, as well government and political

²³⁶ *Ibid* at 635-637.

²³⁷ Baldwin, Cave & Lodge, *supra* note 229 at 375.

²³⁸ John A. C. Conybeare, “Politics and Regulation: The Public Choice Approach” (1982) 41:1 Australian Journal of Public Administration 33 at 33.

action in general, is driven by the economic theory of rational self-interested behaviour.²³⁹ According to public choice theory there thus exists a risk of regulation leading to the hijacking of benefits by special interest groups which are able to influence government regulation at the expense of public welfare.²⁴⁰

While both public interest and public choice theories offer interesting arguments for explaining the motivation behind regulation, some suggest that the theories should not be seen as mutually exclusive but rather as complementary. Hood, Rothstein and Baldwin, for example, argue that both “public attitudes” (a central element of public interest theory) and “organized interests” (a central element of public choice theory), in addition to the type of risk to be addressed, should be taken into consideration when attempting to understand regulatory regimes.²⁴¹ As the authors underline, even these three elements do not however allow to completely predict the content of regulatory regimes, whose analysis remains an “inexact science”.²⁴² This must be kept in mind when attempting to understand regulation theory.

Climate change is a novel phenomenon in many respects. In the field of natural sciences, for example, it has forced climate scientists to develop complex modelling techniques in order to better understand the many interrelated and long-term effects of the changing climate. In a similar manner, it presents a number of new challenges for regulation. A main challenge for climate change regulation is the cross-cutting nature of the phenomenon: its complex causes, far-reaching

²³⁹ *Ibid.*

²⁴⁰ *Ibid.*

²⁴¹ Christopher Hood, Henry Rothstein & Robert Baldwin, *The Government of Risk: Understanding Risk and Regulation Regimes* (Oxford: Oxford University Press, 2003) at 143-144.

²⁴² *Ibid.*

consequences and global nature call for regulatory responses that will often go beyond the established categories described in the previous section. For one, climate change is likely to draw upon all three of the dimensions of regulation described by Baldwin, Cave and Lodge. Indeed, research on climate change is being done in a variety of disciplines, including law, economics as well as political and social sciences. It is thus crucial to keep all three dimensions, from narrow to broad, in mind when examining material related to climate change regulation, be it academic work on the subject or concrete policies put in place. Failure to do so could lead to misunderstandings about the scope and goals of the regulatory measures discussed in the material.

In regard to its geographical scope, regulation for climate change is also bound to challenge established categories as it is enacted at the local, national and international levels. The now-defunct Kyoto Protocol was an attempt at centralized global climate change regulation: it contained binding measures for countries which were to be enforced through a mix of market-based and command-and-control measures established under the Protocol. As was outlined in the previous chapter, its success was mitigated as a number of States Parties opted to not take on commitments for its CP2. Possibilities for global climate regulation remain, notably at the sectoral level: an interesting example is the International Maritime Organization (IMO)'s strategy on the reduction of greenhouse gas emission by ships,²⁴³ adopted in 2018. The main challenge at the international level however remains in developing structures that will reduce redundancies and conflicts between regulatory norms as well as improve coordination and effectivity. The Paris Agreement constitutes the international community's latest attempt at solving this challenge.

²⁴³ *Initial Strategy on Reduction of GHG Emissions from Ships*, IMOOR, Annex 11, UN Doc MEPC 72/17/Add.1 (2018).

With these challenges in mind, an interesting strategy has been put forth by political scientist Ian Bartle. Recognizing the complexity of climate change regulation, he suggests developing regulation consisting of what he calls “transparent core and complementary policies”.²⁴⁴ The core would consist of an instrument for quantified emissions reductions, while complementary policies, like educational programmes and other forms of capacity-building, would be used to reinforce this instrument while staying in touch with the various local legal, social and economic circumstances.²⁴⁵ Transparency regarding the modalities of these policies is required in order to ensure their proper application as well as their acceptance by private actors and society. According to Bartle’s strategy, the role of international law and institutions would thus be to provide a forum for the implementation of the main instrument, coordinate the different complementary policies as well as promote transparency. The Paris Agreement, with its quantified target, NDC process and binding MRV obligations, can be understood as in line with this conceptualization of climate regulation.

3.1.3 Public policy

Public policy is another relatively ambiguous concept. It is rather vaguely defined in the Oxford dictionary of Law as “the principles that underpin the legal system and society”²⁴⁶. In common-law jurisdictions, a contract that is contrary to public policy will generally be treated as illegal.²⁴⁷ In this respect, public policy in its narrow legal sense can be understood as somewhat analogous to the civil law concept of *ordre public*, although the two concepts do not fully coincide.²⁴⁸ Outside

²⁴⁴ Ian Bartle, *A strategy for better climate change regulation: towards a public interest orientated regulatory regime* (2009) 18:5 Environmental Politics 689 at 700.

²⁴⁵ *Ibid.*

²⁴⁶ Law, *supra* note 217 *sub verbo* “public policy”.

²⁴⁷ *Ibid.*

²⁴⁸ See Gerhart Hessel, “Public Policy and Ordre Public” (1938) 25:1 Va L Rev 37 at 40.

the legal discipline however, public policy (sometimes referred to only as policy) is understood differently. In the broader field of social sciences, public policy was originally understood as “a soft synonym for public opinion or general will or consensus”,²⁴⁹ rather than a specific scientific term. As political scientist Theodore J. Lowi notes, it appears to be an established concept only in the English language,²⁵⁰ and its emergence in the middle of the nineteenth century²⁵¹ makes it a relatively recent one even in English-speaking countries. Through the 19th and 20th centuries, as the role of government in western democratic states grew, the term came to be interpreted more and more as an element of the legislative process. According to Lowi, this happened in two steps. The first significant evolution in the understanding of the term can be traced back to political scientist and later United States president Woodrow Wilson’s seminal article *The Study of Administration*. There, he associates policy (or rather its plural form *policies*) to *politics*, which he identifies as one of the two main separate functions of the state, the other being administration.²⁵² Policies were the expression of the state’s will, the work of the legislator, while administration was the execution of these policies, the work of the government.²⁵³

Over the following decades, as national governments grew in size and became more highly differentiated through the establishment of separate ministries and agencies, the term public policy further evolved. In the United States, for example, the increase in size and reach of government came as a result of the progressive reforms put in place by president Franklin Roosevelt to stabilize

²⁴⁹ *Ibid* at 494.

²⁵⁰ Theodore J. Lowi, “Law vs. Public Policy: A Critical Exploration” (2003) 12:3 Cornell JL & Pub Pol’y 493 at 494.

²⁵¹ *Ibid* at 493.

²⁵² Woodrow Wilson, “The Study of Administration” (1887) 2:2 Political Science Quarterly 197 at 210-211.

²⁵³ Frank J. Goodnow, *Politics and Administration: A Study in Government* (New York: Macmillan, 1900) at 18, as quoted in Lowi, *supra* note 229 at 496.

the economy in the aftermath of the Great Depression.²⁵⁴ The idea of a rigid separation between politics and administration was set aside, the political process instead conceptualized as a “seamless web” where law or policy was developed every step of the way. In this web, the distinction between law and policy is blurred, which caused the two terms to become to some extent synonymous.²⁵⁵ Lowi points to the growing amount of discretion delegated to government agencies in interpreting and applying legislation as an example of this blurring of the line between law and policy.²⁵⁶

Despite this blurry boundary however, more focused definitions of public policy can be found in political science literature. Kraft and Furlong for example define it as “the sum of government activities, whether pursued directly or through agents, as those activities have an influence on the lives of citizens”.²⁵⁷ Stressing the fact that not everything the government does qualifies as policy, they identify three separate levels of it. The first consists in policy choices, the decisions affecting citizens made by politicians, civil servants or others who are in a position of authority.²⁵⁸ The second is policy output, which is the setting of these choices into action, whether it be rulemaking, the establishment of programs or the allocation of money towards an outcome.²⁵⁹ The third level consists in policy impacts, the effects of the policy outputs on citizens which “to some degree reflect the success or failure of public policy choices and outputs”.²⁶⁰ The authors insist on the fact that not all policy is implemented by the central government itself. Private organizations and

²⁵⁴ See Kevin J. Fandle, *Law and Public Policy* (New York: Routledge, 2018) at 15.

²⁵⁵ Lowi, *supra* note 250 at 496.

²⁵⁶ *Ibid* at 499.

²⁵⁷ Michael E. Kraft & Scott R. Furlong, *Public Policy: Politics, Analysis and Alternatives*, 5th ed (Thousand Oaks: SAGE, 2020) at 4.

²⁵⁸ *Ibid*.

²⁵⁹ *Ibid*.

²⁶⁰ *Ibid*.

individual citizens can also be involved in the policy process, as are subnational and local governments. As a result, the nature of public policy is complex and interorganizational: “policies [...] emerge from a large number of programs, legislative intentions, and organizational interactions that affect the daily lives of citizens.”²⁶¹

3.1.4 Governance

Governance is yet another concept that defies simple definition. Understanding of the term has evolved over time and its use in business and political circles in addition to academia makes it a multifaceted term which can mean different things depending on the context of its use. In the United Nations system, the UNDP was the first agency to broadly define governance in a 1995 report as “encompass[ing] the direct and indirect management by the State of public affairs and regulatory control of private activities that impinge on human affairs”, whether political, economic or administrative in nature.²⁶²

Recognizing the need for a clearer common understanding of the concept of governance throughout the United Nations system, the UN Economic and Social Council (ECOSOC)’s Committee of Experts on Public Administration produced a report in 2006 in which they gathered and compared a number of definitions put forth by international organizations as well as by prominent scholars on the subject.²⁶³ Some of the definitions cited in the report are broader in scope and less state-centric than the UNDP’s. The Committee for example quotes political scientist

²⁶¹ *Ibid* at 5.

²⁶² UNEP, *Public Sector Management, Governance, and Sustainable Human Development: A discussion paper* (New York: United Nations, 1995) at 19.

²⁶³ Committee of Experts on Public Administration, *Definition of basic concepts and terminologies in governance and public administration*, 5th Sess, Agenda Item 5, E/C.16/2006/4 [Committee of Experts].

and governance theory expert Jon Pierre, who defines governance as the act of “sustaining coordination and coherence among a wide variety of actors with different purposes and objectives”.²⁶⁴ In compiling and comparing these definitions, the Committee frames the concept’s rise to importance as part of a shift in the administrative structure of western democracies over the course of the 20th century from a centralized and bureaucratic State authority to what it calls the “hollow State”.²⁶⁵ In this hollow State, “governance refers to the lateral and inter-institutional relations in administration in the context of the decline of sovereignty, the decreasing importance of jurisdictional borders and a general institutional fragmentation.”²⁶⁶

The Committee however argues that the State is still an important actor in this new context. In support of this it points to Peters and Pierre’s definition of governance. There, governance is characterized by a “growing reliance on less coercive policy instruments” in which “the State plays a leading role, making priorities and defining objectives.”²⁶⁷ The metaphor of a boat can be brought up to illustrate this conceptualization of governance: in this metaphorical boat, the State “steers” by taking the decisions, setting objectives and coordinating action for society and the economy, while it delegates varying amounts of the “rowing”, the concrete actions carried out to reach these objectives, to other actors.²⁶⁸

²⁶⁴ Jon Pierre, *Debating Governance: Authority, Steering, and Democracy* (Oxford: Oxford University Press, 2000) at 3-4, as quoted in Committee of Experts, *supra* note 263 at para 7.

²⁶⁵ Committee of Experts, *supra* note 263 at para 2.

²⁶⁶ H. George Frederickson & Kevin B. Smith, *The Public Administration Theory Primer* (Boulder: Westview Press, 2003) at 236, as quoted in Committee of Experts, *supra* note 263 at para 2.

²⁶⁷ Jon Pierre & Guy B. Peters, *Governance, Politics and the State* (New York: St. Martin’s Press, 2000), as quoted in Committee of Experts, *supra* note 263 at para 8.

²⁶⁷ *Ibid.*

²⁶⁸ See Robert E. Goodin, Martin Rein & Michael Moran, “Overview of Public Policy: The Public and Its Policies” in Robert E. Goodin, ed, *The Oxford Handbook of Political Science* (Oxford: Oxford University Press, 2011) at 896.

Another conceptualization of governance is put forward by law professor Lewis Kornhauser. According to his theory, governance requires that a society accomplish four tasks: characterize acceptable (or unacceptable) behaviour, police behaviour to identify likely instances of deviant behaviour, adjudicate non-conformity to social norms, and sanction deviant behaviour”.²⁶⁹ He further argues that institutional structures are “simply the basic rules or protocol for governance”.²⁷⁰ These structures can be simple or very complex, depending on the society they represent. The State can be understood as one such structure, as can international regimes such as the UNFCCC.

Corporations can be viewed as another institutional structure. As such, their relationship to governance is twofold. On one hand, in a State-led or global governance regime, corporations form a category of non-state actors who is expected to respond to governmental policy. On the other hand, inside their own corporate structure, they are the ones doing the “steering”, setting objectives and coordinating the action of their components through rules and company policy. This second role is often discussed in the context of corporate social responsibility (CSR). CSR can be defined as a form of self-regulation by private corporate actors,²⁷¹ stemming from “the general belief held by many that modern businesses have a responsibility to society that extends beyond the stockholders or investors in the firm.”²⁷² It consists in a “comprehensive set of policies, practices and programs that are integrated into business operations, supply chains, and decision-making

²⁶⁹ Edward N. Zalta, ed, *The Stanford Encyclopedia of Philosophy* (Fall 2017 Edition), “The Economic Analysis of Law” by Lewis Kornhauser, online: Stanford <<https://plato.stanford.edu/archives/fall2017/entries/legal-econanalysis/>> at para 3.3 [Kornhauser, *Economic Analysis of Law*].

²⁷⁰ *Ibid* at 18.

²⁷¹ Benedict Sheehy, “Defining CSR” (2015) 131 *Journal of Business Ethics* 625 at 635.

²⁷² SAGE Publications, *SAGE Brief Guide to Corporate Social Responsibility* (Los Angeles: SAGE, 2012) at 2.

processes throughout the company.”²⁷³ Through CSR, corporate actors operate with the goal of “achieving commercial success in ways that honor ethical values and respect people, communities, and the natural environment”²⁷⁴. Understood this way, CSR can be seen as a link between the two roles of the corporation in governance networks: corporations can “steer” themselves internally through CSR, which allows them to align with state policy priorities while reducing the need for them to be directly subjected to State coercive power.

3.1.5 Articulating the four concepts

The definitions of law, regulation, policy and governance outlined in this section highlight the fact that the four concepts are closely linked. In its simplest form, their relation to one another can be summarized as follows. Regulation is a type of normative activity which can be used to steer the behaviour of actors in a governance context. It is used by governments, in which case it can be seen as an output for public policy choices, but it can also be used by other actors, such as corporations. Law can then be understood as a specific form of regulation, used by States (in the case of domestic law) and some international organizations (in the case of international law) to fulfill their role of coordinating action, or “steering” in this governance context. Law’s normative strength, combined with the fact that is the exclusive prerogative of States and a few international bodies, is what sets it apart from other forms of regulation.

²⁷³ Business for Social Responsibility, *Overview of Corporate Social Responsibility* (San Francisco: BSR, 2004), online:

<http://www.bulentsenver.com/yeditepe/htm/BSR%20%BB%20Business%20for%20Social%20Responsibility%20-%20Overview%20of%20Corporate%20Social%20Responsibility-b.htm>.

²⁷⁴ Allen L. White, *Business Brief: Intangibles and CSR* (2006), online: BSR https://www.bsr.org/reports/BSR_AW_Intangibles-CSR.pdf at 6.

As environmental law professor Jutta Brunnée further explains, a certain number of distinctive characteristics are what gives legal norms their legal legitimacy and high level of persuasiveness. They can be summarized as reasonableness, coherence among norms, coherence with official action, transparency and predictability.²⁷⁵ The more these requirements are met, the more legitimate a norm will be considered and the greater its power to promote adherence will be. Some non-legal norms, whether regulation or soft law, often present some of these characteristics: as such, they can contribute to orienting behaviour alongside law.

Thus, the four concepts of law, regulation, policy and governance all play a part in the functioning of international law. But how are each of them specifically articulated in the UNFCCC regime? Proper understanding of climate law requires analysis of its various norms themselves, but also of their adoption, their effects and alternatives. One theory of legal analysis in particular appears useful in order to properly understand all of these elements: the economic analysis of law. The following section will briefly outline the evolution of the theory before explaining its core concepts and ideas. In doing so, it will highlight how elements of an economic analysis can be particularly useful in understanding environmental law.

3.2 The thesis' perspective: primary and complementary theoretical approaches

3.2.1 The economic analysis of environmental law

The link between environmental law and economics is both long-standing and complex. Indeed, many environmental laws integrate elements from the field of economics. One of the greatest

²⁷⁵ Jutta Brunnée, "COPing with Consent: Law-Making Under Multilateral Environmental Agreements" (2002) 15 *Leiden Journal of International Law* 1 at 36.

successes in US domestic environmental law, the control of the emission of substances causing acid rain, was for example accomplished thanks to the application of an economic instrument, adopted as part of the 1990 *Title IV* amendment to the federal Clean Air Act.²⁷⁶ But according to climate law professor Navraj Singh Ghaleigh, economics has not been engaged with in public international law circles to the same extent as it has in other branches of law.²⁷⁷ This comes across as surprising since the Stern Review, which is considered as one of the landmark studies on the socio-economic effects of climate change alongside the work of the IPCC, is the work of an economist.²⁷⁸ Much national and international climate policy was designed around ideas put forth in the economic assessment that is the Stern Review. A theory which enables us to understand the relationship between international climate law and economics thus would appear to be a useful and possibly underused lens through which analyze climate law: this is where the law and economics theory comes into play.

But what exactly is the law and economics theory? At its root, law and economics, also known as the economic analysis of law, is a theory of legal analysis which “applies the tools of microeconomic theory to the analysis of legal rules and institutions”.²⁷⁹ Microeconomics, in turn, can be defined as the branch of economics that studies the behaviour of individuals and firms in making decisions regarding the allocation of limited resources, the interactions among these individuals and firms as well as the effect of government choices on these behaviours and

²⁷⁶ *Acid Rain Program Regulations*, 40 C.F.R. Parts 72-78 (1990). For an overview of the instrument, see Environmental Protection Agency, “1990 Clean Air Act Amendment Summary: Title IV – Acid Deposition Control”, online: EPA <<https://www.epa.gov/clean-air-act-overview/1990-clean-air-act-amendment-summary-title-iv>>.

²⁷⁷ Navraj Singh Ghaleigh, “Economics and International Climate Change Law” in Gray, Tarasofsky & Carlarne, *supra* note 33 at 75.

²⁷⁸ Nicholas Stern, *The Economics of Climate Change: The Stern Review* (Cambridge: Cambridge University Press, 2007).

²⁷⁹ Kornhauser, *Economic Analysis of Law*, *supra* note 269 at para 1.

interactions.²⁸⁰ Four fundamental concepts of microeconomics are useful in order to understand the law and economics approach: they are scarcity, rationality, equilibrium and efficiency. The first concept, scarcity, refers to resources: each actor has a limited amount of resources (be it time or capital) to allocate among competing ends, which are in theory unlimited.²⁸¹ In this context, actors must make decisions on how to allocate these resources.

Second, microeconomics posits that in allocating these resources, actors behave in a rational manner, which entails that each of them will act in order to maximize their respective utility:²⁸² individuals will maximize happiness or general satisfaction, firms will maximize profit, governments will maximize the results of their policy goals.

Third, economists believe that every social phenomenon can be described as an equilibrium in the interaction of these rational maximizing actors. The actors interact in a dynamic similar to individuals bargaining in a market setting: each of them will push to maximize their utility until a mutually satisfactory outcome is reached. This outcome represents an equilibrium, “a pattern of interaction that persists unless disturbed by outside forces”.²⁸³ This equilibrium is not the necessarily the intention of the actors involved, but rather the natural result of their combined maximizing behaviours.

²⁸⁰ Nigar Hashimzade, Gareth Myles & John Black, *A Dictionary of Economics*, 5th ed (Oxford: Oxford University Press, 2017) *sub verbo* “microeconomics”.

²⁸¹ Robert Cooter & Thomas Ulen, *Law and Economics*, 6th ed (London: Pearson, 2012) at 12.

²⁸² *Ibid.*

²⁸³ *Ibid* at 13.

The fourth concept, efficiency, can be understood in two ways. The first refers to production processes: such a process is considered efficient either if it is not possible to produce the same amount of output using a lower-cost combination of inputs, or if it is not possible to produce more output with the same combination of inputs.²⁸⁴ The second, known as Pareto efficiency after its inventor's last name, refers not to production but to the satisfaction of individual preferences: it is alternatively sometimes referred to as allocative efficiency. A situation (an aforementioned equilibrium) is considered Pareto efficient if it is impossible to change it to make one actor better off without making another worse off.²⁸⁵

Seen through the lens of microeconomics, law can thus be conceptualized as “a social tool aiming at the promotion of economic efficiency – something it has in common with other social practices.”²⁸⁶ The basic approach used in law and economics consists in comparing different equilibria, a method known as comparative statics.²⁸⁷ In doing so, the law and economics perspective allows us to look at how legal norms influence a certain equilibrium, and whether or not the norms and resulting equilibrium contribute to an efficient outcome. This efficiency criteria resembles the Pareto criteria and can be described as follows: a situation is deemed efficient if it maximizes the possibility for an actor to use environmental resources as a tool for socio-economic development, while not jeopardizing others' fair access to, and use of, these same environmental resources. In this sense, an environmentally efficient outcome can be likened to an outcome which respects the concept of sustainable development. In economic terms, this efficient outcome could

²⁸⁴ *Ibid* at 13-14.

²⁸⁵ *Ibid* at 14.

²⁸⁶ James Fieser & Bradley Dowden, eds, *Internet Encyclopedia of Philosophy*, “Law and Economics” by Brian E. Butler, online: University of Tennessee <<https://iep.utm.edu/law-econ/>> at 1.

²⁸⁷ Cooter & Ulen, *supra* note 281 at 13.

then be described as the point where the marginal benefit to society of reducing pollution is equal to the marginal cost of this reduction, assuming that these costs and benefits are properly measured to include all the advantages and disadvantages to society of reducing pollution to different levels. This efficient outcome will generally not lead to a total elimination of pollution, as some pollution is an unavoidable effect of human activity and is acceptable insofar as it is emitted in quantities which the Earth's ecosystems are able to process.²⁸⁸

The situations relevant to environmental law do not limit themselves to one-on-one interactions. Rather, they often involve a large number of actors whose behaviours have an impact on the well-being of society at large. In order to analyze these situations, it is thus necessary to further draw upon some concepts of welfare economics. This branch of economics uses the microeconomics techniques described previously to evaluate social welfare, which can be defined as the well-being of society at large.²⁸⁹ Two main thinkers' theories are especially important in order to properly understand the concepts of welfare economics relevant to environmental law. The first is Pigou's, who is considered the founder of the field.²⁹⁰ His seminal book *The Economics of Welfare*²⁹¹ is credited for developing the concept of externalities, which is central to the economic analysis of environmental law. Externalities can be defined as the effects of an exchange which affect actors who are not parties to the exchange themselves. Since these effects do not directly affect the bargaining parties, they tend to not be accounted for in the exchange. Externalities can be both positive (an external benefit) or negative (an external cost). An example of an external benefit is

²⁸⁸ *Ibid* at 23.

²⁸⁹ *Ibid* at 37-38.

²⁹⁰ Steven N. Durlauf & Lawrence E. Blume, eds, *The New Palgrave Dictionary of Economics*, 2nd ed (London: Palgrave Macmillan, 2008) *sub verbo* "Pigou, Arthur Cecil (1887-1959)".

²⁹¹ Arthur Cecil Pigou, *The Economics of Welfare* (London: Macmillan, 1932).

the pleasure that a house-owner's flower garden provides passers-by to his property. An example of an external cost is the pollution created by a factory which degrades the surrounding environment, negatively affecting neighboring individuals' use and enjoyment of its resources.

The latter example illustrates why negative externalities are a central concern of environmental law: the negative effects of environmental damage caused by a polluting activity will often affect parties who have nothing to do with the activity in question, while not directly affecting the polluter himself. In this sense, these effects constitute negative externalities insofar as they incur a cost not to the actors within the market but rather to society at large: in economic terms, the marginal social cost of the activity is then said to be higher than its marginal private cost.²⁹² According to Pigou, externalities must be accounted for and compensated in order for efficiency to be reached. In his work on the topic, he comes to the conclusion that negative externalities must be balanced out by a tax, whose amount must be calculated and whose range of application must be delineated in a way that realigns the private cost with the social cost, or in other words internalizes the externality.²⁹³ This is what is called a Pigovian tax. If nothing is done to internalize the externality, the efficient environmental outcome will not be reached.

The Pigovian approach to externalities was largely accepted as correct until the 1960s, at which point Chicago economist Ronald Coase challenged it in his article *The Problem of Social Cost*.²⁹⁴ There, he demonstrates through a series of simplified cases that in a situation where rights are clearly allocated and where transaction costs are inexistent, it will be possible for the emitter of

²⁹² Durlauf & Blume, *supra* note 290, *sub verbo* "Pigouvian Tax".

²⁹³ *Ibid.*

²⁹⁴ Ronald H. Coase, "The Problem of Social Cost" (1960) 3 *JL & Econ* 1.

the externality and for the party bearing it to negotiate and arrive to an economically efficient outcome, no matter which party the rights are originally allocated to.²⁹⁵ Applied to our above example of the polluting factory, Coase's demonstration implies that the parties will be able to negotiate and arrive to a mutually beneficial outcome through compensatory payment, whether the law allocates the right to pollute to the factory or, conversely, allocates the right to not be subjected to the pollution to the neighbors. The demonstration, which became known as the Coase Theorem, addresses Pigou's analysis of externalities and proves that a tax or other intervention from the State is not required. Worse, it could lead to inefficient outcomes in these circumstances, since the costs of involving the governmental administrative and regulatory machine are non-negligible. It also highlights that externality issues stem from multiple parties using a resource, and as such are reciprocal from an economic point of view. In our example of the polluting factory, the factory polluting the air lowers the other parties' ability to enjoy it, but the opposite is also true: preserving the air for the neighboring individuals lowers the use the factory can make of the air as a resource.

The assumption of inexistent transaction costs, defined as the costs of negotiating, in the initial formulation of the Coase theorem remains however in the economist's own words "a very unrealistic"²⁹⁶ one. Although Coase discards this assumption in the latter part of his analysis, his initial reliance on it leads to him being sometimes misunderstood and credited as downplaying the need for regulation or intervention in the market system, since in a world with no transaction costs, negotiating parties will arrive to an efficient outcome without the need for such intervention. Far from doing so, Coase rather stresses that in real-world situations where the assumption of

²⁹⁵ *Ibid* at 8.

²⁹⁶ *Ibid* at 15.

inexistent transaction costs does not hold, intervention is necessary in order to allocate the rights necessary for efficiency. “When property rights are well defined and enforceable at a low enough cost, freely bargaining parties will arrive at a mutually advantageous outcome, that is, an efficient one”.²⁹⁷ One role of law according to Coase is thus to define and allocate property rights, which will contribute to reducing transaction costs.

Although Coase’s analysis in *The Problem of Social Cost* highlights some limits of Pigou’s theory on externalities, a careful reading shows that it is not immune to criticism itself. Coase links transaction costs to an inefficiency in the market system, also known as a market failure: high transaction costs can lead to an imperfect allocation of rights, which in turn contributes to an imbalance between private and social costs. When such an imbalance, or externality, occurs, it must be addressed through an intervention to the market system. Other economists have challenged this notion: Demsetz, for example, tempers the importance given by Coase to transaction costs, arguing that they are costs just like any other. From Demsetz’ perspective, an outcome can be considered efficient even if high transaction costs prohibit an otherwise Pareto superior solution from happening.²⁹⁸ By treating transaction costs like any other, Demsetz argues that “there exists an efficient amount of ignorance in an economic system”:²⁹⁹ transaction costs cannot, and should not, be minimized at all costs. Following that same reasoning, he argues that “there exists an efficient degree of ownership that generally is smaller than ‘100 percent’”:³⁰⁰ if the cost of

²⁹⁷ Singh Ghaleigh, *supra* note 277 at 89.

²⁹⁸ Harold Demsetz, “The Problem of Social Cost: What Problem?” (2011) 7:1 Review of Law and Economics 1 at 8-9.

²⁹⁹ *Ibid* at 9.

³⁰⁰ *Ibid* at 10.

ownership is positive, fully assigned property rights, in the way Coase prescribes them, are likely to be inefficient as their cost would be prohibitively high.

As Demsetz also notes, Coase “[treats] the legal system and its courts as if they are parts of the economic system, when they are not”.³⁰¹ Demsetz instead posits that the legal system is independent from the market system: this means that it can (and should) take non-economic considerations into account when making decisions, even decisions which affect market outcomes. Law is a tool to promote economic efficiency, but it serves a broad array of other social objectives besides this. As such, it does not function like a market does. Courts, as Demsetz puts it, “do not behave as if they were owners of the resource whose control is being resolved”.³⁰² Understood this way, the role of the market system is narrower and its purpose more focused. Its role is to provide an efficient allocation of resources within the (non-market) boundaries set by government and an independent legal system.

Another criticism of Coase’s approach in *The Problem of Social Cost* stems from the fact that it assumes one-on-one dynamics, when in reality, environmental externalities most often involve if not multiple emitters, then at least multiple “consumers” of externalities. As Slaev notes, Coase alludes only twice in his article to the “vast number of people” suffering from the smoke externalities in his examples.³⁰³ Some of Coase’s other theoretical cases, such as his example of the cattle rancher with only a single neighbor, are also difficult to imagine in real life. Based on this observation, Slaev argues that when multiple co-owners of a resource are involved, solving

³⁰¹ *Ibid* at 8.

³⁰² *Ibid* at 9.

³⁰³ Aleksandar Slaev, “Coasean versus Pigovian Solutions to the Problem of Social Cost: The Role of Common Entitlements” (2017) 11:2 *International Journal of the Commons* 950 at 960.

externality problems will necessarily require some governmental action which goes beyond merely assigning property rights. In this respect, these solutions will contain some elements of a Pigovian approach. This leads him to argue that when several third parties are concerned, the Coasean and Pigovian approaches are not opposite to one another, but are rather complementary.³⁰⁴

Demsetz takes a different position and argues that in regard to most market interactions, economists' "reliance on a transaction cost rationale has caused [them] to exaggerate the scope of externality problems in a reasonably decentralized economic system that puts control of resources into private hands."³⁰⁵ When goods or services are divisible, the market system is able to reflect individual demand and reach efficiency even when transaction costs are involved, and thus neither the Pigovian nor the Coasean prescriptions for governmental/legal intervention for the internalization of externalities are required.

Although Demsetz' rationale differs from Slaev's in that it minimizes the importance of externalities as an obstacle to efficiency, both authors however come to similar conclusions in that collective problems present an obstacle to economic analysis. For Demsetz, it is not the plurality of actors that causes a problem, but rather the fact that one category of goods is not properly covered by either a Pigovian or Coasean approach, and as such can lead to efficiency issues: this is the category of non-excludable goods. Non-excludable goods are characterized by the fact that once they become available to some on the market, it is difficult to prevent others from consuming them. Within the category of non-excludable goods, a distinction can be made between common goods and public goods. Common goods are non-excludable but rivalrous: they are available to

³⁰⁴ *Ibid* at 952.

³⁰⁵ Demsetz, *supra* note 298 at 11.

all, but consumption by one lowers the total amount available to others. Public goods, by opposition, are non-excludable and non-rivalrous: they are available to all and one person's consumption does not preclude another person's consumption.³⁰⁶ Many environmental goods present some characteristics from these two sub-categories. In the context of climate change, the atmosphere itself can be compared to a common good: it is difficult to exclude emitters from consuming it, and the more greenhouse gases are emitted, the more saturated it becomes and the less it can provide its services to people and the ecosystem. Mitigation of climate change, on the other hand, resembles a public good: once it is produced, it becomes available to all, and the enjoyment of its benefits by one person (or by the population of one country) does not reduce the enjoyment of them by others.

Much like externalities, common goods and public goods are linked to market failures, which are defined as situations in which market dynamics themselves cannot lead to efficiency. For common goods, the failure stems from the fact that when multiple actors are faced with a non-excludable and rivalrous resource, they will be tempted to consume as much of the resource as they can, without regard for how that consumption degrades the good. This is what was coined "the tragedy of the commons".³⁰⁷ A good example of the over-exploitation of a common good is over-fishing, which in the past has put a number of the world's fish stocks in danger of extinction, and which were in some cases subsequently solved by the implementation of economic instruments for their management. In the context of climate change, the Earth's atmosphere can similarly be understood

³⁰⁶ See Paul A. Samuelson, "The Pure Theory of Public Expenditure" (1954) 36:4 *Review of Economics and Statistics* 387 at 387.

³⁰⁷ Garret Hardin, "The Tragedy of the Commons" (1968) 162:3859 *Science* 1243.

as a common good: without a way to control depletion of the resource, excessive emissions are bound to continue.

For public goods, on the other hand, the market failure results from the fact that since they are both non-excludable and non-rival, it becomes impossible to assign them a price once they are put on the market. A simplified example of this is a fireworks display: it is difficult to make people pay for tickets to see the fireworks, since they can instead not pay and still see them from further away. This dynamic leads to an underproduction of public goods, since it will generally not be interesting for a utility-maximizing actor to invest resources in a good when it could instead wait on another to produce it and then consume it for free. This phenomenon is known as free riding.³⁰⁸ In the context of climate change, mitigation of the change through emissions reduction can be likened to a public good: since the effects of the mitigation will benefit everyone, even those who don't participate in the mitigation, there is a temptation for emitters and States to free ride by waiting on others to mitigate instead of doing it themselves.³⁰⁹

The tragedy of the commons and free riding are two sides of the same collective action problem: when combined, the utility-maximizing behaviours of each individual taken separately lead to an undesirable outcome for everyone. A useful tool for understanding such problems from an economic perspective is game theory, which can be defined as the study of the strategic choices of economic actors in situations where the optimal action for one actor depends on what another chooses.³¹⁰ In collective action problems like the ones outlined above, much like in a game of

³⁰⁸ See Cooter & Ulen, *supra* note 281 at 40-41.

³⁰⁹ See Mancur Olson, *The Logic of Collective Action: Public Goods and the Theory of Groups* (Cambridge, Massachusetts: Harvard University Press, 1965) at 14.

³¹⁰ Cooter & Ulen, *supra* note 281 at 33.

rock-paper-scissors, the optimal move for one person will indeed depend on what the other person playing the game decides. One example from game theory is often used to illustrate the problem at the root of both the tragedy of the commons and free riding: the prisoner's dilemma. In this example, two accomplices are arrested for conspiring to commit a crime and are kept in separate rooms, thus unable to communicate. Each of them has the option to denounce the other or to keep quiet: they are informed that their prison sentences will vary according to the following conditions. If both prisoners keep quiet, each of them will receive a lighter sentence of 1 year in prison. If one of them confesses while the other does not, the confessor will be set free while the non-confessor will receive a harsher sentence of 7 years in prison. If both of them confess, each will receive a "medium" sentence of 5 years in prison.

The overall optimal outcome in this situation would be for the two prisoners to keep quiet. However, if we assume utility-maximizing behaviour on both parts, each of them is bound to conclude that confessing is the optimal strategy to follow. In this example, confessing is what is called the dominant strategy: the optimal decision for one prisoner is the same, no matter what the other prisoner does. The outcome of the prisoner's dilemma is an equilibrium, known in economics game theory as a Nash equilibrium:³¹¹ both prisoners will adopt the same dominant strategy, which remains the same as long as the other does not change theirs. Both the tragedy of the commons and the free rider problem can be likened to prisoners' dilemmas. In both scenarios, the dominant strategy for each separate actor is to act in their own self-interest, which leads to an inefficient equilibrium. The dynamics at play in the context of climate change, where an extremely large number of actors (arguably all of humankind) are involved in a worldwide, intergenerational

³¹¹ *Ibid* at 35.

coordination game, make this game very impersonal. As North notes, “in the world of personal exchange, it pays for parties to an exchange to cooperate, because the parties have personal knowledge of the other players and there is a possibility for repeat dealings [...] in a world of impersonal exchange, it pays for the parties to defect, *ceteris paribus*.”³¹² In such a world, the game must be structured in a way to alter the payoffs so it pays to cooperate instead of defect. This is where law comes into play.

As was noted above, the collective action problems linked to common or public goods can be understood as a type of market failure which is distinct from the problem of externalities. Demsetz for example does not view strategic behaviour as an externality problem, although he concedes that the category of problems in which we place it is not very important.³¹³ He goes on to argue that while the market failure attributed to externalities is in his opinion exaggerated, “strategic behaviour problems associated with indivisible goods may be the only category of problems calling for State action in the cause of efficient resource allocation.”³¹⁴ The problem of climate change presents some characteristics of all three of these market failures: non-internalized externality, over-exploited common good and under-supplied public good.

In summary, this overview of the law and economics theory attempted to demonstrate that theory is a useful prism through which to assess environmental law, governance and norms. The core insight it provides to the analysis of law is that actors respond to incentives. As such, law can shape those incentives in order to encourage or discourage certain behaviour. It can also, intentionally or not,

³¹² Douglass C. North, “Dealing with a Non-Ergodic World: Institutional Economics, Property Rights, and the Global Environment” (1999) 10:1 *Duke Envtl L & Pol’y F* 1 at 9.

³¹³ Demsetz, *supra* note 298 at 13.

³¹⁴ *Ibid.*

encourage or discourage the production and allocation of social goods and resources, which can have both efficiency as well as equity consequences.³¹⁵

Applied to environmental law, the economic analysis of law is based on the same principles relied upon in other analyses of environmental law, namely the polluter pays principle, the principle of prevention and the precautionary principle.³¹⁶ In attempting to identify how law can orient towards the optimal, or Pareto efficient, use of an environmental resource, the economic analysis of environmental law can be understood as in line with the principle of sustainable development. Indeed, Pareto efficient use of an environmental resource would ensure access to the resource to both present and future generations. In the environmental context, the application of economic analysis leads to the conclusion that some State intervention is necessary in order to correct a number of market failures inherent to natural resources. Some economists interpret it as the need to internalize externalities, while others argue that strategic behaviour problems instead are at the root of these failures. In the case of climate change, both types of market failures appear to be linked to a certain extent. Strategic behaviour amongst emitters, and amongst States responsible for providing mitigation, results in inefficient outcomes. These outcomes lead to externalities, to which are subjected current and future generations of humankind as well as the earth's ecosystems more generally.

The perspective given by an economic analysis of law must however be relied upon critically. It does not have all the answers and must be completed with other ideas. Law and economics points

³¹⁵ Russel B. Korobkin & Thomas S. Ulen, "Law and Behavioral Science: Removing the Rationality Assumption from Law and Economics" (2000) 88:4 Cal L Rev 1051 at 1054.

³¹⁶ Michael G. Faure & Roy A. Partain, *Environmental Law and Economics: Theory and Practice* (Cambridge: Cambridge University Press, 2019) at 11.

to three market failures which climate law must address, but comes short of providing clear answers as to how these should be addressed. Additionally, law and economics in order to provide a clear and coherent theoretical framework, makes certain assumptions which are not without flaw. One of these is the assumption of the self-interested rationality of actors. It is true that emitters, especially major emitters such as corporations, often operate through economic cost and benefit calculations, and that assuming profit-maximizing behaviour from these actors is a good starting point. But there are limits to rationality assumption and its applications. For one, while the assumption allows economists to measure actors' order of preference, it does not allow them to measure the strength of these preferences.³¹⁷ This lack of precision in the economic analysis' method limits its ability to fully evaluate social preference, which is an important criterion for assessing policy choices. More fundamentally, many law and economics scholars argue that the rationality assumption does not fully hold true in practice, many economic actors instead often behaving irrationally to varying degrees.³¹⁸ Some economists suggest drawing on concepts of behavioural science to address this shortcoming: this school of thought is known as behavioural economics.³¹⁹ In sum, because the rational behaviour assumption is imprecise and to some extent unrealistic, it should not be relied upon unequivocally when adopting a law and economics perspective.

It must finally be noted that the overview of the law and economics perspective presented in this section is nowhere near complete and does not pretend to be exhaustive. It has relied on some general concepts of microeconomic theory, which are elaborated upon much further elsewhere in

³¹⁷ Cooter & Ulen, *supra* note 281 at 19.

³¹⁸ See Jon Elster, "When Rationality Fails" in Karen Schweers Cook & Margaret Levi, eds, *The Limits of Rationality* (Chicago: University of Chicago Press, 1990) 60.

³¹⁹ See Korobkin & Ulen, *supra* note 315.

the literature.³²⁰ It also did not venture into explaining the actual mathematical demonstrations underpinning these concepts.³²¹ The goal of the overview was to generally and concisely explain how environmental law can be understood from an economics perspective, with a focus on the international environmental problem of climate change.

An exploration of three complementary theories will close off the chapter. These theories help refine the theoretical perspective relied upon in the thesis. They do so by providing alternatives to some of the theory's shortcomings and by pointing to possible solutions to the market failures linked to the problem of climate change. The first theory to be explored notably addresses the above-mentioned limits of the rationality assumption by suggesting a more nuanced alternative.

3.2.2 The new Chicago school theory

The new Chicago school theory, also known as the pathetic dot theory, is a theory of regulation elaborated by law professor Lawrence Lessig in a 1998 article of the same name³²² and subsequently popularized in his book *Code and Other Laws of Cyberspace*.³²³ In these works, Lessig posits that behaviour is regulated by four types of constraint: law, social norms, markets and what he calls architecture. He defines the latter as “features of the world – whether made or found – [which] restrict and enable in a way that directs or affects behaviour.”³²⁴ A basic example of “made” architecture regulating behaviour is a man-made brick wall restricting one's ability to

³²⁰ For a thorough explanation of the theory, its history and its application to different branches of law, see Ejan Mackaay & Stéphane Rousseau, *Analyse Économique du Droit*, 2nd ed (Montreal: Themis, 2008). For an analysis of the different theories and schools of thought in the field of law and economics, see Thomas S. Ulen, ed, *Methodologies of Law and Economics*, 2nd ed (Cheltenham: Edward Elgar, 2017).

³²¹ For a well-vulgarised presentation of these demonstrations, see Cooter & Ulen, *supra* note 281 at 12-43.

³²² Lawrence Lessig, “The New Chicago School” (1998) 27 J Legal Stud 661 [Lessig, “New Chicago School”].

³²³ Lawrence Lessig, *Code and Other Laws of Cyberspace* (New York: Basic Books, 1999) [Lessig, *Code*].

³²⁴ Lessig, “New Chicago School”, *supra* note 322 at 663.

snoop on their neighbors. An example of “found” architecture is gravity restricting humans from flying: as a physical phenomenon, this type of architecture has always existed, but was only understood or “found” as humankind’s scientific knowledge evolved.

Together, law, norms, markets and architecture operate together to guide actors, the “pathetic dots” in Lessig’s model, to behave a certain way: they constitute four modalities of regulation. The four types of constraint also interact among each other. Social norms can lead to the development and enactment of law, and law can reinforce existing social norms or lead to an evolution of those norms. A good example of these two dynamics at play is the evolution of attitudes towards cigarette smoke in North America over the last decades. The evolution of social norms opened the door to the adoption of laws to restrict public smoking, which in turn further reinforced the negative social connotations of smoking in public. Markets regulate through price, which functions differently from the ex-post, sanction-based regulation that are law and social norms. Price indeed acts as an ex-ante barrier, limiting who can partake in a behaviour according to how much they are willing or able to pay. Despite this difference in application however, markets rely on law, notably property and contract law, to function and are in most societies constrained by social norms such as solidarity and equity between rich and poor. Architecture also interacts with the three other modalities. The geography and urban planning of a metropolitan area, for example, can affect the market for cars, the social norms linked to owning a car and the related laws such as speed limits and parking rules. This geography can also to some extent be affected by these same modalities: changes in social norms, car prices or zoning and tax laws can influence how urban sprawl, one aspect of the architecture of a city and its surroundings, develops.

One key takeaway from the new Chicago school theory for this thesis' theoretical perspective is its more nuanced assessment of the regulatory power of the market and the underlying assumption of the rational choice of actors, when compared to the law and economics approach outlined in the previous subsection. As Lessig explains, his pathetic dot theory is not the first to highlight the existence of multiple elements of regulation. The theories forming the "old" Chicago school, of which the law and economics theory is a part, do so too, basing their analysis from the perspective of rational choice.³²⁵ The old school theories are however narrower in their analytical scope: in the case of the law and economics theory, the theoretical focus lies on one specific alternate element of regulation, the market, rather than on three. Another important difference between the old and the new Chicago schools lies in the fact that the former pushes the idea that the alternate elements of regulation "displace the significance of law".³²⁶ According to law and economics for example, law should either defer to the forces of the market or attempt to accommodate them, since actors, because of their innate rationality, are bound to respond to these forces.

The new Chicago school posits two main nuances to the assumptions at the root of old Chicago school law and economics. The first is that law's role is not eclipsed by alternative forms of regulation: it rather retains the unique capacity to deliberately constrain the other regulators. Law, if enacted properly, can indeed subject the market, social norms or architecture to its regulatory force and alter them in order to regulate actors indirectly. Law can in this sense regulate the regulators, co-opting their power to better regulate the behaviour of actors. The second nuance, which is related to the first, is that while actors are assumed to act rationally in both old and new school theories, Lessig posits that they respond to all elements of regulation rather than to market

³²⁵ *Ibid* at 665.

³²⁶ *Ibid* at 666.

signals exclusively. The rationality of actors, the “pathetic dots”, is multifaceted and dynamic: as the elements of regulation influence each other and the balance between them changes, an actor’s response to their combined influence will vary. This nuanced take on the rationality assumption remedies one of the limits associated to it as formulated in the law and economics theory. As such, it is a useful notion to take into account in the current thesis’ theoretical perspective.

Another key takeaway from Lessig’s theory for the needs of this thesis is its inclusion of architecture as a form of regulation. Applying this notion to the environmental context, it is possible to frame the Earth’s climate, as well as its other planetary boundaries, as a type of “real-space code” (as opposed to cyberspace code, the subject of Lessig’s book) shaping life on earth. The idea of humankind operating within the limits of the Earth’s planetary boundaries was theorized by a group of environmental scientists in an influential 2009 article and is now increasingly discussed in scientific and environmental policy circles.³²⁷ When articulated in conjunction with the externality concept from law and economics, the idea of planetary boundaries as architecture enables us to make the following argument. Pigou understood externalities as unilateral, caused by an emitter’s activity and affecting third parties. Coase understood them as bilateral, where use of a resource by one usually affected others, and vice versa. But there is a third dimension to the effects of externalities, namely their long-range impact, both geographically and temporally, on the architectural limits of planetary boundaries. The externalities that are greenhouse gas emissions, while not immediately damaging neighboring interests like more localized forms of pollution, bring the human race closer to planet’s climatic architectural limit, slowly but surely. Even if our individual human perspective does not allow us to fully grasp it, we

³²⁷ See Johan Rockström et al, “Planetary Boundaries: Exploring the Safe Operating Space for Humanity” (2009) 14:2 Ecology and Society 32.

are heading towards the brick wall that is the limit of the Earth's atmosphere's capacity to provide a stable climate.

A fundamental problem with our planet's boundaries is that they were not well understood at the inception of the international climate regime and are still not perfectly understood today. Taking the analogy with Lessig's theory further, these boundaries can be seen as a type of found architecture that has not yet totally been found, much like for example gravity before it was theorized by Newton. This makes them somewhat different than the architecture in Lessig's cyberspace model: the boundaries are not created by humankind through code, but rather consist in a set of natural rules present since the dawn of our species and operating at a grand scale. Humankind is only beginning to understand what the consequences of reaching them actually are: as Lessig rightfully illustrates, it is like a child that has never put his hand to the fire.³²⁸

Lessig, in his characterisation of informatic code as regulatory architecture, argues that "regulability is conditional on the character of the code".³²⁹ A corollary notion to this statement is that the code must be understood in order for its regulability to be assessed. The work of the IPCC, as well as climate science more generally, is thus crucial to international climate law, as it allows us to better understand the dynamics at play and the potential consequences of our emissions. Precise accounting of emissions is also important, as it allows us to quantify the aggregate impact of all anthropic actions, big or small, contributing to the problem. Only with these two tools will we be able to adequately (if imperfectly) understand the architectural dimension of the climate

³²⁸Lessig, *Code*, *supra* note 323 at 237.

³²⁹*Ibid* at 108.

change problem. According to Lessig's theory, this will then enable us to assess how it can best be addressed from a regulatory standpoint.

3.2.3 Polycentric governance of the commons

Insights from a second theoretical framework appear particularly relevant to the governance issues for the globally shared resource that is the Earth's climate. That framework is the theory of polycentric governance as applied to common pool resources (CPRs), for which its primary architect, economist Elinor Ostrom, was awarded the 2009 Nobel Prize in Economics. Polycentricity as a mode of organisation of political systems was first formulated in a 1961 article on the organization of government in metropolitan areas authored by her husband Vincent Ostrom, as well as political scientists Charles Tiebout and Robert Warren.³³⁰ There, the three researchers define polycentricity as a system in which many centers of decision-making, which are formally independent from each other, function in a coherent manner by interacting through consistent and predictable patterns of cooperation, competition, conflict and conflict-resolution.³³¹ Vincent Ostrom and his co-authors posited that polycentricity, which at the time was usually not seen as a system but rather dismissed as a series of disconnected, chaotic and problematic interactions between overlapping jurisdictions, is not necessarily worse at providing the public goods necessary to the functioning of a metropolitan area than a centralized, "monocentric" system. Both types of systems have their theoretical weak points,³³² and little empirical evidence could be found supporting the idea that a bigger, more centralized system was the better choice. Subsequent empirical research by Vincent and Elinor Ostrom on the management and provision of public

³³⁰ Ostrom, Tiebout & Warren, *supra* note 10.

³³¹ *Ibid* at 831.

³³² *Ibid* at 837-841.

goods in metropolitan areas, such as water and police services, found that polycentric systems in fact often outperformed monocentric ones in providing these services.³³³

Elinor Ostrom further expanded the study of polycentric theory to CPRs through fieldwork and case analysis over the course of several decades. This work was based on empirical observation of the management of local common natural resources, ranging from forests to fisheries and shared water basins, by communities of individuals. Ostrom, by analyzing these real-life situations and transposing her findings to models of economics game theory, concluded that these communities, by relying on institutions resembling neither the market nor the state, were able to govern some resource systems with reasonable degrees of success over long periods of time.³³⁴ The tragedy of the commons, which in legal and policy circles is often depicted as inevitable in the absence of strong governmental intervention, could thus be framed as manageable, at least in the case of certain local resource systems.

At the core of Ostrom's rationale lies a rebuke of what she calls the conventional approaches to collective action as applied to CPRs. She identifies two such approaches. On one end of the theoretical spectrum, strong governmental control of natural resources is touted by proponents of centralized control as the only answer to the tragedy the commons. This "centralist" approach is to be enacted through coercive "command-and-control" legislation from high levels of the state government. On the other end, proponents of a private property approach, of which the "old"

³³³ See Vincent Ostrom, *Water and Politics: A Study of Water Policies and Administration in the Development of Los Angeles* (Los Angeles: Haynes Foundation, 1953); see also Elinor Ostrom, Roger B. Parks & Gordon P. Whitaker, "Do We Really Want to Consolidate Urban Police Forces? A Reappraisal of Some Old Assertions" (1973) 33:5 *Public Administration Review* 423.

³³⁴ Elinor Ostrom, *Governing the Commons: The Evolution of Institutions for Collective Action* (Cambridge: Cambridge University Press, 1990) at 1 [Ostrom, *Governing the Commons*].

Chicago school law and economics theory is a part, argue that the common-property systems in place for natural resources must be replaced by systems setting private property rights for the tragedy of the commons to be avoided. Ostrom's main criticism of both approaches is that they are often relied upon as a foundation for policy without being adapted to the specific attributes of the CPR they are to be applied to. When this is the case, "constraints that are assumed to be fixed for the purpose of analysis are taken on faith as being fixed in empirical settings [as well], unless external authorities change them."³³⁵ Respectively, the centralist approach tends to assume an omniscient and flawlessly functioning state system (what Ostrom calls "'institution-free' institutions")³³⁶ while the private property approach instead assumes a cost-free pricing system.

These assumptions are justified when working at the theoretical level but should not be taken as factual. Indeed, if relied upon as is, they lead to major simplifications which can result in negative outcomes if directly applied to real-life situations. Through the adoption of badly adapted regulation (in the case of the centralist approach) or by contributing to skewed market dynamics (in the case of the private property approach), they can indeed lead to more damage to the resource than if no intervention had been taken.³³⁷ The assumptions also risk perpetuating the idea of individuals and communities as helpless victims, a grim narrative which also risks being damaging by encouraging passivity or resignation.³³⁸ In doing so, they can further lead to the dismissal or dismantling of functioning alternative agreements for the management of the resource, which tend to not be valued by authorities on the account that they are informal or not lawful.³³⁹ Ostrom gives

³³⁵ *Ibid* at 6-7.

³³⁶ *Ibid* at 21.

³³⁷ *Ibid* at 17.

³³⁸ *Ibid* at 8.

³³⁹ *Ibid* at 18.

the example of the ill-advised nationalisation of forest resources in some developing countries. There, insufficient monitoring, lack of practical information and corruption in the newly centralized governance system led to over-exploitation in areas where de facto limited-access common-property resources systems, achieved through alternative management strategies set up by local communities, previously existed.³⁴⁰

Ostrom understands the need for model-building in theoretical approaches to social sciences. She however believes inquiry must go beyond this simplified and generalized level of analysis and be carried further through empirical work in field and laboratory settings. In this respect, every CPR must be viewed as a separate study in an empirical terrain. She notably stresses that the specific characteristics of the physical environment involved will have an impact on the possibilities for its governance, and thus on the rules or mechanisms to be applied.³⁴¹ A parallel can here be traced with Lessig's approach: the specificity of the resource, which can be likened to its architecture in Lessig's terms, must be taken into account for proper management to be possible. Local CPRs were first chosen as subject "organisms" of Ostrom's studies. These smaller scale systems were chosen "because particular processes can be studied more effectively using [these organisms] than any other."³⁴² The local CPRs studied differed widely from one-another, ranging from fisheries to communal herding to irrigation systems. All of them however presented three common characteristics: the resources managed were renewable, they presented a degree of scarcity, and all cases studied consisted in situations where users could substantially harm one another but where no one user could by himself produce major external harm for others. Asymmetrical pollution

³⁴⁰ *Ibid* at 23.

³⁴¹ *Ibid*.

³⁴² *Ibid* at 26.

problems, such as situations where one factory pollutes a whole shared resource, were thus excluded.

From the findings made through these smaller scale case studies, Ostrom suggests an alternative to the conventional approaches to collective action, which she calls the institutional theory of self-organized and self-governing forms of collective action.³⁴³ At the root of this theory is the framing of collective action problems as coordination problems between individuals with “very similar limited capabilities to reason and figure out the structure of complex environments”.³⁴⁴ This presumption of general limited rationality differs from the centralist theory’s presumption that some individuals are incompetent, evil or irrational while others are omniscient. It also differs from the private property theory’s presumption that actors, because they act rationally, are bound to be able to make sense of their environment and arrive to a desirable outcome through bargaining. Ostrom’s actors, through limited rationality, attempt to collectively manage CPRs, and in doing so face a variety of complex problems. Some of them can be likened to prisoners’ dilemmas as explained through economic analysis, but others go beyond that model. She gives the example of the complex structure of the theoretical game to which the users of a shared water resources are subjected. Over time, each of them is called to make multiple choices: whether or not to steal, whether or not to monitor other users’ behaviour, and if so to which extent. The resulting structure of this game is more complex than the traditional prisoners’ dilemma, presenting more than one equilibrium. This very complexity is what makes these coordination games solvable, in contrast to the prisoner dilemma’s inevitably suboptimal Nash equilibrium. Solving such complex games is however equally complicated, and often requires complex rulemaking and coordination.

³⁴³ *Ibid* at 29.

³⁴⁴ *Ibid* at 25.

Ostrom posits that the rulemaking necessary to solve these complex games and to effectively manage CPRs is complex and multilayered. It can be seen as organized along three levels: operational, collective and constitutional.³⁴⁵ Operational rules are the rules which directly affect the day-to-day decisions of a resource user, for example a how much water one user of a common basin can use daily. Collective-choice rules underpin the operational rules: to follow in the same example, these would include the organisational rules of the private association monitoring said common water basin. The constitutional rules operate one level deeper by determining who is eligible and determining which collective-choice rules can be used: in our example, this would include the local and national laws regulating the status and prerogatives of private associations in managing water resources. Rules at all three levels are dynamic and evolve over time. Additionally, a change at a foundational level will often affect rules at the higher levels. Here another parallel can be traced with Lessig's theory of code or architecture as a normative concept. Indeed, Ostrom compares the structure of the three types of rules to the structure of computer language: "what can be done at a higher level will depend on the capabilities and limits of the software (rules) at that level, on the software (rules) at a deeper level, and on the hardware (the CPR)".³⁴⁶ The resource itself, or in Lessig's terms, its architecture, is thus a component of the constitutional rules for the management of a CPR.

The different levels of rules are enacted through institutions, which according to Ostrom play several crucial roles. Institutions are indeed "used to determine who is eligible to make decisions in some arena, what actions are allowed or constrained, what aggregation rules will be used, what

³⁴⁵ *Ibid* at 52-53.

³⁴⁶ *Ibid* at 51-52.

procedures must be followed, what information must or must not be provided, and what payoffs will be assigned to individuals dependent on their actions.”³⁴⁷ Ostrom’s theory does not identify specific institutions that a CPR governance system must contain in order to be successful in managing its resources. She rather formulates a number of design principles which the institutions of the studied CPR systems who were successful in managing the resource had in common. These principles are (1) clearly defined boundaries for both the resource itself as well as for individuals’ rights to it; (2) congruence between appropriation rules, provision rules and local conditions; (3) collective-choice arrangements; (4) monitoring; (5) graduated sanctions; (6) conflict-resolution mechanisms; (7) minimal recognition of rights to organize; and for CPRs which are part of larger systems (8) nested enterprises.³⁴⁸ The term nested enterprises can be understood as sets of rules and institutions operating at different scales in a linked manner. In the case of water basins for example, nested enterprises would be the integration of local management schemes of smaller upstream rivers with a larger scheme for the management of the common downstream basin. Each nested enterprise is characterised by its own operational, collective and constitutional rules, and changes in one enterprise can affect corresponding or higher levels of rules at other scales.

While the majority of Ostrom’s initial work was focused around local CPRs, she devoted the later part of her career to applying her findings to issues of global commons management, including climate change. She conceptualizes polycentricity for the global commons as encompassing numerous governing units, ranging from families, firms and local governments to national governments and international regimes. These units are linked to one another in the way of nested enterprises, as are the units’ collective-choice and constitutional rules: the constitutional rules of a

³⁴⁷ *Ibid* at 51.

³⁴⁸ *Ibid* at 90.

smaller unit often depend on the collective-choice and constitutional rules of the larger ones.³⁴⁹ Ostrom notes that global polycentric systems present advantages over monocentric systems in that their structure leads to the development of better mechanisms for mutual monitoring, learning and adaptation of better strategies over time.³⁵⁰ While they do not make polycentric systems perfect, these attributes help enhance trustworthiness, cooperation, innovation and lead to achievement of more effective, equitable and sustainable outcomes at multiple scales.³⁵¹

In sum, Elinor Ostrom's polycentric governance as applied to the global commons contributes a number of useful insights to this thesis' theoretical perspective. In a similar manner to Lessig's new Chicago school theory, it tempers the some of the assumptions relied upon in an economic analysis of law. According to Ostrom, actors do not behave in a perfectly rational manner and economic efficiency is not the only criterion against which successful management of CPRs should be measured. Much like the new Chicago school, Ostrom's theory also underlines the importance of applying and adapting theoretical models to real-world situations. The architecture of the resource to be managed must be taken into account, especially when dealing with environmental resources. Applied to the subject matter of this thesis, this means that climate change must be properly understood and framed before it can be effectively regulated. While the new Chicago school gives us insights on the role of law in regulating behaviour on a more conceptual scale, polycentricity helps us understand the institutional and normative structure of specific regimes. It provides us with a flexible model through which to conceptualize the rules and institutions of the UNFCCC regime: this appears particularly useful in the wake of the adoption of the major new

³⁴⁹ *Ibid* at 50.

³⁵⁰ Elinor Ostrom, "Polycentric Systems for Coping with Collective Action and Global Environmental Change" (2010) 20 *Global Environmental Change* 550 at 552 [Ostrom, "Polycentric Systems"].

³⁵¹ *Ibid*.

instrument that is the Paris Agreement. This conceptualization will be carried out in more detail in the next chapter.

3.2.4 Innovation and Law

Innovation is an integral part of life in the twenty-first century. The ever-growing amount of technology involved in our daily lives is but one example of its impact. Although its concrete applications are omnipresent, its boundaries as a concept are however hard to define. Godin explains that innovation has evolved over the last two centuries from a subversive trait which was repressed by society to a socially valued one.³⁵² Innovation also has an ambiguous relationship with the environment. Indeed, even though some forms of technological innovation, like the development of the automobile and of certain industrial processes, have had major negative environmental consequences, it is generally understood that innovation is necessary in order to develop solutions to current environmental problems like climate change. As the first chapter of this thesis mapped out, climate law is dynamic and has evolved over the last three decades. This evolution, as reflected in its three main agreements, has gone hand in hand with progress on the state of scientific and policy knowledge on climate change, which is constantly improving thanks in no small part to technological innovation.

Innovation is also a key concept for the law and economics approach. Indeed, a purpose of law according to law and economics is to lead to an efficient allocation of resources in order to maximize welfare as per the Pareto criterion. One way to reach Pareto improvements is through

³⁵² Benoît Godin, “Innovation: A Conceptual History of an Anonymous Concept, Project on the Intellectual History of Innovation” (Paper delivered at the Workshop “Can Innovators Be Made?”, Smithsonian Institution and Virginia Tech, Washington, March 20-21 2015), online: CSIIC <<http://www.csiic.ca/PDF/WorkingPaper21.pdf>>. at 8.

innovation: someone discovers a new product or process that performs better than what was previously possible, allowing for a more Pareto-efficient outcome. Economists see this continuous process of innovation and improvement as a key to economic growth but have so far not been able to explain precisely how the innovation process works.³⁵³ The law and economics theory provides some insights as to how law can best foster the innovation process. Cooter and Ulen give the example of contract and property law as two fundamental legal tools to enable people to overcome the mistrust preventing cooperation in business.³⁵⁴ If, as we have postulated so far this chapter, climate change is to be understood as the result of market failures (be it externalities or strategic behaviour problems), then a theory providing further insight on how to best harness innovation to remedy these market failures appears useful. This is where the innovation and law theory comes into play. This theory, conceptualized by legal scholars Butenko and Larouche, is indeed a useful third and final complementary theoretical perspective for this thesis' analysis, as it aims to provide a better understanding of the interactions between law and the innovation process.

The authors define innovation as a combination of three elements: “(1) a novel idea or *invention*; (2) its *diffusion* or adoption by users, customers or citizens – as the case may be; and (3) a *positive social impact* in the form of an increase in welfare or a contribution to the achievement of public policy aims”.³⁵⁵ Their theory borrows from two streams of the legal literature that frame the relationship between law and innovation very differently from one another: law and economics on the one hand, law and technology on the other. Innovation and law highlights the two theories' differences and respective analytical blind points in order to reconcile their perspectives and

³⁵³ Cooter & Ulen, *supra* note 281 at 50.

³⁵⁴ *Ibid.*

³⁵⁵ Anna Butenko & Pierre Larouche, “Regulation for innovativeness or regulation of innovation?” (2015) 7:1 Law, Innovation and Technology 52 at 56.

produce a synthesis of their insights. At the core of Butenko and Larouche’s analysis lies what they call the pacing problem or challenge of regulatory connection between law and innovation³⁵⁶: technology inevitably develops faster than the corresponding regulation, which continually lags behind and has to play catch-up in order to remain effective. The differences in approach between the two streams can be schematized along two axes of this regulatory disconnect between innovation and law: the horizontal axis, along which the timing of the regulatory intervention is situated, and the vertical axis, along which varies the degree of technological specificity of this intervention.³⁵⁷ As mentioned above, law and economics focuses on regulating to foster innovation or to cultivate “innovativeness”, the conditions leading to innovation. It assumes that innovation is inherently positive and downplays the potential normative or welfare issues associated with its impacts.³⁵⁸ As a result, it preconizes later and more technology-neutral intervention, which tends to cause less interference with the innovative process by offering stability and predictability, albeit at the cost of a higher level of regulatory disconnect. Law and technology, on the other hand, frames the role of regulation for innovation as ensuring the latter’s compliance with fundamental rights and policy goals, as well as maximizing its positive and minimizing its negative effects.³⁵⁹ It has thus historically favoured earlier and more technology-specific regulation, which, while running the risk of stifling innovativeness to some degree, is more likely to minimize regulatory disconnect.

³⁵⁶ *Ibid* at 66.

³⁵⁷ *Ibid* at 81.

³⁵⁸ *Ibid* at 62.

³⁵⁹ Roger Brownsword & Han Somsen, “Law, Innovation and Technology: Before We Fast Forward – A Forum for Debate” (2009) 1:1 *Law, Innovation and Technology* 1, as quoted in Butenko & Larouche, *supra* note 355 at 64.

Butenko and Larouche conclude their analysis by suggesting a combination of the two approaches. Their synthesis offers a more critical view of innovation than usually seen in law and economics but suggest less rigid regulation than what is often preconized in the law and technology literature. According to them, the objective for lawyers is to use as starting points public policy objectives and fundamental principles set out at the most general decision level. From there, the role of law becomes to test where whether and how these objectives are affected by innovation, either positively or negatively, and then assess if any intervention is required. The process for these interventions can be enacted through a layered institutional structure, where the central authority sets the general rules, guaranteeing some level of stability and predictability, while more specialized institutions such as regulatory agencies can operate on a faster timeframe and at a more technology-specific level by assessing issues as they arise, on a case-by-case basis.³⁶⁰

The main useful takeaway from the law and innovation theory for the purpose of this thesis is the fact that it gives us a balanced model through which analyze the process of innovation. Innovation, while important from a law and economics perspective, tends to be pictured as some kind of a “black-box”, whose functioning is difficult to explain and whose consequences are assumed to be positive. Butenko and Larouche’s three-pronged definition and synthesis of the law and economics and law and technology approaches allows us to look inside this black-box. In doing so, it allows us to better understand the process of innovation, but also to assess it from a more critical point of view. In the context of climate change, two main interrogations benefit from the insights given by this model. On one hand, the model can help us assess which form or level of regulatory intervention could best promote the diffusion of climate innovation. On the other hand, it can help

³⁶⁰ Butenko & Larouche, *supra* note 355 at 81-82.

us identify and analyse cases where climate technology could risk leading to negative impacts worthy of regulation.

3.3 Conclusion

The current chapter laid out the conceptual and theoretical foundation of the thesis. It started by defining the four connected core concepts of law, regulation, policy and governance. It then proceeded to elaborate the theoretical perspective of the thesis. This perspective is based on one main school of legal thought, namely the law and economics theory. To this general theoretical framework were supplemented elements from three additional theories: Lessig's new Chicago school theory, Ostrom's theory of polycentric governance of the commons and Butenko and Larouche's theory of law and innovation. These three complementary perspectives are useful additions as they allow for a more detailed and nuanced economic analysis of law. When applied together, the insights gained from the three complementary theories outlined in this section also provide the thesis with a number of useful tools to analyse the technology provisions inside an international legal regime such as the UNFCCC. They do so by operating at different levels of analysis, while still allowing us to draw parallels and make analytical connections among them. Indeed, the new Chicago school theory allows us to understand law's specific normative force in a world where social norms, the market and our planet's architecture also influence behaviour. In this world, Ostrom's theory articulates the concept of polycentric governance structures, which offer a number of advantages when attempting to achieve sustainable governance of CPRs. Butenko and Larouche's theory in turn offers a model through which to understand how law can be operationalized in order to strike a balance between fostering and regulating innovation: this operationalization can be done through a layered institutional and normative structure compatible

with a polycentric governance scheme. Taken together, the three complementary perspectives allow a nuanced analysis of market failures and coordination problems as understood in an economic analysis of law. The next chapter will go one step further and suggest an analysis of international environmental law through the theoretical perspective. It will demonstrate how the international climate treaties can be understood as legal instruments for the governance of the global climate commons in an emerging polycentric governance system.

4. Towards an emerging polycentric climate regime: the UNFCCC treaties as understood through the theoretical perspective

The first chapter of this thesis traced the general evolution of international climate law. It outlined some of the UNFCCC regime's main objectives, principles, norms and institutions. It also provided some context as to how these were elaborated, adopted and implemented. In doing so, it pointed to some areas where significant progress was made but also to a number of recurring obstacles to its effectiveness. At the moment of writing this thesis, we are in 2021: this year represents a significant point in the UNFCCC timeline as it marks the official end of the Kyoto Protocol's CP2. Consequently, it was at the start of this year that the Paris Agreement, its processes and institutions were expected to be fully operational. Much was expected of COP26, notably in relation to rules for the Article 6 flexibility mechanisms, but the conference was postponed from November 2020 to November 2021 as a consequence of the COVID-19 pandemic.³⁶¹ This unforeseen situation undoubtedly jumbles the Agreement's implementation process.

Despite this however, it appears useful to draw a snapshot of the situation as it stands five years after the adoption of the Paris Agreement. In order to do so, elements from the four theories outlined in the previous chapter will be applied to the subject at hand. As was highlighted in the previous chapter, these theories are useful as stand-alone analytical tools, but a number of additional insights can be garnered by making links between them. The four theories will thus collectively inform the perspective of this thesis, each of them respectively filling a specific role in doing so. The economic analysis of law will mainly be relied upon to understand the role that

³⁶¹ UN Climate, "UN Climate Press Release – COP26 Postponed" (01 April 2020), online: UNFCCC <<https://unfccc.int/news/cop26-postponed>>.

international law can play in the context of global climate change. The new Chicago school theory and Ostrom's polycentric theory for commons governance will then be used as a theoretical model through which conceptualize the UNFCCC regime as part of the fabric of international law. This two-level analysis the starting point for the analysis of the legal issues related to climate technology transfer, which will constitute the second part of the thesis.

4.1 International environmental law: a tool for global climate coordination

As was mentioned in the first chapter's overview of the international climate law regime, Article 2 of the UNFCCC states its overarching objective. It is there defined as the "stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system".³⁶² By stabilizing these concentrations, the member states to the UNFCCC act to protect and preserve the resource that is the earth's climate. According to the guiding principles listed at Article 3, this objective is to be carried out "on the basis of equity",³⁶³ while the policies and measures taken to reach it are to be "cost-effective so as to ensure global benefits at the lowest possible cost".³⁶⁴

By framing the climate in turn as a resource and a "common concern of humankind",³⁶⁵ the language used in the text of the UNFCCC takes cues from both the economics and the human-rights spheres and advocates for a response that balances efficiency with equity. Furthermore, by consecrating the central role of sustainable development in its fundamental principles,³⁶⁶ it marks

³⁶² *UNFCCC*, *supra* note 1 at art. 2.

³⁶³ *Ibid* at art. 3(1).

³⁶⁴ *Ibid* at art. 3(3).

³⁶⁵ *Ibid* at Preamble par. 1.

³⁶⁶ *Ibid* at art. 3(4).

a departure from many traditional environmental rules of the past, which had been criticized for solely imposing constraints on economic activity.³⁶⁷ According to international law scholars Abbott and Snidal, “in its origins and operation, law is both an interest-based and a normative enterprise”.³⁶⁸ International law can thus be seen as reflecting both States Parties’ (economic) interests as well as fundamental values. In this sense the UNFCCC is a good example of an international legal instrument reflecting these two facets of States Parties’ priorities and serving, in their words, as both a “contract” and [a] covenant”.³⁶⁹ Buckley qualifies economics as “a tool intended to serve social ends, which include equity as well as efficiency”.³⁷⁰ By pursuing the dual objective of contract and covenant, which is to be simultaneously efficient and equitable, the UNFCCC can thus be seen as incorporating elements of an economic approach in its legal framework. As explained in the previous chapter, an economic approach to environmental law can be likened to the application of the concept of sustainable development. The role of law in this context is to regulate the human activities that risk damaging the environment, in order to balance the socio-economic needs of current and future generations while also preserving the ability of ecosystems to process and recover from this human activity by respecting the Earth’s planetary boundaries.

The near-universal membership of the UNFCCC treaties signals that the common climate stabilization goal stated at Article 2 of the 1992 Convention, and further defined in Article 2 of the Paris Agreement is widely shared by the international community. As Faure and Partain explain,

³⁶⁷ Peter H. Sand, “Sticks, Carrots, and Games” in Michael Bothe & Peter H. Sand, eds, *La politique de l’environnement: De la réglementation aux instruments économiques* (The Hague : Martinus Nijhoff, 2000) 3 at 3.

³⁶⁸ Kenneth W. Abbott & Duncan Snidal, “Hard and Soft Law in International Governance” (2000) 54(3) *International Organization* 421 at 425.

³⁶⁹ *Ibid.*

³⁷⁰ Ralf Buckley, *Perspectives in Environmental Management* (Berlin: Springer, 1991) at 71.

once such a common environmental perspective, or *grundnorm*, is reached, the challenge according to law and economics then becomes to acquire the information necessary to make the right decisions in order to bring environmentally risky activities in line with the norms and principles set out through this *grundnorm*.³⁷¹ In the case of climate change, the risky activity is the emission of greenhouse gases, which if carried out excessively causes two types of market failures. The first one is caused by major emitters who, through their excessive use of the atmosphere's resources, impose negative externalities onto third parties. These externalities exist at an intragenerational as well as intergenerational scale. Indeed, within the current generation of humankind, individuals in developing countries, which have historically emitted and generally continue to emit less greenhouse gases than those in developed countries, are denied their share of the global climate resource. The same is true for future generations of humankind which risk being born into a world where permanent climate damage is a reality. The second market failure, linked to the first one, is that the non-excludable nature of the climate as a resource leads to the tragedy of the (global) commons that is the Earth's climate and conversely to the underproduction of the public good that is climate mitigation. The coordination problems in managing the globally shared climate resource and in producing the public good necessary for its conservation are what must be remedied for the externalities to be internalized.

Climate change represents, in the words of former World Bank research manager Michael Toman, a particularly "wicked problem"³⁷² in that it presents a never-before-seen complexity, notably because of its globally diffused nature and extended timeframe. This has led to long-standing

³⁷¹ Faure & Partain, *supra* note 316 at 13.

³⁷² World Bank, "A Wicked Problem: Controlling Global Climate Change" (September 30, 2014), online: World Bank <<https://www.worldbank.org/en/news/feature/2014/09/30/a-wicked-problem-controlling-global-climate-change>>.

disagreements in both political and academic circles on how to address it, and even how to fundamentally frame it. As Toman notes, economists tend to see climate change as a problem to be weighed against other human imperatives such as socio-economic development, while some ecologists first and foremost see it as an existential crisis for life on Earth itself, be it human or otherwise.³⁷³ Similarly, groups of States Parties to the UNFCCC treaties have pushed different narratives to the problem during the negotiating stages of these treaties, the views of least developed and most vulnerable States often clashing with those of petroleum-producing States. If the near-universal membership to the UNFCCC reflects the existence of a shared perspective on the climate, these disagreements are a sign that under the surface, this climate *grundnorm* remains fragile. This lingering fragility is precisely what has made solving climate change coordination problems difficult. Luckily, international environmental law can play a role in strengthening the *grundnorm* for climate, notably through the treaty-making process.

In a context where uncertainty or disagreement hinders the ability of actors (in our case States Parties) to coordinate in order to reach a globally advantageous outcome, one key role of treaties is to reduce the transaction costs associated with long-term negotiations. As explained in the previous chapter, transaction costs can be defined generally as the costs of negotiating. These costs can be separated in three main categories: search and information costs, bargaining and decision-making costs, and monitoring and enforcement costs.³⁷⁴ In the context of climate change, search and information costs are the costs associated with properly understanding the dynamics of climate change and its possible solutions. Bargaining and decision-making costs are the costs of getting States to commit to enact these solutions, notably through the mitigation their greenhouse gas

³⁷³ *Ibid.*

³⁷⁴ Singh Ghaleigh, *supra* note 277 at 87.

emissions. Monitoring and enforcement costs are the costs of verifying that States' commitments are being fulfilled and of ensuring compliance.

Treaties and their institutions can be used as tools to lower all three types of costs. In the UNFCCC regime for example, the IPCC, the SBSTA and other groups of experts reduce information costs by providing trusted and readily available information on the scientific and socio-economic implications of climate change. The COP constitutes a forum where bargaining States Parties regularly meet, thereby optimizing the bargaining and decision-making process. Once agreement is reached, verification and compliance mechanisms such as the Paris Agreement transparency framework³⁷⁵ and the Kyoto Protocol compliance mechanism³⁷⁶ provide predictable and agreed-upon procedures for monitoring and enforcement. Designing, maintaining and amending these treaty tools comes with costs of its own,³⁷⁷ but the idea behind a treaty regime is that in the context of repeated interactions over a long period of time, the benefits for cooperation and lowering of long-term costs provided by these tools will outweigh the initial "policy-making" costs. By minimizing transaction costs, treaties allow States to negotiate more efficiently, which per the Coase theorem will enable them to arrive to a satisfactory outcome. In our case this outcome is a global and coordinated response to the climate crisis.

Economist Scott Barrett further refines the role of environmental treaties from a law and economics perspective. He argues that the international externality and coordination problems at the root of global environmental problems, usually labeled as market failures at the domestic level, should

³⁷⁵ *Paris Agreement*, *supra* note 2 at art 13.

³⁷⁶ *Kyoto Protocol*, *supra* note 126 at art 18.

³⁷⁷ Singh Ghaleigh, *supra* note 277 at 87.

instead be understood as “interstate failures”.³⁷⁸ The main difference between the two is that at the domestic level, intervention by the state, even if not always the only or the best solution to market failures, remains possible. Because of the horizontal structure of international relations however, the correction of interstate failures cannot similarly rely upon the intervention of a higher level of authority such as a world government. Instead, other approaches, such as the manipulation of incentives, must be relied upon. Barrett argues that international law can restructure incentives to coordinate state behaviour and protect the environment. From his perspective, the climate treaties can thus be seen not merely as tools to reduce transaction costs, but rather as instruments, created by states but extraneous to them, which constrain state behaviour with the goal of inducing cooperation between them.

In doing so, treaties must orient states towards both participation and compliance. The two are different phenomena but both need to be enforced if a treaty is to change behaviour. Barrett argues that while a treaty must be capable of deterring both non-compliance and non-participation, the latter is more important – if non-participation can be deterred, then non-compliance should also be possible to deter. Indeed, in a horizontal system where there is no higher level of enforcement, “the largest credible deviation is for a non-complying party to behave as if it were a non-party. So if this level of non-participation can be deterred, then all levels of non-compliance can be deterred.”³⁷⁹ Non-participation must be deterred because a high enough degree of participation to the treaty is required for it to be credible and effective in achieving its goal. An effective treaty should thus make states want to participate to it in order to reach the collective goal but also in

³⁷⁸ Scott Barrett, “An Economic Theory of International Environmental Law” in Bodansky, Brunnée & Hey, *supra* note 22 231 at 239.

³⁷⁹ *Ibid* at 251.

order to for them to be “in the loop”, which for example can allow them to better their reputation on the world stage or gain access to certain political or economic advantages. The greatest punishment would then be to be excluded from the treaty “loop”. Parties would be ready to accept commitments as well as possible punishment for non-compliance in order to retain the advantages provided by the treaty.

Compliance enforcement however presents an additional challenge when compared to participation enforcement. Contrarily to participation, which is easily verifiable from the outside (states are either Parties to a treaty or not), compliance is often self-reported and thus cannot always be relied upon to be truthful. Two types of mechanisms are useful to cultivate trust among Parties and enforce compliance: independent verification of compliance and a credible mechanism to punish cases of non-compliance.³⁸⁰ Indeed, without robust independent verification, findings of non-compliance will usually require that other countries demonstrate that a material breach has occurred, which can lead to friction among States Parties and weaken trust and cooperation. The purpose of a compliance mechanism is similar: its primary function is not to punish non-compliance, but to deter it. This deterring effect provides assurance to cooperating Parties that others are also complying.

Because of the global scale of the problems they attempt to solve, international environmental treaties require wide participation in order to be effective. At the same time, full agreement among the entire international community on wide-ranging, deep commitments is unrealistic in a world where states operate according to numerous and often conflicting national priorities. A key

³⁸⁰ *Ibid* at 252.

question hence becomes finding the right balance between depth of commitment and breadth of participation. In negotiating for an effective level of participation, a trade-off between the depth and breadth of cooperation thus often occurs: the more ambitious and binding the treaty commitments are, the narrower the participation tends to be, and vice versa. As Barrett notes, participation to the Kyoto Protocol was broad yet it was able to impose binding (deep) emission reduction obligations to certain States Parties: this would thus seem to challenge the trade-off theory as applied to climate change treaties.³⁸¹ However, as Barret also notes, his trade-off theory assumes symmetric countries and participation, while the Kyoto Protocol was negotiated and implemented by asymmetric countries, both in terms of capacity and of commitment: this could explain the deviation. It also must be noted that the Kyoto Protocol was not particularly successful in bringing the international community closer to its emissions reduction objective, especially during its CP2 when participation decreased. The Paris Agreement, in order to garner broader participation and reinstate confidence in the UNFCCC system, veered away from the Kyoto approach and instead opted for flexible and self-determined, thus arguably shallower, mitigation commitments applicable to a larger number of States Parties.

Barrett's economic theory of international environmental law underlines the importance of equity in international agreements. In the horizontal context of international law, equity plays a role as a principle guiding states' actions, but also has a more concrete use as a common denominator for states as they negotiate. As Barrett explains, "should any country believe that the arrangement put on the negotiating table is not in its interest to accept – or that it imposes an unfair burden – it can always walk away. Fairness, in the context of international negotiation, must be seen from a

³⁸¹ *Ibid* at 253.

horizontal, not a vertical, perspective.” Equity is a tangible and concrete requirement for coordination, not just an abstract principle: as such, its importance must not be underestimated.

To summarize, the law and economics perspective as applied to international environmental law identifies two purposes to treaties: they can be seen as tools to minimize the costs of coordination as well as institutions that actively induce cooperation between states. While well-functioning treaty law can contribute to solving coordination problems between states, it is important to keep in mind that legal or governance processes, which are in practice never perfect, can also introduce their own transaction costs. These costs, which can arise from legal uncertainties and contestation, are sometimes overlooked but operate as barriers to the construction and operation of what might otherwise be effective regimes.³⁸² If not addressed, these costs can lead to government failures, which resemble market failures in that they steer away from efficient coordination. The costs and potential failures of international agreements must thus also be taken into account when assessing environmental treaties.

4.2 From the 1992 UNFCCC to the Paris Agreement: towards a polycentric framework for climate governance

The first chapter of the thesis mapped out the evolution of the UNFCCC regime, identifying three phases through which climate law has progressed up until today.³⁸³ A first constitutional phase, which led to the adoption and entry into force of the 1992 Framework Convention, was followed by a regulatory phase marked by the enactment of binding emissions reduction commitments

³⁸² Singh Ghaleigh, *supra* note 277 at 88.

³⁸³ Bodansky, Brunnée & Rajamani, *International Climate Change Law*, *supra* note 11 at 102.

through the Kyoto Protocol. The regime's second constitutional phase began when a two-track negotiation process, which had as one objective the adoption of a long-term outcome for the post-2020 period, was launched simultaneously to the Kyoto Protocol's entry into force. This phase led to the adoption of the Paris Agreement in 2015. Following the entry into force of the Paris Agreement, we can say that the regime has now entered into its second regulatory phase. Indeed, now that the Paris Agreement is in force, States Parties to it are expected to fulfill their NDCs. As per the Agreement's provisions, they are notably bound to account for these NDCs, to communicate their accounting through periodical reports and to ratchet up their commitments over time.

Through both sets of constitutional and regulatory phases, the international climate regime has followed a similar process: first, gather maximum participation, at the risk of compromising on the depth of commitment, before subsequently attempting to deepen this commitment. In doing so, the Paris Agreement is set to fulfill the treaty roles of behaviour coordination and compliance enforcement differently than the Kyoto Protocol. Indeed, States Parties' commitments under the Paris Agreement are expected to deepen progressively and incrementally, according to each Parties' respective capability, through the implementation process instead of being locked in upon signature of the treaty as was the case for Kyoto. The overall goal however remains largely the same as agreed upon in 1992, if only more precise. This goal is now to stabilize the emissions of greenhouse gases in order to hold the increase in global average temperature to "well below 2°C above pre-industrial levels and pursuing efforts to limit the temperature increase to towards 1.5°C above pre-industrial levels."³⁸⁴

³⁸⁴ *Paris Agreement*, *supra* note 2 at art. 2(1)a).

The fact that a second constitutional phase was needed following the Kyoto Protocol can be interpreted as a regression in the regime's evolution and thus as a possible sign of the failure of the first regulatory phase to gather and enforce a sufficient level of commitment. It is true that the emissions reductions resulting from the Kyoto Protocol did not do much to put the international community on track with its current 2°C/1.5°C target. Indeed, global greenhouse gas emissions grew for the third consecutive year in 2019 and have done so consistently since 2010.³⁸⁵ It is also true that the Kyoto Protocol's CP2 was marked by the non-renewal of commitments from major emitter States Parties, which negatively affected the treaty's perceived legitimacy. When seen under the light of the thesis' theoretical perspective however, the evolution of the regime from Kyoto until today can still be framed as a positive, albeit imperfect, progression towards climate cooperation in several ways. One important form of progress to come from the Kyoto Protocol was the elaboration and integration of market mechanisms into the international climate regime. While their design and implementation was marked by disagreements among Parties over to which extent they should be relied upon in a subsidiary manner to domestic reductions,³⁸⁶ the mechanisms ended up playing a significant role as a tool for Kyoto States Parties to fulfill their commitments.³⁸⁷ They are expected to continue to play an important role in the climate regime once the modalities for the Paris Agreement Article 6 flexibility mechanisms are adopted. The Kyoto Protocol and its market mechanisms can also be seen as a good first step towards climate regulation in that they

³⁸⁵ See United Nations Environment Programme, *Emissions Gap Report 2020: Executive Summary* (2020), online: UNEP <<https://wedocs.unep.org/bitstream/handle/20.500.11822/34438/EGR20ESE.pdf>> at IV.

³⁸⁶ See Jaime Saura Estapa, "Flexibility Mechanisms in the Kyoto Protocol: Constitutive Elements and Challenges Ahead" (2004) 34:1 RGD 107 at 120.

³⁸⁷ See Romain Morel & Igor Shishlov, "Ex-Post Evaluation of the Kyoto Protocol: Four Key Lessons for the 2015 Paris Agreement" (Paris: CDC Climat, May 2014), online: I4CE <<https://www.i4ce.org/wp-core/wp-content/uploads/2015/09/14-05-Climate-Report-n%C2%B044-Analysis-of-the-KP1.pdf>> at 15.

have, despite their shortcomings, been shown to have led to a reduction from business-as-usual emissions for the States Parties they applied to.³⁸⁸

Understood through the perspective of the new Chicago school theory, the market mechanisms' main positive effect comes not from their role in the mitigation of greenhouse gases, but first and foremost from their contribution to an efficient identification and accounting of emissions at a permit level. Indeed, by setting centralized carbon accounting standards that emitters must comply with and that States Parties must review in order to participate in the flexibility mechanisms, the mechanisms take steps towards standardizing carbon emissions reporting, which improves their traceability and opens the door to more wider-reaching, and thus more effective, international regulation.³⁸⁹ The main weak point of the Kyoto Protocol, when seen this way, is that despite having the structure and the ambitions of global agreement, it was in fact a sub-global one. The fact that only Annex 1 Parties entered into binding commitments and thus could participate in the flexibility mechanisms limited these mechanisms' reach, possibly leading to carbon leakage, the relocation of emissions to non-Annex countries where the accounting standards are not enforced. The carbon accounting standards put in place by the flexibility mechanisms, in order to be successful, must be expanded to a global scale: this requires global participation.

Through the second constitutional phase of the climate regime, scientific understanding of both the phenomenon of climate change itself as well as on its socio-economic impacts on humankind also improved significantly. The IPCC Assessment Reports and the Stern Review³⁹⁰ are two

³⁸⁸ Nada Maamoun, "The Kyoto Protocol: Empirical evidence of a hidden success" (2019) 95 *Journal of Environmental Economics and Management* 227 at 244.

³⁸⁹ See Lessig, *Code, supra* note 323 at 54.

³⁹⁰ Stern, *supra* note 278.

examples of landmark scientific contributions that have helped define the problem of climate change in the years following the adoption of the Kyoto Protocol. Although not a direct product of the climate treaties, both these works can be linked to the climate regime: the IPCC is an agency which is part of UN system and has formal institutional ties to the UNFCCC, while the Stern report was commissioned by an Annex 2 State Party, the United Kingdom. Alongside the building blocks for climate accounting set up through the Kyoto flexibility mechanisms, these scientific advancements have played an important role in improving the understanding of the architecture of the climate problem from a new Chicago school perspective. Notably, they led to the introduction of the 2°C/1.5°C target at COP15 in Copenhagen: this target added a much-needed quantification to the original FCCC stabilization objective, which was crucial in order for States Parties to coordinate their actions.³⁹¹ Since its consecration through the Cancun Agreements, the 2°C/1.5°C target orients decision-making: it is used as the main reference point for calculating required mitigation action, effectively shaping what can be seen as a global greenhouse gas emissions budget. The advancements in scientific knowledge fostered by international climate law, combined with the accounting enabled by the Kyoto flexibility mechanisms, enable us to better understand the architecture of the climate problem and thus the possibilities for its regulation, or as Lessig calls it, its “regulability”.³⁹² Gathering scientifically sound data on the Earth’s climate planetary boundary as well developing globally agreed-upon standards for calculating emissions are non-negligible steps in the right direction. Together, improvements in climate science and climate accounting, both by-products of the international climate treaties, have helped set the stage for effective coordination in managing the global climate commons.

³⁹¹ See Yun Gao, Xiang Gao & Xiaohua Zhang, “The 2 °C Global Temperature Target and the Evolution of the Long-Term Goal of Addressing Climate Change – From the United Nations Framework Convention on Climate Change to the Paris Agreement” (2017) 3 *Engineering* 272 at 277.

³⁹² Lessig, *Code*, *supra* note 323 at 237.

Faure and Partain explain that under a law and economics approach, environmental regulation generally proceeds through a standard-setting process. The initial step consists in defining overall quality standards or targets that are to be reached. This is what the climate regime's now quantitative target represents. The second step is to deduct the emissions standard necessary to reach this target: once an overall emissions standard is set, it must be further divided and directed to individual actors.³⁹³ The Kyoto QELRCs and the Paris NDCs are two types of such emission standards. From a law and economics point of view, emissions standards must be aligned with the overall quality standard in order for the policy objective to be reached. Although they were individually legitimate, the Kyoto QELRCs did not have much effect since they were only applied to a minority of States Parties and since, more fundamentally, they had no clear overarching global mitigation target to align themselves with at the time. The Paris Agreement NDCs, by being applicable to all States Parties, attempt to align with the Article 2 target but as of today are not ambitious enough to do so. This is where more progress is required.

In summary, the Kyoto Protocol CP1 led to significant, albeit incomplete, progress on managing the global climate commons. International climate law enabled the establishment of flexibility mechanisms for mitigation and fostered improvements in climate science, which in turn helped define the architecture of the planetary climate boundary and of the emission standard to be reached to avoid crossing that boundary. The mitigation commitments taken by some developed States Parties led to reduced emissions when compared to modeled business as usual scenarios: while these reductions are nowhere near what is required to reach the now quantified 2°C/1.5°C

³⁹³ Faure & Partain, *supra* note 316 at 66.

target, the Kyoto QELRCs were a step in the right direction. A major obstacle to the Kyoto Protocol's effectiveness was its sub-global scope. This can be explained by the strong ideological divide between Annex and non-Annex States Parties, qualified by some negotiators as a "firewall", which had plagued negotiations since the inception of the UNFCCC regime.³⁹⁴ The stark divide between the two groups, combined with the consensus voting requirement imposed by the lack of agreed-upon rules of procedure, led to a deadlock in the Kyoto negotiations. On one side, major emitter developing countries refused to accept any sort of binding commitment. They based their position on their interpretation of the CDRRC principle, arguing that Annex Parties' responsibility for past emissions justified it. On the other side, developed States Parties either accepted only less ambitious mitigation commitments or, in the case of the United States, refused to ratify altogether. In the language of law and economics, Kyoto-era climate cooperation appeared to be drawn to an inefficient Nash equilibrium, the Annex/non-Annex divide leading to the Protocol's sub-global scope and low-ambition mitigation commitments. In this sense, a major success of the second constitutional phase, in addition to setting forth the global quantified 2°C/1.5°C target, was breaking down the Annex/non-Annex firewall in order to enable truly global participation. Indeed, the Annex/non-Annex dichotomy was set aside in favor of bounded self-differentiation as embodied by the Paris Agreement NDCs.³⁹⁵ Both of these successes are now enshrined in the Paris Agreement: the second regulatory phase consists of a globally applicable response with a quantified overall target. Understood this way, the shift in approach from the Kyoto Protocol to the Paris Agreement was maybe not as bad a failure as what some say:³⁹⁶ the

³⁹⁴ Bodansky, Brunnée & Rajamani, *International Climate Change Law*, *supra* note 11 at 111.

³⁹⁵ Pieter Pauw, Kennedy Mbeva & Harro van Asselt, "Subtle differentiation of countries' responsibilities under the Paris Agreement" (2019) 5:86 *Palgrave Communications*, online: Nature <<https://www.nature.com/articles/s41599-019-0298-6.pdf>> at 2.

³⁹⁶ See e.g. Sasja Beslik, "5 Reasons Why the Paris Agreement is a Joke (and How We Can Fix It)" (March 18, 2019) online: Medium <<https://medium.com/in-search-of-leverage/4b636409bb05>>.

insights gained from the Protocol's successes and obstacles provided the regime with a way out of deadlock and a possible path to success. The Kyoto Protocol was a demonstration that international climate law can lead to improved management of the global climate commons, but its limited success signals that climate treaties must be scaled up to a truly global scale in order to be effective. What is now left to do is to elaborate and apply quantified emissions standards at the national level, with an ambition level that aligns with the global target. This is no small feat, but this is what the international climate regime aims to orchestrate through the Paris Agreement.

In 2009, Elinor Ostrom, who would go on to win the Nobel Prize in Economics that same year, produced an article on the topic of polycentricity for coping with the problem of climate change, which was to be used as a background paper to the 2010 World Development Report.³⁹⁷ There, she argued that a polycentric system for governing the global climate commons was already emerging. In support of this she highlighted systems for collective climate action established at the municipal, subnational and regional level. Ostrom also identified four recurring problems plaguing efforts to control greenhouse gas emissions in this emergent polycentric system: leakage, inconsistent policies, free riding and inadequate certification.³⁹⁸ As was discussed earlier in this section, the Kyoto Protocol, because of its sub-global scope, did not do much to improve the uniformity of climate policy at a global scale. This unwillingly perpetuated the problems of free riding and leakage. In addition to these four perduring issues, Ostrom also underlines that the Kyoto Protocol flexibility mechanisms introduced the problem of actors gaming the system by

³⁹⁷ Elinor Ostrom, "A Polycentric Approach for Coping with Climate Change", World Bank Policy Research Working Paper No 5095 (October 2009), online: World Bank <<http://documents1.worldbank.org/curated/en/480171468315567893/pdf/WPS5095.pdf>> [Ostrom, "A Polycentric Approach"].

³⁹⁸ *Ibid* at 29.

finding loopholes in the credit schemes made to incentivize participation to the mechanisms.³⁹⁹ She concluded by arguing that despite these recurring problems, a polycentric approach to coping with climate change is advantageous, mainly because it encourages experimental and innovative efforts at various scales, which in turn allows decision makers to compare the successes and failures of these efforts and learn from them. Another advantage mentioned by Ostrom is that polycentric governance, by linking small or medium scale initiatives through information networks and monitoring, helps build trust among actors which enables greater commitment.⁴⁰⁰

Sadly, Elinor Ostrom passed away in 2012, before the adoption of the Paris Agreement. Given the institutional linkage between the World Bank and the UNFCCC, notably through the GEF, it is plausible that her background paper had an impact on the COP21 negotiations and outcome. Whether that is the case or not, since her passing, other researchers have developed her ideas on polycentricity and climate change further. Jordan et al, for example, further define the characteristics of polycentric governance in the context of climate change through the enumeration of five core propositions. They are: (1) the emergence of governance units through local action; (2) the existence of a process of mutual adjustment between governance units; (3) an enabling environment for policy experimentation and innovation; (4) interaction between governance units which leads to building trust; and (5) the coordination of these units by a set of overarching rules.⁴⁰¹ The Paris Agreement can be seen as integrating significant elements of Ostrom's polycentric approach as refined through these propositions. For example, while the climate regime has always been a combination of centralized mechanisms and bottom-up initiatives, the Paris Agreement

³⁹⁹ Ostrom, "Polycentric Systems", *supra* note 350 at 555.

⁴⁰⁰ Ostrom, "A Polycentric Approach", *supra* note 397 at 39.

⁴⁰¹ Andrew Jordan et al, "Governing Climate Change Polycentrically: Setting the Scene" in Andrew Jordan et al, eds, *Governing Climate Change: Polycentricity in Action?* (Cambridge: Cambridge University Press, 2018) 3 at 12.

NDC process for mitigation gives more importance to decentralized approaches than before. Indeed, as Chan et al note, the climate regime evolved from a “global deal” model, with States Parties accepting binding commitments upfront, to a “pledge-and-review” model where States Parties set their own goals subsequently, subject to treaty modalities. In such an environment, subnational and non-state action is treated not as a substitute or alternative to state action but rather as a part of States Parties’ NDCs.⁴⁰² As such, when subnational and non-state actors make mitigation progress on the territory of a State Party, they encourage it to adjust its NDC upward which in turn promotes further ambition. This process legitimizes action at a smaller scale, which is in line with Jordan et al’s polycentric propositions of local action coordinated through overarching rules and following a process of mutual adjustment. Elements of polycentricity at a horizontal level, between the UNFCCC and other global governance regime, can also be observed. The integration of a climate change objective within the UN 2030 Agenda for Sustainable Development’s Sustainable Development Goals (SDGs), alongside other objectives for international environmental and socio-economic change, is one sign of this.⁴⁰³

Some references to polycentricity can be inferred directly from the text of the Paris Agreement. Its Preamble recognizes “the importance of the engagements of all levels of government and various actors”.⁴⁰⁴ Through this, it appears to acknowledge a wider breadth of actors than did the UNFCCC text, whose Preamble rather refers to “comprehensive response strategies at the global, national, and where, agreed, regional levels”.⁴⁰⁵ The Paris Agreement also refers to “private entities”⁴⁰⁶ and

⁴⁰² Sander Chan et al, “Reinvigorating International Climate Policy: A Comprehensive Framework for Effective Non-State Action” (2015) 6:4 Global Policy 466 at 469.

⁴⁰³ *Transforming our world: the 2030 Agenda for Sustainable Development*, GA Res 70/1, UNGAOR, 70th Sess, UN Doc A/RES/70/1, (2015) [*Agenda for Sustainable Development*] at 23.

⁴⁰⁴ *Paris Agreement*, *supra* note 2 at Preamble para 15.

⁴⁰⁵ *UNFCCC*, *supra* note 1 at Preamble para 18.

⁴⁰⁶ *Paris Agreement*, *supra* note 2 at art. 6(4) b).

“private sector participation”⁴⁰⁷ in its Article 6 provisions for flexibility mechanisms, to the “knowledge of indigenous and local knowledge systems”⁴⁰⁸ in its provisions on adaptation, to “subnational and local levels”⁴⁰⁹ in its provisions on capacity building, as well as to “relevant organizations and expert bodies outside the Agreement”⁴¹⁰ in its provisions on loss and damage. The use of these terms in the text of the Paris Agreement can be seen as nods to governance units other than UNFCCC States Parties and institutions, acknowledging polycentricity along the vertical axis, from international to local, as well as horizontally, across international regimes.

As Chan, Brandi and Bauer note however, the text of the Paris Agreement does not refer to specific non-Party actors or specify their role.⁴¹¹ In contrast, its adopting decision does. In the Preamble of Decision 1/CP.21, the COP agrees to “promote regional and international cooperation in order to mobilize stronger and more ambitious climate action by all Parties and non-Party stakeholders, including civil society, the private sector, financial institutions, cities and other subnational authorities, local communities and indigenous peoples”.⁴¹² Section V of the decision further invites non-Party stakeholders to “scale up their efforts [...] and demonstrate these efforts via the Non-State Actor Zone for Climate Action [NAZCA] platform”,⁴¹³ a web portal set up as part of the Decision whose role is to be a platform “where actors from around the globe – countries, regions, cities, companies, investors and other organizations – can display their commitments to act on

⁴⁰⁷ *Ibid* at art. 6(8) b).

⁴⁰⁸ *Ibid* at art. 7(5).

⁴⁰⁹ *Ibid* at art. 11(2).

⁴¹⁰ *Ibid* at art. 8(5).

⁴¹¹ Sander Chan, Clara Brandi & Steffen Bauer, “Aligning Transnational Climate Action with International Climate Governance: The Road from Paris” (2016) 25:2 RECIEL 238 at 242.

⁴¹² FCCC Dec 1/CP.21, *supra* note 186 at Preamble para 15.

⁴¹³ *Ibid* at para 135.

climate change”,⁴¹⁴ with an aim to “present a clear, comprehensive view of Global Climate Action”.⁴¹⁵ In addition to NAZCA, Decision 1/CP.21 also establishes a “platform for the exchange of experiences and sharing of best practices on mitigation and adaptation in a holistic and integrated manner”⁴¹⁶ in order to channel the knowledge, technologies, practices and efforts of local communities and indigenous peoples in addressing and responding to climate change. The Local Communities and Indigenous Peoples Platform (LCIPP)’s main functions include knowledge-sharing, capacity-building and “the integration of diverse knowledge systems, practices and innovations in designing and implementing international and national actions”,⁴¹⁷ all of which are elements of a polycentric approach. To summarize, when analyzed through the lens of Ostrom’s polycentric governance theory, the Paris Agreement be seen as an international legal agreement integrating and codifying certain elements of a polycentric approach in its provisions and institutions. Since a *de facto* polycentric governance system has already begun to emerge around (or in parallel to) the previous international climate law instruments, notably through subnational and private initiatives, this more formal integration, while still partial, is welcome.

Elinor Ostrom describes her method for analysing the management of CPRs as consisting in four stages. First, she tries “to understand something about the structure of the resource itself – its size, clarity of boundary, and internal structure.”⁴¹⁸ She then turns to the analysis of the consumption patterns of the resource before assessing characteristics of the actors involved and finally

⁴¹⁴ UNFCCC, *Global Climate Action – NAZCA: About*, online: UNFCCC <<https://climateaction.unfccc.int/views/about.html>>.

⁴¹⁵ *Ibid.*

⁴¹⁶ FCCC Dec 1/CP.21, *supra* note 186 at para 136.

⁴¹⁷ UNFCCC, *LCIPP Initial Workplan* (27 March 2020), online: UNFCCC <<https://unfccc.int/documents/210676>> at 1.

⁴¹⁸ Ostrom, *Governing the Commons*, *supra* note 334 at 56.

examining the rules set up by these actors.⁴¹⁹ In the context of climate change, the resource managers, namely the UNFCCC institutions and States Parties, attempted to set rules for the management of the climate at the same time as they were building up their understanding of the resource itself, whose characteristics weren't well understood initially. Our analysis of the UNFCCC regime's evolution reveals that an improved understanding of the resource and of its consumption patterns is what it has mainly been able to provide so far. As was shown, the foundations for climate accounting laid down through Kyoto Protocol mechanisms as well as the quantified target agreed upon in Copenhagen and formally adopted in Paris, while not without their flaws, can be seen as significant first steps in building a common network through which manage the resource polycentrically. In leading to these global incremental improvements, international climate law is helping define the modalities of cooperation in order to achieve sustainable use of the common climate resource. The Paris Agreement marks further progress in that direction: the most significant advancement is that all State Parties agree that their respective use of the resource must be regulated to some degree, taking a legal commitment in that sense. Even if the Kyoto Protocol can at first glance appear as if it was able to gather deeper commitment through its QELRCs, the Paris Agreement approach, if implemented properly, appears equally valid from the thesis' perspective since it has the capacity to be fully global in scope.

In parallel to the international climate regime, initiatives to cope with climate change have been enacted in other governance units, be they at the subnational level, in other international regimes or in the private sector. The Paris Agreement also sets forth certain mechanisms to harness the progress made at these different scales. In a context where regulatory experimentation is ongoing

⁴¹⁹ *Ibid.*

and where previous global attempts have not been successful, enabling the international regime to learn from positive outcomes at these other scales appears useful. Now that long-term action for the post-2020 period is set to start, what is left to do is for States Parties to align their ambition level with the global target, and for the international climate regime to further build trust and enhance cooperation by ensuring compliance and transparency, notably through its MRV mechanisms. The structure of the Paris Agreement leaves the former to the political sphere, as it is up to States themselves to set their NDC targets. International climate law's role instead lies in the latter. Indeed, the Paris Agreement procedural MRV obligations are where the core of its legally binding power lies. One limit to the Paris Agreement MRV obligations in a polycentric system is that they operate at the national level, with reporting by States Parties. As Chan, Brandi and Bauer note, tracking the progress of non-state actors remains a great analytical challenge as it has not been specified or uniformized.⁴²⁰ With the ambition gap as it stands, major progress by actors at all scales is required if the Paris Agreement global target is to be reached.⁴²¹ This is no small feat, and the clock is ticking.

4.3 Conclusion

Now that the normative and theoretical background to the thesis have been laid out, the next chapter signals the start of the incursion into the core subject matter of the thesis, namely the role of TD&T in the international climate regime. In chapter 4, the concept of TD&T, its evolution and current role in climate treaty law will be elaborated upon. Its relationship with the innovation process and its role in the polycentric climate governance system will be highlighted. Through the

⁴²⁰ Chan, Brandi & Bauer, *supra* note 411 at 244.

⁴²¹ UNEP, *supra* note 385 at IX.

lens of the theoretical perspective as a whole, past and current initiatives for TD&T within the UNFCCC regime will be reviewed.

5. Technology development and transfer in a polycentric climate system: framework, evolution and future perspectives

This chapter focuses on one area of international climate law where polycentricity, treaty law, and innovation intersect: the UNFCCC provisions for climate TD&T. As was explained in the previous chapter, the Paris Agreement can be seen as an attempt of international climate law to coordinate action within a polycentric system of climate governance. To quote Ostrom, such a system however is “no panacea”⁴²² for a complex global problem such as climate change: polycentric systems’ tendency to foster change in a slow, incremental manner has been noted as one of their weak points.⁴²³ Climate change, in contrast, is a pressing problem and requires solutions to be enacted as soon and as at many scales as possible. One way a polycentric system can contribute to these solutions is by fostering experimentation and innovation, through which governance units can learn from one another and best practices can be adapted across scales. In order to deliver on this, polycentric governance requires overarching rules to build trust, foster experimentation and monitor compliance:⁴²⁴ in the climate governance system, these overarching rules lie within the international climate treaties, of which the Paris Agreement is the newest addition. Polycentricity offers a broader take on climate governance as it attempts to coordinate action among actors other than States, such as subnational governments and the private sector, the latter playing a key role in the TD&T process. The overarching rules of the climate treaties are by design often narrower in their scope of application: as norms of international law, they are elaborated by and apply to States Parties. Insights from the thesis’ theoretical perspective can here be used to understand how

⁴²² Ostrom, “Polycentric Systems”, *supra* note 350 at 555.

⁴²³ Jordan et al, eds, *supra* note 401 at 13.

⁴²⁴ *Ibid* at 19.

the international legal rules and mechanisms of the climate treaties can reach these other actors and influence the decentralized processes for climate TD&T.

This chapter, together with chapter 5, focuses on TD&T as a tool for managing the common resource problem of climate change by highlighting and addressing two main legal issues for climate technology. The first issue, the subject of this chapter, relates to the place of TD&T within the UNFCCC regime: through an analysis of the relevant legal provisions, policy documents and empirical studies, this chapter will synthesize the situation of TD&T in the UNFCCC as it stands in order to gain insights on the progress made so far and to identify potential institutional and normative improvements. The second issue, which is the subject of chapter 5, pertains to the relationship between international climate law and other spheres of international law in regard to TD&T: synergies and potential conflicts between different international legal regimes will be analyzed, with the goal of improving the understanding of the interaction between them.

The current chapter will begin by analyzing in detail the provisions for TD&T in the UNFCCC regime, up until the adoption of the Paris Agreement. The main institutional actors for climate TD&T operating both under and in parallel to the UNFCCC regime will be described. The polycentric character of their organization will be explained and the link between innovation and TD&T in international climate law will be highlighted. The relationship between technology diffusion and the need for capacity-building of developing country States Parties will also be touched upon.

Following this analysis, possibilities for an expanded role of TD&T in the international climate governance regime will be explored through a review of recent developments. As will be shown, UNFCCC TD&T provisions and institutions have the potential of playing an important role in the post-Paris context as they open the door to linkages between treaty law and non-state actors. One key to their success remains the enactment of more thorough MRV for TD&T. The second part of the chapter will also highlight how, in parallel to the designated UNFCCC TD&T norms and institutions, a second, *de facto* channel for TD&T emerged through the Kyoto Protocol's CDM. It concludes that for both mechanisms, much is however still left to do for climate TD&T to be enacted to its full potential.

2.1 Technology development and transfer in the UNFCCC regime

2.1.1 Norms, mechanisms and institutions

The first mention of TD&T in international law dates back to the 1960s: since then, the topic has been an important one on the international stage, notably for developing countries who consider it a key to their social and economic development.⁴²⁵ Provisions for TD&T have been included in the climate regime treaties since the adoption of the UNFCCC in 1992. In the 1992 Convention's text, it is determined that climate technology should play a significant role in reaching the Convention's main objective. It is indeed stated in its Preamble the fact that the "steps required to understand and address climate change will be environmentally, socially and economically most effective if they are based on relevant scientific, technical and economic considerations and continually re-evaluated in the light of new findings in these areas".⁴²⁶ TD&T can thus be

⁴²⁵ Michael Waibel & William P. Alford, *Technology Transfer* (Oxford: Oxford University Press, 2012) at 801.

⁴²⁶ UNFCCC, *supra* note 1 at Preamble para. 16.

understood as a tool to fulfill the Convention’s objective in accordance with the fundamental principles described in Chapter 1 of the thesis, which include the principle of CBDRRC⁴²⁷ and of the “specific needs and special circumstances of developing country Parties”.⁴²⁸

The IPCC defines climate TD&T as the “broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change amongst different stakeholders such as governments, private sector entities, financial institutions, NGOs and research/education institutions”,⁴²⁹ which “encompasses diffusion of technologies and technology cooperation across and within countries”.⁴³⁰ UNEP further defines what constitutes a climate technology in a 2021 brief: it is there defined a piece of equipment, technique, practical knowledge or skill for performing an activity that has a direct and measurable positive effect in efforts to reduce greenhouse gas emissions and/or enable a particular economic sector or population to better manage or adapt to the effects of climate change.⁴³¹ It is important to note that this broad definition of climate technology covers technological hardware as well as skills, techniques, organizational processes and other less tangible forms of technology. In this respect, climate technology can be categorized along three types: the tangible items, such as equipment and products (hardware); the know-how, experience and practices (software) associated with the production and use of this

⁴²⁷ *Ibid* at art. 3(1).

⁴²⁸ *Ibid* at art. 3(2).

⁴²⁹ Metz et al, *supra* note 13 at 3.

⁴³⁰ *Ibid*.

⁴³¹ James Haselip & Léa Jehl Le Manceau, *Achieving the Sustainable Development Goals: Exploring Linkages with Technology Needs Assessments* (2021), online: UNEP DTU <<https://tech-action.unepdtu.org/publications/achieving-the-sustainable-development-goals-exploring-linkages-with-the-technology-needs-assessments/>> at 2.

hardware; and the institutional framework, or organisation, involved in the transfer and diffusion of a new piece of equipment or product (orgware).⁴³²

The 1992 UNFCCC provisions for climate TD&T can be found in its Article 4. There, it is stated that all Parties commit to “promote and cooperate in the development, application and diffusion, including transfer, of technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases”,⁴³³ taking into account their common but differentiated responsibilities and respective capabilities. Developed country Parties additionally commit to “take all practicable steps to promote, facilitate and finance, as appropriate, the transfer of, or access to, environmentally sound technologies and know-how to other Parties, particularly developing country Parties”⁴³⁴ as well as to “provide [new and additional] financial resources, including for the transfer of technology, needed by the developing country Parties”.⁴³⁵

To guide the Conference of the Parties in regard to technological matters, the Convention established the Subsidiary Body for Scientific and Technological Advice (SBSTA) through Article 9. Open to all States Parties and multidisciplinary in nature, it is formed of government representatives with relevant expertise.⁴³⁶ In regard to climate TD&T, the SBSTA’s role is to “identify innovative, efficient and state-of-the-art technologies and know-how”, “advise on the ways and means of promoting development and/or transferring such technologies”, “provide advice on scientific programmes [and] international cooperation in research and development

⁴³² TEC, *Enhancing the Implementation of Technology Needs Assessments: Guidance for Preparing a Technology Action Plan* (Bonn: UNFCCC, 2017), online: UNEDP DTU: <<https://tech-action.unepdtu.org/publications/enhancing-implementation-of-technology-needs-assessments/>> at viii.

⁴³³ UNFCCC, *supra* note 1 at art. 4(1)c).

⁴³⁴ *Ibid* at art. 4(5).

⁴³⁵ *Ibid* at art. 4(3).

⁴³⁶ *Ibid* at art. 9(1).

related to climate change” and “respond to scientific, technological and methodological questions that the Conference of the Parties and its subsidiary bodies may put to the body”.⁴³⁷

Transfer of funding and technology by developed Parties is essential to developing States Parties’ participation: indeed, “the extent to which developing country Parties will effectively implement their commitments under the Convention will depend on the effective implementation by developed country Parties of their commitments under the Convention related to financial resources and transfer of technology”.⁴³⁸ Article 11 of the UNFCCC thus provides for a “mechanism for the provision of financial resources on a grant or concessional basis, including for the transfer of technology”,⁴³⁹ to be operated by “one or more existing international entities”.⁴⁴⁰ The GEF, established at the Rio Earth Summit, was chosen to become the organization managing the UNFCCC financial mechanism.

The Kyoto Protocol to the 1992 Convention was adopted in 1997. As discussed in Chapter 1, it was an important milestone for the UNFCCC regime as it was the first instrument to impose legally binding greenhouse gas emission reduction targets to some States Parties. In addition to this, the Protocol also led to progress in regard to the issue of TD&T. Notably, it established the CDM,⁴⁴¹ through which developed country Parties could finance projects promoting sustainable development and emission reductions in developing countries in exchange for credits going towards their own emission reduction goals.⁴⁴² As will be discussed later in the chapter, CDM

⁴³⁷ *Ibid* at art. 9(2)c), d) and e).

⁴³⁸ *Ibid* at art. 4(7).

⁴³⁹ *Ibid* at art. 11(1).

⁴⁴⁰ *Ibid*.

⁴⁴¹ *Kyoto Protocol, supra* note 126 at art. 12.

⁴⁴² Freestone, *supra* note 33 at 107.

initiatives contributed to climate TD&T between project participants and the host States Parties. Much was however still left to be done after Kyoto in regard to UNFCCC TD&T mechanisms and institutions. Notably, a long-term strategy for TD&T had yet to be agreed upon.⁴⁴³ This strategy was adopted as part of the Marrakesh Accords during COP7 in 2001: in order to further enhance the implementation of Article 4 of the UNFCCC, the Technology Transfer Framework (TTF) was adopted and the Expert Group on Technology Transfer (EGTT) established.⁴⁴⁴ Between 2001 and 2010, the EGTT worked to improve the understanding of both the concept of TD&T itself as well as of its practical implications, such as funding and specific climate technologies.⁴⁴⁵ It was however criticized for being “closed to observers”⁴⁴⁶ and “dominated by the conflicting interests of developed and developing country representatives”.⁴⁴⁷

A surge of activity around climate TD&T followed the 2007 Bali Climate Conference: after having played a relatively marginal role in the international climate efforts since 1992, it was positioned as a key issue by States Parties going forward.⁴⁴⁸ Major changes were carried out at the institutional level. The EGTT was replaced in 2010 by the TM,⁴⁴⁹ a new two-tiered institution formed of a policy body, the Technology Executive Committee (TEC), as well as an implementation body, the Climate Technology Centre and Network (CTCN).⁴⁵⁰ The CTCN was fully operationalized in

⁴⁴³ Shabalala, *supra* note 17 at 161.

⁴⁴⁴ *Framework for meaningful and effective actions to enhance the implementation of Article 4, paragraph 5, of the Convention*, FCCC Dec 4/CP.7, annex 1, UNFCCCOR, 7th Sess, UN Doc FCCC/CP/2001/13/Add.1 at 24.

⁴⁴⁵ UNFCCC, *Expert Group on Technology Transfer: Five Years of Work* (Bonn: UNFCCC, 2007), online: UNFCCC <https://unfccc.int/resource/docs/publications/egtt_eng.pdf> at 11 [UNFCCC, *EGTT: Five Years of Work*].

⁴⁴⁶ Heleen de Coninck & Ambuj Sagar, “Technology Development and Transfer (Article 10)” in Daniel Klein et al, eds, *The Paris Agreement on Climate Change: Analysis and Commentary* (Oxford: Oxford University Press, 2015) 258 at 260.

⁴⁴⁷ *Ibid.*

⁴⁴⁸ Verbeke, *supra* note 14 at 143.

⁴⁴⁹ FCCC Dec 1/CP.16, *supra* note 172 at para 117.

⁴⁵⁰ *Ibid.*

2012:⁴⁵¹ as part of this process, it was determined that it would be hosted by a consortium of partner institutions led by UNEP alongside the United Nations Industrial Development Organization (UNIDO) and fourteen other institutions.⁴⁵² The two bodies forming the TM work together in a complementary manner to “support developing country efforts to address both policy and implementation aspects of climate technology development and transfer”.⁴⁵³ the TEC develops policy recommendations which it transmits to the COP through annual reports, while the CTCN mainly contributes to TD&T by assisting States Parties on a per-project basis.

A key tool designed to enable TD&T in the UNFCCC regime is the Technology Needs Assessment (TNA) process. TNAs were first formalized as part of the 2001 TTF: they consist of country-driven, multi-stakeholder consultative processes whose goal is to identify the barriers to technology transfer as well as measures to address these barriers through sectoral analyses.⁴⁵⁴ TNAs are enacted in three steps. First, the country identifies specific sectors and technologies that it wishes to prioritize. Second, the barriers for their uptake and diffusion within the country are analyzed and evaluated. Third, the steps needed to go beyond these barriers and successfully implement the selected technologies, including the need for any technological or financial assistance, are synthesized into a Technology Action Plan (TAP), which can then be presented to the GEF or other funding bodies in order to obtain assistance in fulfilling the technology needs and achieving the objectives identified in the TNA.⁴⁵⁵ TNAs are conducted by States Parties

⁴⁵¹ *Arrangements to make the Climate Technology Centre and Network fully operational*, FCCC Dec 14/CP.18, UNFCCC/COR, 18th Sess, UN Doc FCCC/CP/2012/8/Add.2 (2012) at para 2.

⁴⁵² For a list of these partner institutions, see CTCN, *Consortium Partners*, online: CTCN <<https://www.ctcn.org/about-ctcn/consortium-partners>>.

⁴⁵³ TT: Clear, *Technology Mechanism*, online: UNFCCC <<http://unfccc.int/ttclear/support/technology-mechanism.html>>.

⁴⁵⁴ FCCC Dec 4/CP.7, annex 1, *supra* note 444 at para 3.

⁴⁵⁵ Haselip & Jehl Le Manseau, *supra* note 431 at 1.

themselves, but the TEC and CTCN have the mandate to provide guidance and support to countries undertaking the process in their respective capacity.⁴⁵⁶

The adoption of the Paris Agreement in 2015 led to further significant developments for climate TD&T, some of which are still being operationalized. TD&T is mainly addressed in Article 10 of the Agreement. There, it is notably stated that Parties “shall strengthen cooperative action on technology development and transfer”⁴⁵⁷ and that “support, including financial support, shall be provided to developing country Parties for the implementation of this Article, including for strengthening cooperative action on technology development and transfer at different stages of the technology cycle”.⁴⁵⁸ Information on efforts for the support given to developing country Parties for technology development under article 10(6) is to be taken into account by the COP as part of its periodical global stocktake.⁴⁵⁹ Both provisions, with their use of the term “shall”, have been interpreted as indicating a strong legal obligation for cooperation on technology transfer, although the exact modalities of this obligation remain rather vague. De Coninck and Sagar are of the opinion that the while wording of Article 10 indicates a legal commitment for States Parties, this commitment is one of conduct, not result.⁴⁶⁰ While a lack of precision on the legal nature of technology obligations could hamper progress, the two scholars however note that Parties’ accountability is likely to be enhanced compared to previous agreements, as it will be more thoroughly reviewed through the Paris Agreement global stocktake. This is one positive aspect of the new Paris modalities for TD&T.

⁴⁵⁶ TT: Clear, *Technology Needs Assessment: Pathways for climate tech implementation*, online: UNFCCC <<https://unfccc.int/ttclear/tna/guidance.html>>.

⁴⁵⁷ *Paris Agreement*, *supra* note 2 at art. 10(2).

⁴⁵⁸ *Ibid* at art. 10(6).

⁴⁵⁹ *Ibid* at arts. 10(6) and 14.

⁴⁶⁰ De Coninck & Sagar, *supra* note 446 at 266.

Since the establishment of the TM, TD&T has been enacted through an approach that is more in line with polycentric governance models than it had previously been under the 1992 Convention and its Kyoto Protocol. This shift towards polycentricity is set to continue under the Paris Agreement, since as was discussed in the previous chapter of this thesis it favours a decentralized, multi-stakeholder approach to tackling climate change, sometimes called a “bottom-up” approach.⁴⁶¹ The Agreement’s Preamble underlines this change in approach: it is there stated that the Parties to the Agreement recognize “the importance of the engagements of all levels of government and various actors, in accordance with respective national legislations of Parties, in addressing climate change”.⁴⁶² The UNFCCC TM is mandated to continue its work of enhancing TD&T in cooperation with States Parties and other relevant actors under the Paris Agreement.⁴⁶³

A notable institutional development is the establishment of a new TF under the Agreement, whose role is “to provide overarching guidance to the work of the Technology Mechanism in promoting and facilitating enhanced action on technology development and transfer”.⁴⁶⁴ The TF was not adopted as part of the Paris Agreement but was rather set to be subsequently drafted by the SBSTA and adopted by the CMA at its first session.⁴⁶⁵ It was finalized in 2018 and adopted at the third meeting of CMA1 in Katowice.⁴⁶⁶ The purpose of the TF as formulated in article 10(4) of the Paris agreement is re-stated in its text: it is to provide overarching guidance to the two branches of the

⁴⁶¹ Annalisa Savaresi, “The Paris Agreement: a new beginning?” (2016) 34:1 J Energy & Nat’l Res L 16 at 21.

⁴⁶² *Paris Agreement*, *supra* note 2 at preamble para 15.

⁴⁶³ *Ibid* at art. 10(3).

⁴⁶⁴ *Ibid* at art. 10(4).

⁴⁶⁵ FCCC Dec 1/CP.21, *supra* note 186 at para 68.

⁴⁶⁶ *Technology Framework under Article 10, paragraph 4 of the Paris Agreement*, FCCC Dec 15/CMA.1, Annex, UNFCCCOR, 24th Sess, UN Doc FCCC/PA/CMA/2018/3/Add.2 (2018).

TM.⁴⁶⁷ Article 2 further defines what this overarching guidance means in practice, by stating that “the technology framework can play a strategic role in improving the effectiveness and efficiency of the work of the Technology Mechanism, (...) by addressing the transformational changes envisioned in the Paris Agreement and the long-term vision on technology development and transfer”.⁴⁶⁸ Section II of the TF enumerates and describes the five principles which should guide the TM in the implementation of the Paris Agreement. These principles are: “coherence”; “inclusiveness”; a “result-oriented approach”; a “transformational approach”; and “transparency”.⁴⁶⁹ It is specified that these principles should be “designed and implemented in a manner that facilitates the participation of all relevant stakeholders” as well as “in a manner that enhances the transparency of the results, costs and process, such as through planning, resource management and reporting on activities and support.”⁴⁷⁰

The actions and technology-related activities to be enacted under the TF are to be centered around five key themes, labeled “focused areas of action”. These themes are “innovation”; “implementation”; “enabling environment and capacity-building”; “collaboration and stakeholder engagement”; and “support”.⁴⁷¹ Each key theme is respectively further defined and described in subsections III A to III E of the draft. In these subsections, some context around the key theme is given and examples of actions that should be undertaken are grouped in categories and explained.

⁴⁶⁷ *Ibid* at para 1.

⁴⁶⁸ *Ibid* at para 2.

⁴⁶⁹ *Ibid* at para 3.

⁴⁷⁰ *Ibid* at para 3a) and e).

⁴⁷¹ *Ibid* at para 4.

It is interesting to note that the UNFCCC COP, in its decision adopting the Paris Agreement, specifically mentioned enhancement of the TNA process and of provision of financial and technical support to it as elements to be taken into consideration in the elaboration of the TF.⁴⁷² As a result, TNAs are referred to several times in the TF. The TF text notably underlines the need to facilitate their undertaking, to enhance the implementation of their results as well as to promote links between them, NDCs and national adaptation plans.⁴⁷³ In addition to this, the TNA guidelines are to be reviewed and updated with a view to align them with the Paris Agreement.⁴⁷⁴ This indicates that the TNA process is likely to remain a central one for TD&T going forward.

The TF refers to “the transformational changes to the UNFCCC regime envisioned in the Paris Agreement”.⁴⁷⁵ These ongoing changes raise questions regarding the future governance structure and the functioning of institutions for climate TD&T. For example, in parallel to the implementation of the TF, will the scope and mandate of already-existing institutions and processes for TD&T, like the TEC, the CTCN and TNAs, change significantly? And, when compared to their current iterations, to what extent can the flexibility mechanisms of the Paris Agreement be expected to continue contributing to TD&T? This is what the second half of this chapter will attempt to determine through the analysis of past and projected action for TD&T in the Paris Agreement. Before doing so however, the polycentric character of TD&T and its linkages with innovation and capacity-building will be elaborated upon. This will help situate TD&T within the conceptualization of climate law laid out through the thesis’ theoretical perspective.

⁴⁷² FCCC Dec 1/CP.21, *supra* note 186 at para 68a) and b).

⁴⁷³ FCCC Dec 15/CMA.1, Annex, *supra* note 466 at paras 12a), 12b) and 25c).

⁴⁷⁴ *Ibid* at para 12c).

⁴⁷⁵ *Ibid* at para 2.

2.1.2 Polycentricity in climate TD&T

The definition of TD&T itself, as formulated in the UNFCCC regime, hints at its polycentric character. Indeed, it is defined by the IPCC as covering the “broad set of processes [...] amongst different stakeholders such as governments, private sector entities, financial institutions, NGOs and research/education institutions”.⁴⁷⁶ Within UNFCCC official documents, it is possible to trace references to polycentricity in TD&T provisions back to the 2001 TTF. More specifically, “cooperation among various stakeholders (the private sector, governments, the donor community, bilateral and multilateral institutions, NGOs and academic and research institutions)”⁴⁷⁷ is preconized in paragraph 2 of the TTF as part of its overall approach for implementing the 1992 UNFCCC provisions on TD&T.

A number of actors operating at different scales can be seen as forming the polycentric governance system of climate TD&T. In regard to clean energy technologies for example, these include other international agencies such as the G8-founded International Energy Agency (IEA), the International Partnership for Energy Efficiency Cooperation, the International Renewable Energy Agency (IRENA) as well as Mission Innovation, a multinational initiative for clean energy innovation launched at COP21. Transnational public-private initiatives linking subnational actors across borders, such as the Vienna-based Renewable Energy and Energy Efficiency Partnership (REEEP) and the Indian-led International Solar Alliance (ISA), as well as the World Bank and other regional and national development banks are other examples of actors operating in the

⁴⁷⁶ Metz et al, *supra* note 13 at 3.

⁴⁷⁷ FCCC Dec 4/CP.7, *supra* note 444 at para 2.

polycentric TD&T system.⁴⁷⁸ As Andonova, Castro and Chelminski explain, the polycentric system for climate TD&T emerged and evolved as different state actors, pursuing their respective national interests, influenced existing institutions and created new ones, which through the years have adjusted to each other and cooperated but also sometimes competed against one another.⁴⁷⁹ This polycentric system has and still continues to evolve, gaining in legitimacy and authority through increased recognition by the UN.⁴⁸⁰

The evolution in the structure of UNFCCC TD&T institutions, from the previous EGTT to the current TM, is a good example of the growing formal recognition of polycentricity in UNFCCC TD&T governance. Indeed, the EGTT was fully integrated within the UNFCCC structure, as it was closely linked to the SBSTA. As mentioned earlier, the TM differs as it is comprised of two distinct bodies, the TEC and the CTCN. The former resembles the EGTT in role and structure, but the latter is novel both in its structure and functioning. It is hosted by a consortium of organisations including UNEP and UNIDO, and coordinates a network composed of 640 institutions, ranging from financial institutions and intergovernmental organizations to research and academic institutions, public and private sector organizations, NGOs and other not-for-profit organizations. Many of these latter subnational entities are classified as Nationally Designed Entities (NDEs), which means they are selected by States Parties to function as one of their respective national focal points.⁴⁸¹ As Andonova, Castro and Chelminski argue, the structure of the CTCN, which is established through the UNFCCC, managed by UNEP, and includes both intergovernmental and

⁴⁷⁸ For an overview of these international actors, see Liliana B. Andonova, Paula Castro & Kathryn Chelminski, “Transferring Technologies: The Polycentric Governance of Clean Energy Technology” in Jordan et al, eds, *supra* note 401 266 at 271-272.

⁴⁷⁹ *Ibid* at 274.

⁴⁸⁰ *Ibid* at 281.

⁴⁸¹ For information on the CTCN Network member institutions, see CTCN, *CTCN Network visualizations*, online: CTCN <<https://www.ctc-n.org/network/network-visualizations>>.

transnational organisations, represents a political recognition of the polycentric structure of TD&T governance.⁴⁸²

Polycentricity is reaffirmed in the latest UNFCCC initiatives for TD&T. In the TF, it is mainly reflected in theme D on collaboration and stakeholder engagement. Paragraph 19 underlines the importance of “enhanced engagement of stakeholders at the local, regional, national and global level”, stating that “activities for cooperation on technology development and transfer across relevant organizations, institutions and initiatives should be harmonized and synergized.”⁴⁸³ Collaboration with the private sector is specifically referenced: one of the recommended actions listed at Paragraph 20 consists in “enhancing engagement and collaboration with the private sector, on a voluntary basis, to leverage expertise, experience and knowledge regarding effective enabling environments.”⁴⁸⁴ The importance of collaboration with the private sector is reflected in the CTCN’s structure, with nearly 50 percent of the Centre’s Network formed of private sector actors, a majority of which consists of small- and medium-sized businesses.⁴⁸⁵

2.1.3 Innovation in climate treaty TD&T provisions

Innovation is also often linked to TD&T in UNFCCC treaty provisions. In the 1992 Convention for example, one of the functions of the SBSTA, the body responsible for the implementation of TD&T measures, is described in Article 9 as “identify(ing) innovative, efficient and state-of-the-art technologies and know-how and advis(ing) on the ways and means of promoting development

⁴⁸² Andonova, Castro & Chelminski, *supra* note 478 at 273.

⁴⁸³ FCCC Dec 15/CMA.1, Annex, *supra* note 466 at para 19.

⁴⁸⁴ *Ibid* at Annex para 20b).

⁴⁸⁵ Climate Technology Centre and Network, *Progress Report 2019: Connecting countries to the climate technologies they need*, (Copenhagen: 2019) online: CTCN <https://www.ctc-n.org/sites/www.ctc-n.org/files/resources/progress_report_2020_march_rev1.pdf> at 51.

and/or transferring such technologies”.⁴⁸⁶ Innovation is also directly referred to in Article 10(5) of Paris Agreement, which addresses TD&T. The Article states that “accelerating, encouraging and enabling innovation is critical for an effective, long-term global response to climate change and promoting economic growth and sustainable development”.⁴⁸⁷

Innovation is also an important concept in the new Paris Agreement TF, with key theme A of the framework being dedicated to it. There, the TF stresses the “pressing need to accelerate and strengthen technological innovation”⁴⁸⁸ and prescribes actions to “accelerate and scale up innovation at different stages of the technology cycle, addressing both adaptation and mitigation in a balanced manner”⁴⁸⁹ It suggests that “fostering innovation could be done through new collaborative approaches to climate technology research, development and demonstration (RD&D); the creation and promotion of relevant enabling policy to incentivize and nurture a supportive environment for innovation; and the active engagement of the private sector and closer collaboration between the public and private sector.”⁴⁹⁰

In addition to these treaty and institutional provisions, innovation has also been referred to in a number of UNFCCC TD&T policy documents over the years. In its *Strategy paper for the long-term perspective beyond 2012*, it identified the need to "address all stages of technology transfer from technology innovation to diffusion and consider integrated approaches to facilitate effective

⁴⁸⁶ UNFCCC, *supra* note 1 at art. 9(2)c).

⁴⁸⁷ Paris Agreement, *supra* note 2 at art. 10(5).

⁴⁸⁸ FCCC Dec 15/CMA.1, Annex, *supra* note 466 at para 5.

⁴⁸⁹ *Ibid* at para 6.

⁴⁹⁰ *Ibid* at para 7.

international cooperation at all stages”⁴⁹¹ as an important consideration. In its 2010 *Report on options to facilitate collaborative technology research and development*, it produced a list of existing research and development initiatives, identifying *inter alia* the innovation phase, key players and climate technologies involved for each of these initiatives.⁴⁹² To do so, it relied on a model of the innovation chain developed by climate change policy researcher Michael Grubb. This model conceptualizes innovation as a process initiated by technology suppliers and destined to technology consumers. In doing so, the process goes through five main steps: basic and applied research, technology development and demonstration, product development, early deployment and commercialization.⁴⁹³ Grubb underlines that this innovation chain is not necessarily linear, with steps of the chain often feeding back into each other as part of the process, enabling learning from past successes and mistakes.

Besides this reference to Grubb’s model however, it appears that a clear definition of innovation had until recently not been set in the UNFCCC literature. This changed in 2017, when the TEC suggested a definition of the concept in a policy brief on technological innovation and the Paris Agreement. In the brief, the TEC defines technological innovation as a process which “broadly comprises the research, development, demonstration, deployment, and diffusion of a technology.”⁴⁹⁴ The TEC has put forward a plan to improve institutional governance for

⁴⁹¹ Expert Group on Technology Transfer, *Strategy paper for the long-term perspective beyond 2012, including sectoral approaches, to facilitate the development, deployment, diffusion and transfer of technologies under the Convention*, UNFCCCOR, 2009, UN Doc FCCC/SB/2009/3 at para 6b) [Expert Group on Technology Transfer, *Strategy Paper*].

⁴⁹² Expert Group on Technology Transfer, *Report on options to facilitate collaborative technology research and development*, UNFCCCOR, 2010, UN Doc FCCC/SBSTA/2010/INF.11 at 41.

⁴⁹³ Grubb, “Technology Innovation”, *supra* note 16 at 116-117.

⁴⁹⁴ TEC, *Technological Innovation for the Paris Agreement: Implementing nationally determined contributions, national adaptation plans and mid-century strategies (TEC Brief #10)* (Bonn: UNFCCC, 2017) at 4 [TEC, *Technological Innovation*].

innovation. In a 2015 brief, it outlined its objective of strengthening National Systems for Innovation (NSIs), which it defined as “network[s] of actors, institutional contexts and linkages that underlie national technological change”.⁴⁹⁵ Achieving this in developing countries could be a step in the right direction to overcome the challenge of diffusion of innovation in those countries.

It is interesting to compare the TEC’s definition of technological innovation with the general working definition used in Butenko and Larouche’s law and innovation theory. As discussed in chapter 2, according to this latter definition, innovation comprises three elements: “ (1) a novel idea or invention; (2) its diffusion or adoption by users, customers or citizens – as the case may be; and (3) a positive social impact, in the form of an increase in welfare or a contribution to the achievement of public policy aims – here as well as the case may be, depending also on the analytical perspective”.⁴⁹⁶ A significant difference between the two definition lies in the fact that the third element of the Butenko and Larouche definition, impact, is not mentioned in the TEC definition. As will be explored in the conclusion of the thesis, the absence of impact as a UNFCCC consideration could have implications going forward for the governance of a specific type of innovative climate technology.

Innovation is also a core concept for actors evolving alongside the UNFCCC in the polycentric climate technology system. A telling example of this is the multilateral Mission Innovation initiative. As its name implies, fostering innovation is at the heart of the initiative’s mission. The goal of Mission Innovation, whose membership is composed of 24 countries and the European Union, is to accelerate the rate of clean energy innovation in order to provide widely available

⁴⁹⁵ TEC, *Strengthening National Systems of Innovation to Enhance Action on Climate Change: TEC Brief #7* (Bonn: UNFCCC, 2015) at 1 [TEC, *Strengthening NSIs*].

⁴⁹⁶ Butenko & Larouche, *supra* note 355 at 56.

clean energy solutions through performance breakthroughs and cost reductions.⁴⁹⁷ Since its inception in 2015, it has led to improvements in both public and private sector engagement and funding, as well as contributed to 1000 innovations globally with the potential to avoid 12 gigatons of CO2 emissions per year by 2030 if fully deployed.⁴⁹⁸

2.1.4 Technology diffusion and capacity-building

In 2004, climate researchers Pacala and Socolow published an influential paper in which they outline a “wedge-based” framework for stabilising climate change over fifty years.⁴⁹⁹ According to their model, reductions sufficient to stabilise CO2 emissions by 2054 were possible through the combined application of a number of then-available technologies, with the deployment of each of them leading to the reduction of a 1 gigaton of carbon per year (GtC/yr) “wedge” of emissions relative to business-as-usual levels. Their calculations assumed that a total of seven such reduction “wedges” would be necessary to stabilize CO2 emissions by 2054. While further reductions, and thus additional innovative mitigation strategies, would still be needed after 2054 to reach the Paris Agreement 2°C/1.5°C target, Pacala and Socolow argued that “humanity can solve the carbon and climate problem in the first half of this century simply by scaling up what we already know how to do.”⁵⁰⁰ Following their line of argumentation, the key challenge for UNFCCC TD&T governance would be improving transfer, or diffusion, of existing climate technology, rather than further incentivize the research and development of novel breakthrough innovations.

⁴⁹⁷ Mission Innovation, “*Enabling Framework for Mission Innovation* (1 June 2016), online: Mission Innovation <<http://mission-innovation.net/wp-content/uploads/2016/06/MI-Enabling-Framework-1-June-2016.pdf>> at para I.

⁴⁹⁸ Mission Innovation, *The Story So Far: 2020 Impact Report* (September 2020), online: Mission Innovation <<http://mission-innovation.net/wp-content/uploads/2020/09/1.-MI-Impact-Review-2020.pdf>> at 2.

⁴⁹⁹ Stephen Pacala & Robert Socolow, “Stabilization Wedges: Solving the Climate Problem for the Next 50 Years with Current Technologies” (2004) 305 *Science* 968.

⁵⁰⁰ *Ibid* at 968.

Pacala and Socolow's wedge-based framework is not without flaw. As they themselves admit, the solutions listed in their framework must be scaled up in order to be able to deliver sufficient reductions:⁵⁰¹ such a large scaling up is complicated and risks introducing other environmental and social problems which were not present at a smaller scale.⁵⁰² Additionally, Pacala and Socolow's framework was developed over fifteen years ago: a recent study on the progress of global decarbonisation along their strategy concludes that the world is on track to fulfill only one-and-a-half of the seven wedges required. When transposed to the current Paris Agreement goal, which is understood as requiring net-zero emission levels to be reached by 2050, Pacala and Socolow's wedges are only on track to fulfill between 4 and 16 % of the global target.⁵⁰³ Their framework, while useful as an analytical tool, appears to have been based on overoptimistic predictions.

Despite its limitations however, the wedge-based framework contributes interesting insights for climate law and TD&T, this at two levels. First, it gives a straightforward, if simplified, way to conceptualize progress for climate TD&T. Second, it highlights that a key challenge remains the scaling up of climate technology. Scaling up involves improving the diffusion of climate innovation, specifically its uptake by developing countries. This uptake by developing countries requires capacity building. Capacity-building, as pertaining to TD&T, is defined in the TTF as “a process which seeks to build, develop, strengthen, enhance and improve existing scientific and technical skills, capabilities and institutions particularly in developing countries, to enable them to

⁵⁰¹ *Ibid.*

⁵⁰² Grubb, “Technology Innovation”, *supra* note 16 at 108.

⁵⁰³ Nathan James Johnson, Robert Gross & Iain Staffell, “Stabilisation Wedges: Measuring progress towards transforming the global energy and land use systems” (2021) 16:6 Environmental Research Letters, online: IOPScience <<https://iopscience.iop.org/article/10.1088/1748-9326/abec06>> at 15.

assess, adapt, manage and develop environmentally sound technologies”.⁵⁰⁴ De Coninck and Sagar further identify three complementary facets to capacity-building: “the capacity to identify and plan the technological pathways appropriate to national development objectives and context, the capacity to execute the implementation of technologies accordingly, and the capacity to assess and learn from various implementation activities.”⁵⁰⁵ Developing these facets in turn requires “technical capabilities, analytical capabilities, business and other operational capabilities, and most of all coordination capabilities.”⁵⁰⁶

Empirical studies of TD&T diffusion recognize the need for capacity building. De Coninck and Sagar, in their review of the implementation of UNFCCC TD&T provisions, indeed underline that the “most important, but also perhaps the most challenging of various steps to enhance the clean technology transition in developing countries is the development of appropriate capacity.”⁵⁰⁷ Similarly, Dechezleprêtre et al’s empirical analysis of climate TD&T through patent data leads them to conclude that a key challenge remains improving the absorptive capacities of the countries receiving technology. “Low absorptive capacities mean shortages of skilled technical personnel, a lack of information on available technologies, and high transaction costs”,⁵⁰⁸ all of which act as barriers to TD&T. As they note, “this highlights the importance of long-term education and capacity building policies and programs in promoting North-South technology transfer.”⁵⁰⁹

⁵⁰⁴ UNFCCC, *EGTT: Five Years of Work*, *supra* note 445 at 7.

⁵⁰⁵ De Coninck and Sagar, *supra* note 446 at 271.

⁵⁰⁶ *Ibid.*

⁵⁰⁷ De Coninck and Sagar, *supra* note 446 at 271.

⁵⁰⁸ Antoine Dechezleprêtre et al, “Invention and Transfer of Climate Change-Mitigation Technologies: A Global Analysis” (2011) 5:1 *Review of Environmental Economics and Policy* 109 at 125.

⁵⁰⁹ *Ibid.*

The text of the UNFCCC also underlines the interrelated character of capacity-building and TD&T. Indeed, there is no article in the 1992 Convention specifically addressing capacity-building: rather, it is linked to TD&T through Article 4(5), where it is stated that developed country Parties commit to “support the development and enhancement of endogenous capacities and technologies of developing country Parties”.⁵¹⁰ Capacity-building and TD&T are also linked at the institutional level. The SBSTA, as part of its role for TD&T, was initially designated as the treaty body responsible of “provid[ing] advice on scientific programmes, international cooperation in research and development related to climate change, as well as on ways and means of supporting endogenous capacity-building in developing countries.”⁵¹¹ When assessing the effectiveness of UNFCCC TD&T and the possibilities for improvements, the importance of capacity-building and funding for developing country States Parties where technology is transferred must be kept in mind. For example, progress on initiatives such as the TEC’s plan to strengthen NSIs relies largely on financing by developed countries. Bridging the funding gap then becomes crucial. Overcoming the barriers to TD&T is possible but will likely depend on the progress made on capacity building and financial support.

5.2 UNFCCC TD&T provisions and mechanisms: a real-world assessment

The enactment of technology norms and institutions that enable climate TD&T by fostering innovation and capacity-building has been one of the regime’s objectives for some time. But have UNFCCC treaty and institutional provisions led to measurable progress on this front, and if so, to what extent? Some interesting empirical research on the diffusion of climate innovation can be

⁵¹⁰ UNFCCC, *supra* note 1 at art. 4(5).

⁵¹¹ *Ibid* at art. 9(2)d).

found in the literature. For example, a group of economists led by Dechezleprêtre analyzed climate technology patent data to measure innovation performance on a per-country basis.⁵¹² They come to the conclusion that while innovation for climate mitigation has largely followed trends in oil prices since the 1980s, the development of environmental and climate policies have had a significant impact on this type of innovation since the 1990s, with a notable acceleration post-2000 that can be interpreted as a result of the adoption of the Kyoto Protocol and its subsequent implementation through national policies.⁵¹³ De Coninck and Sagar, basing their analysis on countries' expenditures in climate-relevant research and development (R&D), conversely conclude that there has been little correlation between UNFCCC policy and climate innovation until today. They indeed find that while industrialized countries have increased their public climate R&D expenditures, in real terms these investments are still below the peaks reached after the 1970s oil crisis.⁵¹⁴ Their analysis would seem to indicate that changes in oil prices, more than the policy changes resulting from the implementation of the international climate agreements, have been the main influence on the rate of public financing for climate innovation until now.

Established through the adoption of the TTF in 2001, the EGTT was the first UNFCCC constituted body specifically mandated to enhance the implementation of Article 4 (5), and thus of both TD&T and capacity-building.⁵¹⁵ The EGTT's role was however executive in nature, consisting mainly in advising the COP on policy matters through reports to the SBSTA. From 2001 onwards, project-based activity for TD&T was to be enacted through the nationally-led TNA process, but limited

⁵¹² Dechezleprêtre et al, *supra* note 508 at 114.

⁵¹³ *Ibid* at 117-118.

⁵¹⁴ De Coninck and Sagar, *supra* note 446 at 267.

⁵¹⁵ *Terms of reference of the expert group on technology transfer*, FCCC Dec 4/CP.7, annex 1, Appendix, UNFCCCOR, 7th Sess, UN doc FCCC/CP/2001/13/Add.1 at para 1.

progress was achieved on that end during the EGTT's mandate.⁵¹⁶ This lack of progress was one of the reasons behind the reform of the UNFCCC TD&T institutions, which amounted to the non-renewal of the EGTT and the creation of the TM in 2010. Although the TM's structure, with its distinct policy and implementation branches, represents a significant institutional departure from the previous EGTT, it remains to be seen if this revamped structure can lead to tangible progress for TD&T among States Parties. One challenge inherited by the TM has been to find ways to analyze and codify the knowledge accumulated through years of project experience,⁵¹⁷ as well as to measure the progress made on TD&T objectives in order to build on past experience and deliver tangible results. A second recurring obstacle to the TM's effective coordination of climate TD&T has been its lack of financial resources. The TM relies mostly on donor contributions for funding, which have so far been inconsistent: the absence of consistent funding has indeed been reported by the SBSTA as affecting the level of operation of the CTCN at times.⁵¹⁸ As de Coninck and Sagar underline, the availability of structural rather than incidental funding, which could for example be provided by the UNFCCC's central financial mechanism, is crucial for the CTCN to fully fulfill its mandate.⁵¹⁹ Better integration of the TM and its activities within the UNFCCC funding structure could thus be useful. As the Paris Agreement begins its operationalization, questions thus remain around the capacity of the climate regime's designated institutions and processes to live up to their potential and provide strengthened cooperative action on TD&T in accordance with Article 10.

⁵¹⁶ See Merylyn Hedger, "Stagnation or Regeneration: Technology Transfer in the United Nations Framework Convention on Climate Change (UNFCCC)", in Ockwell & Mallet, *supra* note 14 211 at 212-213.

⁵¹⁷ Verbeken, *supra* note 14 at 161.

⁵¹⁸ *Joint annual report of the Technology Executive Committee and the Climate Technology Centre and Network for 2017*, 47th Sess, UN Doc FCCC/SB/2017/3 at para 116.

⁵¹⁹ De Coninck and Sagar, *supra* note 446 at 275.

5.2.1 Latest developments: the Katowice Rulebook

The latest normative developments for TD&T, which were adopted as part of the Katowice rulebook in 2018, have the potential to yield significant improvements in regard to both recurring challenges of measurable effectiveness and adequate funding. Indeed, in addition to the adoption of the TF, a number of procedural rules with the objective of improving the reporting of TD&T effectiveness and of support for it were adopted. One such significant development is the adoption of modalities for the periodic assessment of TD&T action referred to in paragraph 69 of the COP decision adopting the Paris Agreement.⁵²⁰ The periodic assessment of TD&T action is to be undertaken every five years, with the first assessment to be completed by 2022.⁵²¹ It will focus on the evaluation of two elements, namely the effectiveness of the TM in supporting the implementation of the Paris Agreement on matters relating to TD&T and the adequacy of the support provided to it.⁵²² The periodic assessment is to be taken into account as an input to the Paris Agreement Article 14 global stocktake.⁵²³ More specifically, the modalities for the global stocktake state that information on the provision of support for TD&T as well as information on the barriers and challenges for TD&T, including outputs of the periodic assessment of the TM, are to be considered as sources of input for it.⁵²⁴

In parallel to this overall assessment of TD&T effectiveness and support, States Parties are required to report for TD&T on a state-by-state basis as part of the Paris Agreement Article 13 transparency framework. Decision 18 of the Katowice Rulebook and its Annex lay out the

⁵²⁰ Dec 1/CP.21, *supra* note 186.

⁵²¹ *Scope of and modalities for the periodic assessment referred to in paragraph 69 of decision 1/CP.21*, FCCC Dec 16/CMA.1, UNFCCCOR, 24th Sess, UN Doc FCCC/PA/CMA/2018/3/Add.2 at para 3 and Annex para 10a).

⁵²² *Ibid* at Annex para 1.

⁵²³ *Ibid* at para 4.

⁵²⁴ *Matters relating to Article 14 of the Paris Agreement and paragraphs 99-101 of decision 1/CP.21*, FCCC Dec 19/CMA.1, UNFCCCOR, 24th Sess, UN doc FCCC/PA/CMA/2018/3/Add.2 at paras 6 d) and 6 f).

modalities for this framework. States Parties shall submit a biennial report, the first of which shall be submitted at the latest on 31 December 2024.⁵²⁵ As part of this report, developed country Parties shall provide information on TD&T support provided to developing Parties.⁵²⁶ Similarly, developing country Parties should provide information on TD&T support needed and received.⁵²⁷ The detailed modalities for the TD&T information to be provided by developed and developing country Parties can respectively be found in sections V) D and VI) E and F of the annex: the format for both types of communications is similar and will contain a textual description of the efforts as well as information on specific measures or activities in a common tabular format.⁵²⁸ States Parties' biennial reports are to be reviewed through a technical expert review, whose modalities can be found at section VII) of the Annex. While the reviews are non-binding,⁵²⁹ they are to be made publicly available on the UNFCCC website⁵³⁰ A facilitative multilateral consideration of progress, open to participation by all States Parties and to observation by registered observers,⁵³¹ follows the publication of the technical expert review: it shall made be publicly accessible online.⁵³²

In addition to the transparency framework reporting obligations, developed country Parties shall biennially communicate indicative quantitative and qualitative information on the provision of financial resources to assist developing country Parties, with other Parties providing resources also

⁵²⁵ *Modalities, procedures and guidelines for the transparency framework for action and support referred to in Article 13 of the Paris Agreement*, FCCC Dec 18/CMA.1, UNFCCCOR, 24th Sess, UN doc FCCC/PA/CMA/2018/3/Add.2 at para 3.

⁵²⁶ *Ibid* at Annex para 10d).

⁵²⁷ *Ibid* at Annex para 10e).

⁵²⁸ *Ibid* at Annex paras 126-127, 135-136 and 137-138.

⁵²⁹ The technical expert review team shall communicate “recommendations” (for “shall” provisions) and/or “encouragements” (for non- “shall” provisions): see *Ibid* at Annex para 162d).

⁵³⁰ *Ibid* at Annex para 188.

⁵³¹ *Ibid* at Annex paras 192a) and 193b).

⁵³² *Ibid* at Annex para 199.

encouraged to do so on a voluntary basis.⁵³³ These communications should include information on the purposes and types of support, of which one type is listed as technology transfer.⁵³⁴ Financial support communications by developed country Parties were to be submitted starting in 2020:⁵³⁵ the communications received thus can be found on the UNFCCC website.⁵³⁶

Last but not least, Decision 20 of the Katowice rulebook specifies the modalities of the Committee to facilitate implementation and promote compliance established under Article 15 of the Paris Agreement. In a case where a Party fails to comply with its obligations, the Committee can engage in a transparent, non-adversarial and non-punitive process to facilitate implementation and promote compliance.⁵³⁷ Notably, if the challenges to the Parties' implementation or compliance relate to technology, the Committee can assist the Party in engaging with the relevant technology bodies or arrangements.⁵³⁸ In addition to this individual implementation and compliance process, the Committee also has the role of identifying systemic issues and making recommendations to the CMA for its consideration.⁵³⁹ This could serve as a last resort mechanism for catalyzing action for TD&T if lack of progress on that front becomes a systemic problem. It must be noted that the draft rules of procedure of the compliance committee have yet to be formally adopted: they are to be recommended for adoption at CMA 3 in Glasgow at the end of 2021.⁵⁴⁰

⁵³³ *Identification of the information to be provided by Parties in accordance with Article 9, paragraph 5, of the Paris Agreement*, FCCC Dec 12/CMA.1, UNFCCCOR, 24th Sess, UN doc FCCC/PA/CMA/2018/3/Add.1 at para 2.

⁵³⁴ *Ibid* at Annex para d).

⁵³⁵ *Ibid* at para 4.

⁵³⁶ UNFCCC, *Biennial Communications received in accordance with Article 9, paragraph 5, of the Paris Agreement*, online: UNFCCC <<https://unfccc.int/Art.9.5-biennial-communications>>.

⁵³⁷ *Modalities and procedures for the effective operation of the committee to facilitate implementation and promote compliance referred to in Article 15, paragraph 2 of the Paris Agreement*, FCCC Dec 20/CMA.1, UNFCCCOR, 24th Sess, UN doc FCCC/PA/CMA/2018/3/Add.2 at Annex para 2.

⁵³⁸ *Ibid* at Annex para 30a) to d).

⁵³⁹ *Ibid* at Annex part V.

⁵⁴⁰ UNFCCC, *Committee to facilitate implementation and promote compliance referred to in Article 15, paragraph 2 of the Paris Agreement (PAICC): Latest News* (6 November 2020), online: UNFCCC <<https://unfccc.int/process->

5.2.2 Progress, challenges and possibilities

The Katowice rulebook, through its periodic assessment of TD&T action, imposes binding reporting obligations to the TM on two elements: the effectiveness of its institutions and the adequacy of the support provided to it.⁵⁴¹ As a result, the two branches of the TM have taken steps to provide reporting that complies with the assessment guidelines. Both the TEC and the CTCN have indeed adopted new monitoring and evaluation frameworks to guide the assessment of their effectiveness.⁵⁴² The TEC has in addition produced as a rolling workplan for 2019-2022, through which it responds to guidance by the COP and CMA and sets out the activities to be carried out for the implementation of TD&T under the Paris Agreement.⁵⁴³

The CTCN, in a 2017 independent review of the Centre, had been called upon to take measures to improve its effectiveness in responding to technical assistance requests by beneficiaries.⁵⁴⁴ This call for improvement appears to have yielded results: as of May 2021, 111 technical assistance requests had been completed out of a total of 228 filed,⁵⁴⁵ a significant improvement from the

[and-meetings/bodies/constituted-bodies/committee-to-facilitate-implementation-and-promote-compliance-referred-to-in-article-15-paragraph-2>.](#)

⁵⁴¹ FCCC Dec 16/CMA.1, *supra* note 521 at Annex para 1.

⁵⁴² TT: Clear, *Technology Executive Committee Monitoring and Evaluation Framework* (4 November 2019) online: UNFCCC

<https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/TEC_Documents_doc/920a0d0fc9904ed2b6e8be0e7e213ac7/313acbc090484c5fb67992ad452057c2.pdf>; CTCN, *Climate Technology Centre & Network Monitoring and Evaluation System* (March 2020) online: CTCN <https://www.ctc-n.org/sites/www.ctc-n.org/files/resources/ctcn_me_system.pdf>.

⁵⁴³ TT: Clear, *Rolling workplan of the Technology Executive Committee for 2019-2022* (10 February 2021), online: UNFCCC

<https://unfccc.int/ttclear/misc_/StaticFiles/gnwoerk_static/tn_meetings/d908990e4acd41d7bfe5422bc4ef960f/777b46dc9bf442a98891f81ef125306c.pdf>.

⁵⁴⁴ *Report on the independent review of the effective implementation of the Climate Technology Centre and Network*, UNFCCCOR, 23rd Sess, UN doc FCCC/CP/2017/3 [Effective implementation report].

⁵⁴⁵ CTCN, *Technical Assistance Facts & Figures* (May 2021), online: CTCN <<https://www.ctc-n.org/technical-assistance/request-visualizations>>.

situation at the time of the independent review, when only 13 out of 181 requests had been completed.⁵⁴⁶ Despite the CTCN’s progress on effectiveness, uncertainties about the adequacy of its funding remain. Indeed, the COP, at its 25th session in 2019, “[noted] with concern the challenge of securing sustainable financial resources for the CTCN”⁵⁴⁷ and requested it to “enhance its resource mobilization efforts and further diversify the sources, including by exploring new and innovative ways, to support its operation in order to effectively implement its programme of work”.⁵⁴⁸ As de Coninck and Sagar note, with limited budgets and means, it is a major challenge to guide the trillions of dollars that will be invested in sectors such as energy, transport, industry and water over the following decades towards climate-resilient technologies.⁵⁴⁹ With these financial and structural constraints, it becomes even more crucial for the UNFCCC technology infrastructure to be designed in an intelligent way, because the vast part of investments in mitigation- and adaptation-relevant sectors will happen outside of UNFCCC institutions.⁵⁵⁰ De Coninck and Sagar suggest that one way for the CTCN to improve its efficiency within its budgetary constraints would be to focus on its role as a global repository of practices, rather than a technology library focused on technological hardware. As the two researchers note however, capacity-building in developing countries must also be improved for the CTCN to be effective: “the supply of this [best-practice] information will contribute to the clean energy transition only to the extent where there is capacity on the receiving end to absorb this knowledge and to develop and implement local plans.”⁵⁵¹ This highlights once again the need for improved capacity-building

⁵⁴⁶ *Effective implementation report*, *supra* note 544 at para 10.

⁵⁴⁷ *Enhancing climate technology development and transfer through the Technology Mechanism*, FCCC Dec 14/CP.25, UNFCCCOR, 25th Sess, UN Doc FCCC/CP/2019/13/Add.2 at para 24.

⁵⁴⁸ *Ibid* at para 26a).

⁵⁴⁹ De Coninck & Sagar, *supra* note 446 at 274.

⁵⁵⁰ *Ibid*.

⁵⁵¹ *Ibid*.

alongside TD&T, and for improved MRV of both through transparency framework.⁵⁵² It thus remains to be seen if the TM institutions, especially the CTCN, will be able to fulfill their mandate of coordinating decentralized action in the increasingly polycentric system of climate TD&T.

Beyond the TM, another persistent obstacle for coordinated TD&T action lies in the fact that MRV of state practice for it is almost entirely lacking in international and transnational governance initiatives.⁵⁵³ The Katowice rules introduce some forms of regulation of TD&T action by States Parties, but their reach is limited. Through the transparency framework, developed country States Parties now have a set of mandatory procedural obligations to follow, but as the TEC and CTCN note, there are still challenges for UNFCCC TD&T institutions to track the implementation of the TNA process by country stakeholders.⁵⁵⁴ One solution put forward for this would be to integrate a review of TNA implementation in the review process of States Parties' NDCs. This solution is to be further examined by the TM as part of the TF's "implementation" key theme: one of the activities to be enacted under this theme indeed consists in promoting the link or alignment of TNAs with NDCs.⁵⁵⁵ Some work has been done in this sense, with the TEC mandated to produce a paper on potential linkages between the two processes at its 23rd session in 2022.⁵⁵⁶ It is however still unclear as to how NDCs and TNAs could be combined: as noted by the TEC, for both the NDC and TNA planning tools, there is no uniform process prescribed by the Convention.⁵⁵⁷ As the guidelines adopted for the NDC process as part of the Katowice rulebook are applied by States,

⁵⁵² FCCC Dec 18/CMA.1, *supra* note 525 at Annex part V e) and part VI g), h) & i).

⁵⁵³ Andonova, Castro & Chelminski, *supra* note 478 at 280.

⁵⁵⁴ *Joint Annual report of the Technology Executive Committee and the Climate Technology Center and Network for 2020*, UN Doc FCCC/SB/2020/4 at para 53e).

⁵⁵⁵ FCCC Dec 15/CMA.1, Annex, *supra* note 466 at para 12b).

⁵⁵⁶ *Concept note for a paper on linkages between the technology needs assessment process and the nationally determined contribution process*, UN Doc TEC/2021/22/8 at para 5.

⁵⁵⁷ *Updated paper on linkages between the TNA and NDC process*, UN Doc TEC/2018/16/7 at para 31.

the process is expected to evolve and possibly reach a more standardized form over time. In this context, an important role for UNFCCC TD&T institutions will be to use the tools at their disposal to promote the integration of TNAs within NDCs. Even if TNA reporting becomes a part of the NDC process through the practice of States Parties, this would not amount to a binding obligation for TD&T action because of the discretion given to States Parties in formulating their NDCs. It might however be the best outcome possible given the legal nature of the Paris Agreement NDC provisions.

Questions also remain as to the modalities for the assessment of action by non-state actors, who are set to play an important role in the TD&T process as well as in the achievement of the Paris Agreement goals more generally. According to Katowice rules, the Paris Agreement global stocktake will include participation by non-Party stakeholders, whose submissions are to be considered as one source of inputs for the stocktake.⁵⁵⁸ The exact way these submissions are to be integrated in the global stocktake remains to be determined. One group of authors has outlined a simplified framework for assessing climate action by non-state actors: this framework could serve as a template for non-state actor submissions to the global stocktake.⁵⁵⁹ The manner through which these submissions would be reviewed and verified, even if they were standardized through such a framework, however remains unclear. One possibility for this, albeit outside the formal UNFCCC structure, would be for research organizations and NGOs to contribute by assessing the publicly available information submitted by non-state actors. Their position outside the intergovernmental process and their expertise in the matter put them in a position to enhance the visibility and

⁵⁵⁸ FCCC Dec 19/CMA.1, *supra* note 524 at paras 10 and 37i).

⁵⁵⁹ Thomas N. Hale et al, “Sub- and non-state climate action: a framework to assess progress, implementation and impact” (2021) 21:3 Climate Policy 406 at 409.

transparency of this part of the process.⁵⁶⁰ An online “non-paper” prepared by the chairs of the SBSTA and the SBI to provide guidance for the first stocktake hints at this possibility. In this non-paper, the chairs indeed consider the possibility for non-Party stakeholder input to be consolidated and provided through the observer organizations accredited under UNFCCC, as a way to streamline the assessment process and avoid too many individual inputs.⁵⁶¹ The chairs also mention the Yearbook of climate action, the annual publication reviewing initiatives registered under NAZCA, as one source of input for non-Party stakeholder action.⁵⁶² The first Paris Agreement global stocktake is set to be carried out in 2023: it will be interesting to see how the assessment of non-state actor climate action will be integrated in it.

In sum, the norms and mechanisms for TD&T adopted as part of the Paris Agreement and enacted through the Katowice rulebook offer solutions to the obstacles that have hindered progress by institutions and States Parties until now. The Katowice rules for TD&T reaffirm the general approach preconized in the Paris Agreement, which rests upon three main features: national determination of substantive commitments, an emphasis on transparency as the engine to promote ambition and accountability, and a nuanced approach to differentiation.⁵⁶³ In this respect, it is consistent with the emergent polycentric approach to international climate governance as understood through this thesis’ theoretical perspective, in which the role of law is to foster

⁵⁶⁰ Harro van Asselt & Thomas Hale, *How non-state actors can contribute to more effective review processes under the Paris Agreement* (Oxford: Stockholm Environment Institute, 2016), online: SEI <<https://mediamanager.sei.org/documents/Publications/Climate/SEI-PB-2016-Non-state-actors-Paris-Agreement.pdf>> at 4.

⁵⁶¹ UNFCCC, *Preparing for the First Global Stocktake: Non-Paper by the Chairs of the SBSTA and SBI (Version 27/05/2021)*, online: UNFCCC <https://unfccc.int/sites/default/files/resource/Non-paper%20on%20Preparing%20for%20GSTI_0.pdf> at 9.

⁵⁶² *Ibid.* See Marrakech Partnership for Global Climate Action, *Yearbook of Global Climate Action 2020* (Bonn: UNFCCC, 2020), online: UNFCCC <https://unfccc.int/sites/default/files/resource/2020_Yearbook_final_0.pdf>.

⁵⁶³ Lavanya Rajamani & Daniel Bodansky, “The Paris Rulebook: Balancing International Prescriptiveness with National Discretion” (2019) 68 ICLQ 1023 at 1024-1025.

coordination among States Parties and non-state actors in order to reach the goal of managing the global climate commons. Through the Paris Agreement, the international community attempts to do this by setting broadly accepted, albeit loosely binding commitments for TD&T, and coupling these with stricter obligations for monitoring and verification of progress. It however remains to be seen how effective these procedural obligations will be in improving accountability and promoting coordination for TD&T.

5.3 Flexibility mechanisms as subsidiary tools for climate TD&T: lessons from the CDM, possibilities under Article 6

5.3.1 The Kyoto Protocol CDM

In parallel to the limited success of the TNA process under the EGTT and the TM during the pre-Paris period, one of the Kyoto flexibility mechanisms, the CDM, emerged as a channel through which action for TD&T and capacity-building could be enacted on a project-based level. The CDM is a mechanism through which project developers can invest in an emission-reducing project realized in a non-Annex country and in exchange receive credits which can be counted towards Annex 1 States' emission reduction commitments, called Certified Emissions Reductions (CERs). Article 12 of the Kyoto Protocol establishes the CDM, but its specific modalities and procedures were left to be elaborated subsequently:⁵⁶⁴ they were adopted by the CMP in 2005.⁵⁶⁵ Together, these two documents constitute the legal framework of the CDM, which can be summarized as follows.

⁵⁶⁴ *Kyoto Protocol*, *supra* note 126 at art. 12(7).

⁵⁶⁵ *Modalities and procedures for a clean development mechanism as defined in Article 12 of the Kyoto Protocol*, UNFCCCOR, 11th Sess, Annex, Dec 3/CMP.1, UN Doc FCCC/KP/CMP/2005/8/Add.1 [*Modalities and procedures*].

Paragraphs 2 and 3 of Article 12 respectively state the overall purpose of the CDM and its benefits for Annex 1 and non-Annex 1 States Parties.⁵⁶⁶ Paragraphs 4 and 5 establish the CDM's main institutions, namely the Executive Board (EB) and the designated operational entities (DOEs). The role of the EB is to supervise the CDM at the macro level. Its structure and responsibilities are specified in Part C of the modalities and procedures. The EB approves the issuance of CERs, in accordance with Part J. It is also responsible for the accreditation and designation of operational entities,⁵⁶⁷ the process of which is elaborated in detail in Part D. Its other responsibilities include elaborating and reviewing the various CDM processes, reporting and making recommendations to the COP/MOP as well as developing and maintaining a publicly available CDM registry:⁵⁶⁸ the requirements of this registry are found in Appendix D. The DOEs are independent auditors accredited by the EB.⁵⁶⁹ Their role is to certify the emissions reductions resulting from each of the projects undertaken under the CDM.⁵⁷⁰ Their responsibilities are enumerated at Paragraph 27 of the modalities and procedures. The main role of a DOE consists in validating CDM projects and verifying and certifying their emissions reductions.⁵⁷¹ According to Paragraph 27e), a DOE performs one of those two functions for a given CDM project; it can however perform both functions upon authorization by the EB.⁵⁷² DOEs are also responsible for maintaining public records of its activities and submitting annual activity reports to the EB.⁵⁷³ Part F of the modalities and procedures specifies the modalities of States Parties' participation to the CDM. Participation

⁵⁶⁶ *Kyoto Protocol*, *supra* note 109 at art. 12(2) and (3).

⁵⁶⁷ *Modalities and procedures*, *supra* note 565 at para 5f).

⁵⁶⁸ *Ibid* at para 5l).

⁵⁶⁹ UNFCCC, *CDM: Designated Operational Entities*, online: UNFCCC <<https://cdm.unfccc.int/DOE/index.html>>.

⁵⁷⁰ *Kyoto Protocol*, *supra* note 126 at art. 12(4).

⁵⁷¹ *Modalities and procedures*, *supra* note 565 at para 27a) and b).

⁵⁷² *Ibid* at para 27e).

⁵⁷³ *Ibid* at para 27f) to h).

is open to all non-Annex 1 States Parties to the Kyoto Protocol on a voluntary basis.⁵⁷⁴ States Parties who wish to participate in the CDM must designate a national authority for it.⁵⁷⁵

The different steps of the CDM process are outlined in Parts G to J of the modalities and procedures. This process can be summarized in four main steps. First, projects are validated by a DOE before being registered by the EB: this second step constitutes its formal acceptance as a CDM project.⁵⁷⁶ The approval of voluntary participation by the designated national authority (DNA) of each participant to a project is required before the DOE validation report can be sent to the EB for registration: the DNA of the host country must notably confirm that the project assists it in achieving sustainable development.⁵⁷⁷ Second, once the project is registered, project participants are responsible for self-monitoring their activity and of periodically providing a monitoring report to the DOE.⁵⁷⁸ Third, the DOE verifies the self-monitoring information and produces a report certifying the amount of greenhouse gas emission reductions achieved by the project.⁵⁷⁹ This certification report is finally sent to the EB, which issues the corresponding amount of CERs to be added to the relevant accounts in the CDM registry.⁵⁸⁰ CERs can be used by Annex 1 States Parties towards their QELRCs, in accordance with Paragraphs 31 to 33 of the modalities and procedures. They can also be traded under the emissions trading mechanism established in Article 17 of the Kyoto Protocol and other trading schemes linked to it, the largest being the EU ETS.⁵⁸¹ The UNFCCC executive secretary qualifies the CDM as a success: in support of this, it

⁵⁷⁴ *Ibid* at paras 28 & 30.

⁵⁷⁵ *Ibid* at para 29.

⁵⁷⁶ *Ibid* at paras 35 & 36. The modalities of the validation and registration process can be found at paras 37 to 52.

⁵⁷⁷ *Ibid* at para 40a).

⁵⁷⁸ *Ibid* at paras 53 to 60.

⁵⁷⁹ *Ibid* at paras 61 to 63.

⁵⁸⁰ *Ibid* at paras 64 to 66.

⁵⁸¹ UNFCCC, *Emissions trading*, online: UNFCCC <<https://unfccc.int/process/the-kyoto-protocol/mechanisms/emissions-trading>>.

points to the fact that “over 8,000 projects and Programmes of Activities in 111 countries have reduced or avoided 2 billion tonnes of CO2 equivalent and sparked investment of close to USD 304 billion in climate and sustainable development projects.”⁵⁸²

CDM projects often employ technology that was previously not available to host countries in order to accomplish emissions reductions and contribute to sustainable development. It thus became apparent that CDM projects, in the process of mitigating climate change in host countries, had the potential to contribute to climate TD&T in those countries in a complementary manner. There is no explicit requirement for TD&T in the CDM. Notably, TD&T is not mentioned Article 12 of the Kyoto Protocol, which establishes the CDM. It is however referred to in the COP decision adopting the CDM modalities and procedures: there, it is stated that “clean development project activities should lead to the transfer of environmentally safe and sound technology and know-how in addition to that required under Article 4, paragraph 5, of the Convention and Article 10 of the Kyoto Protocol”. The fact that the reference is placed in the Preamble of the decision as well as the use of the verb “should” instead of “shall” however signals that a TD&T component is not a mandatory criterion for a CDM project. As per the modalities and procedures, CDM project participants are nonetheless required to describe any eventual technology transfer element in the project as part of the project design document (PDD), a prerequisite for validation by the DOE and certification by the EB.⁵⁸³

⁵⁸² UNFCCC, *Achievements of the Clean Development Mechanism 2001-2018: Harnessing Incentive for Climate Action* (Bonn: UNFCCC, 2018), online: UNFCCC <https://unfccc.int/sites/default/files/resource/UNFCCC_CDM_report_2018.pdf> at 5.

⁵⁸³ *Project design document*, UNFCCCOR, 11th Sess, Annex, Dec 3/CMP.1, Appendix B, UN Doc FCCC/KP/CMP/2005/8/Add.1 at para 2a).

The inclusion of a written TD&T component in the PDD model has allowed researchers to derive some information on the rate of TD&T in CDM projects by reviewing PDD data. A review of the empirical studies on the topic confirms that CDM projects have resulted in some climate TD&T, although the scale of the CDM's contribution to TD&T is the topic of debate. Several studies establish a significant link between CDM projects and TD&T activity.⁵⁸⁴ In a background paper prepared for the UNFCCC Secretariat, Seres, Haites and Murphy determine that as of June 2010, 30% of projects in the CDM process pipeline, representing 48% of estimated emissions reductions, involved technology transfer.⁵⁸⁵ An updated analysis by the same group of researchers determined that out of 3949 such projects registered as of March 2012, 39% of projects were expected to involve some form of technology transfer.⁵⁸⁶ In another study, economist Katsuri Das however concludes that within the portion of CDM projects containing some elements of TD&T, a majority did so only in an accessory manner.⁵⁸⁷ According to her, the reason for this is that TD&T is not an official objective of the CDM, its goal rather being to realize emissions reductions as efficiently as possible and support sustainable development. As a result, there is no requirement in the CDM process for projects to include a TD&T component beyond what is necessary for their successful operation.⁵⁸⁸

⁵⁸⁴ See Stephen Seres, Erik Haites & Kevin Murphy, *The Contribution of the Clean Development Mechanism under the Kyoto Protocol to Technology Transfer* (Bonn: UNFCCC, 2010), online: UNFCCC <<https://cdm.unfccc.int/Reference/Reports/TTreport/TTrep10.pdf>> at 10. See also Antoine Dechezleprêtre, Matthieu Glachant & Yann Ménière, "The Clean Development Mechanism and the international diffusion of technologies: an empirical study" (2008) 36 *Energy Policy* 1273; Heleen de Coninck, Frauke Haake & Nico van der Linden, "Technology transfer in the Clean Development Mechanism" (2007) 7 *Climate Policy* 444; and Malte Schneider, Andreas Holzer & Volker H. Hoffmann, "Understanding the CDM's contribution to technology transfer" (2008) 36 *Energy Policy* 2930.

⁵⁸⁵ *Ibid* at 10.

⁵⁸⁶ Kevin Murphy et al, "Technology transfer in the CDM: an updated analysis" (2015) 15:1 *Climate Policy* 127 at 127.

⁵⁸⁷ Katsuri Das, *Technology Transfer under the Clean Development Mechanism: an empirical study of 1000 CDM Projects*, The Governance of Clean Development Working Paper 014 (Norwich: University of East Anglia, July 2011), online: SSRN <https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1887727> at 28.

⁵⁸⁸ *Ibid* at 29.

One factor that explains the varying conclusions of the empirical reviews is that while the PDD requires participants to mention potential technology transfer components as part of the project description, there is no clear definition of what this implies in the CDM modalities and procedures. This led to project participants having the leeway to subjectively interpret what constitutes TD&T in the PDD criteria. In a context where a TD&T component is seen as a positive, if non-mandatory asset to a project, PDD editors may have had an incentive to overstate the existence of technology transfer as it helped project registration.⁵⁸⁹ Faced with the absence of a set definition of TD&T in the CDM process and with the varying interpretation of the concept by project developers, researchers analyzing project data in turn were left with little objective criteria against which to interpret this data. Some, like Seres, Haites and Murphy, relied directly on the IPCC definition of TD&T,⁵⁹⁰ while Das opted for a more narrow operational definition which does not count import of technology without transfer of knowledge.⁵⁹¹ This double subjectivity possibly introduced inconsistencies in the PDD data analysis, which could have led to differing interpretations of the actual presence of TD&T in CDM projects.

Despite differences in the methodology and findings of the empirical studies reviewed, some interesting information can be gathered from these studies' findings. One consistent finding across the studies reviewed is that larger CDM projects more often contain a TD&T component.⁵⁹² A second is that there are notable differences among host countries, both in the number of CDM

⁵⁸⁹ Dechezleprêtre, Glachant & Ménière, *supra* note 584 at 1275.

⁵⁹⁰ Seres, Haites & Murphy, *supra* note 584 at 13.

⁵⁹¹ Das, *supra* note 587 at 5.

⁵⁹² Dechezleprêtre, Glachant & Ménière, *supra* note 584 at 1280; Murphy et al, *supra* note 586 at 134; Das, *supra* note 587 at 10.

projects enacted and the proportion of these projects resulting in TD&T. A majority of CDM projects have been carried out in four large industrialized developing countries: India, Brazil, Mexico and China.⁵⁹³ There does however not appear to be a correlation between the size or GDP of the host country and the rate of TD&T in CDM projects.⁵⁹⁴ For example, although the four countries mentioned above are among the biggest and richest of CDM host countries, the percentage of CDM projects with a TD&T component varies greatly among them. Mexico is consistently cited as having the among the highest percentage of TD&T, while India is among the lowest, all countries considered.⁵⁹⁵ As Seres interestingly points out, some host country DNAs have clearer or stricter requirements for a TD&T component in their PDD approval process than others. One explanation for the varying rate of TD&T in projects enacted the four countries listed above could thus lie in the variation of TD&T requirements in these countries' DNAs. As part of the CDM project approval process in Mexico, where a high amount of TD&T was realized, "realization of technology transfers" is directly listed as one of the economic criteria to be assessed as part of a project's contribution to sustainable development.⁵⁹⁶ Conversely, the wording of the technology transfer criterion in the Indian guidelines for CDM, which states that "the transfer of technology can be within the country as well from other developing countries also",⁵⁹⁷ can be interpreted as specifically encouraging technology transfer from domestic and developing-country

⁵⁹³ Dechezleprêtre, Glachant & Ménière, *supra* note 524 at 1277; Schneider, Holzer & Hoffmann, *supra* note 584 at 2934; Murphy et al, *supra* note 586 at 133; Das, *supra* note 587 at 9.

⁵⁹⁴ Stephen Seres, *Analysis of Technology Transfer in CDM Projects* (December 2008), online: UNFCCC <<https://cdm.unfccc.int/Reference/Reports/TTreport/TTrep08.pdf>> at p.8.

⁵⁹⁵ Dechezleprêtre, Glachant & Ménière, *supra* note 584 at 1277; Schneider, Holzer & Hoffmann, *supra* note 584 at 2935; Murphy et al, *supra* note 586 at 133; Das, *supra* note 587 at 9.

⁵⁹⁶ Comisión Federal de Electricidad, *Guía Para Verificar Los Requisitos de Proyectos Para su Registro ante de la Junta Ejecutiva de la ONU, Bajo el Mecanismo de Desarrollo Limpio* (November 2006), online: CFE <<https://lapem.cfe.gob.mx/normas/pdfs/f/SPA00-34.pdf>> at para 6d) II.

⁵⁹⁷ National CDM Authority India, *Approval Process*, online: Government of India <https://ncdmaindia.gov.in/approval_process.aspx>.

sources. Given that a majority of climate technology originates from developed countries,⁵⁹⁸ this could possibly have negatively influenced the degree of TD&T contained in its CDM projects. In interpreting the correlation between DNA requirement and prevalence of TD&T, it remains important to remember the possible overstating of a TD&T component by project developers resulting from the lack of a clear definition of what qualifies as TD&T in the CDM process. It is possible that this overstating could have been more prevalent in countries with a higher requirement.

A third important takeaway from the CDM empirical studies is that better TD&T tends to be realized through CDM projects when a longer “deal-structure” is in place.⁵⁹⁹ Longer-term projects between project developer and host country were indeed shown to involve increased transfer of knowledge in addition to equipment, which leads to more durable TD&T as it gives the technology recipient the skills to properly adopt the technology as well as to improve on it.⁶⁰⁰ Murphy and his colleagues further observed that as more CDM projects of a given type were implemented in a host country, the frequency of TD&T in these projects declined. According to them, this suggests that TD&T via CDM projects creates capacity in a country, which allows later projects to increasingly rely on local knowledge and equipment instead of on international technology transfer.⁶⁰¹ Taken together, these two conclusions tend to suggest that TD&T via longer-term CDM cooperation has the potential to contribute to technology capacity building in project host countries.

⁵⁹⁸ Murphy et al, *supra* note 586 at 135.

⁵⁹⁹ Schneider, Holzer & Hoffmann, *supra* note 584 at 2932.

⁶⁰⁰ *Ibid.*

⁶⁰¹ Murphy et al, *supra* note 586 at 134-135.

Three main conclusions can be inferred from these studies which could serve as useful lessons for TD&T under the Paris Agreement flexibility mechanisms. First, if a process similar to the CDM is to be enacted as part of the Paris Agreement Article 6 mechanisms, it should integrate a clear definition of TD&T against which project developers' PDD propositions could be assessed and on which DNAs could base their approval. Similarly, a guideline encouraging DNAs to require a TD&T component as a more specific condition for their approval project proposals, as some have done under the CDM, could have positive impacts on the rate of TD&T in these projects. Such a guideline could be integrated in the new modalities and procedures to be adopted for the Article 6 mechanisms.

Second, the finding that larger CDM projects have a higher likelihood of contributing to TD&T suggests that a scaling-up of CDM activities should be encouraged. One avenue for such a scaling-up has been the establishment of CDM Programmes of Activities (PoAs), through which several small-scale CDM activities, called component project activities (CPAs), are bundled together as one CDM PoA.⁶⁰² Only the overarching PoA is required to go through the EB registration process, a regulatory simplification which encourages smaller CPAs that might not have been pursued on a project-by-project basis.⁶⁰³ As Das argues, a programmatic approach to CDM has the potential of being more conducive to TD&T, for example by enabling technological learning among activities bundled under one PoA.⁶⁰⁴ The bundling of CPAs under a PoA can also be more attractive for a technology provider in the sense that it offers it a way to reach a larger market with

⁶⁰² *Further guidance relating to the clean development mechanism*, UNFCCCOR, 11th Sess, Annex, Dec 7/CMP.1, UN Doc FCCC/KP/CMP/2005/8/Add.1 at para 20.

⁶⁰³ Rutger de Witt Wijnen & Sander Simonetti, "After the World Cup: Programmatic CDM Kicks Off in South Africa" (2010) 4:4 Carbon & Climate Law Review 321 at 321.

⁶⁰⁴ Das, *supra* note 587 at 30.

lower transaction costs.⁶⁰⁵ In addition, since CPAs under the same PoA can be implemented in different countries,⁶⁰⁶ technology learning within a PoA could play a role in enabling TD&T in countries where other strategies have been less effective. The programmatic CDM counts 349 registered PoAs as of May 2021, 57 of which were registered after the adoption of the Paris Agreement.⁶⁰⁷ This seems to indicate that the programmatic approach is set to continue post-2020, with PoAs transferred into the upcoming Article 6 flexibility mechanisms. Similarly to regular CDM PDDs, a PoA design document (PoA-DD) must include information on the technologies to be employed by CPAs as well as a description of how these technologies and the know-how for their use are to be transferred to the host Party, if applicable.⁶⁰⁸ Such information is however only required as part of the description of a “typical CPA”.⁶⁰⁹ The PoA-DD information requirement, by being less stringent than the already loose regular CDM requirement, is likely to make evaluating the actual rate of TD&T in programmatic CDM activity even more difficult than it has been in its project-based activity. A way to improve this would be to require more specific TD&T information, possibly on a per-CPA basis, but this appears difficult to enact without making the simplified approach on which programmatic CDM relies more complicated and burdensome.

A third conclusion can be drawn from the positive impact of long-term CDM collaboration on host country technology capacity-building. This positive impact highlights the importance of “more

⁶⁰⁵ François Beurain & Guido Schmidt-Traubt, *Developing CDM Programmes of Activities: A Guidebook* (November 2010), online: Ministère français de la transition écologique <<https://www.ecologie.gouv.fr/sites/default/files/Developing%20CDM%20Programmes%20of%20Activities%20A%20Guidebook.pdf>> at 46.

⁶⁰⁶ De Witt Wijnen & Simonetti, *supra* note 603 at 321.

⁶⁰⁷ CDM, *Programmes of Activities – Registered* (25 May 2021), online: UNFCCC <<https://cdm.unfccc.int/ProgrammeOfActivities/registered.html>>.

⁶⁰⁸ CDM, *CDM project standard for programmes of activities*, CDM Executive Board Report 101, Annex 3 (29 November 2018) online: UNFCCC <<https://cdm.unfccc.int/Reference/Standards/index.html>> at para 33 e) and f).

⁶⁰⁹ CDM, *CDM Programme of activities design document form, Version 9.0* (31 May 2019), online: UNFCCC <https://cdm.unfccc.int/Reference/PDDs_Forms/index.html> at 2.

general institutional frameworks” that encourage longer-term cooperation, notably frameworks that have an impact on general investment conditions such as intellectual property rights (IPRs) and international trade.⁶¹⁰ In order to fully realize climate TD&T, it is thus necessary to consider the interplay between climate law and other international law regimes, in order to understand its implications for climate TD&T. This interplay will be analyzed in the final chapter of the thesis.

It is worth mentioning that significantly fewer CDM projects were enacted during the Kyoto Protocol’s CP2 than during its CP1.⁶¹¹ This can be explained by the lower demand for CERs resulting from fewer States Parties participating during that period, as well as by the uncertainty surrounding the entry into force of the Doha Amendment possibly having a chilling effect on CDM activity. No published studies on the rate of TD&T achieved in CDM projects between 2012 and 2020 were found through a review of the literature, but it is reasonable to assume that the lack of political will that affected the overall ambition level of the CP2 and led to less CDM projects also likely affected its contribution to TD&T negatively.

5.3.2 Going forward

Despite the secondary role of the CDM in enhancing TD&T so far, one conclusion relevant for our analysis is that the place of TD&T in the next iteration of this flexibility mechanism deserves to be reviewed and clarified in order to encourage improved integration of TD&T. As Andonova, Castro and Chelminski note, the CDM, more than the designated TNA process, became the “*de*

⁶¹⁰ Schneider, Holzer & Hoffmann, *supra* note 584 at 2934.

⁶¹¹ See *Annual report of the Executive Board of the clean development mechanism to the Conference of the Parties serving as the meeting of the Parties to the Kyoto Protocol*, UNFCCCOR, 26th Sess, UN Doc FCCC/KP/CMP/2020/1 (advance version), online: UNFCCC <https://unfccc.int/sites/default/files/resource/cmp2020_01_adv.pdf> at para 8.

facto UNFCCC channel”⁶¹² for TD&T during the Kyoto Protocol’s CP1: the measurable outcomes for TD&T, which were not part of the CDM’s design but rather emerged as co-benefits from it, suggest that the CDM, rather than the dedicated treaty institutions and processes, was a significant channel for project-based TD&T during those years. In order to maximize progress on climate TD&T going forward, there is thus an opportunity to build upon the inherent synergy between flexibility mechanisms and TD&T through the implementation of the new Paris Agreement mechanisms.

As mentioned in the first chapter, the legal basis for the Paris Agreement flexibility mechanisms can be found in its Article 6. Three different approaches are set out through the Article: rules for the coordination of decentralized bilateral or multilateral cooperative approaches under Article 6(2) and (3), a centralized mechanism under Article 6(4) to 6(7) and a framework for non-market approaches under Article 6(8) and (9). Negotiations surrounding the adoption of rules and modalities for these three mechanisms have been arduous: originally scheduled to be adopted as part of the Katowice Rulebook, they have as of June 2021 still not been adopted, with ongoing disagreements among States Parties regarding their accounting rules and the eligibility of unused Kyoto Protocol flexibility credits towards Paris Agreement Pledges.⁶¹³ Despite this however, an analysis of the draft decision proposals for these mechanisms provides insights as to the role they could play for climate TD&T once operationalized.

⁶¹² Andonova, Castro & Chelminski, *supra* note 478 at 269.

⁶¹³ Jennifer Iris Allan et al, “Summary of the Chile/Madrid Climate Change Conference: 2-15 December 2019” (2019) 12:775 Earth Negotiations Bulletin, online: IISD <<https://enb.iisd.org/climate/cop25/enb/>> at 26.

The mechanism outlined in Article 6(4) is generally understood as opening the door to a Paris Agreement equivalent to the Kyoto Protocol CDM, which as explained earlier played a subsidiary role for TD&T through its project-based activity. Indeed, the latest draft CMA decision proposal by the CMA president on the rules, modalities and procedures of the Article 6(4) mechanism outlines a process closely resembling the CDM's, with validation, registration, monitoring, verification, certification and issuance overseen by a UNFCCC body, tentatively named the Supervisory Body, in conjunction with DOEs.⁶¹⁴ The modalities for the transition of CDM activities to the Article 6(4) mechanism are also outlined in the draft,⁶¹⁵ with the CMA requesting the Supervisory Body to review CDM-approved baselines and methodologies with a view to applying them to the Article 6(4) mechanism.⁶¹⁶

Enabling the transition of projects and approved methodologies from the CDM to the upcoming Article 6(4) mechanism would be advantageous as it would be cost effective and enable faster deployment of the mechanism. Baselines and methodologies, for example, can cost up to 200 000 dollars to get approved and take years to do so.⁶¹⁷ Allowing the carry-over of CDM credits, however, is controversial and has been a contentious issue in the Article 6 negotiations: it has been demanded by some States Parties but blocked by others who argue that the overabundance of existing CDM credits could lead to decreased ambition for new projects. If the draft proposal is any indication, CDM credit carry-over could be allowed but only under certain circumstances. If

⁶¹⁴ *Draft Text on Matters relating to Article 6 of the Paris Agreement: Rules, modalities and procedures for the mechanism established by Article 6, paragraph 4, of the Paris Agreement. Proposal by the President – Version 3 of 15 December 1:10 hrs*, UN Doc DT.CMA2.i11b.v3 (2019) at Annex part 5 [provisional] [*Article 6 Draft Text*].

⁶¹⁵ *Ibid* at Annex paras 72-74.

⁶¹⁶ *Ibid* at para 3c).

⁶¹⁷ Stephan Hoch et al, *Closing the Deal on CDM Transition: How COP 25 Defined New Guardrails for Compromise and What They Mean for Africa* (2020), online: Climate Finance Innovators <www.climatefinanceinnovators.com/wp-content/uploads/2020/05/Closing-the-deal-on-CDM-Transition_web.pdf> at 6

the wording of the current draft proposal is any indication, an eventual Article 6(4) mechanism is likely to operate as a continuation of the Kyoto Protocol CDM: this appears logical as departing from this already established framework to develop a new one would be time-consuming and costly.

If the Article 6(4) mechanism is set to be a new version of the CDM, can it improve on its predecessor in fostering TD&T through its modalities and procedures? As was discussed earlier in this section, potential improvements to the CDM modalities and procedures include formulating a more detailed definition of TD&T to be used as a requirement in project design documents and encouraging host country authorities to include a TD&T criterion when evaluating projects on their territory for approval. Further details on the exact modalities of the project documents for new projects are still to be determined by the Supervisory Body.⁶¹⁸ Integrating these improvements into the Article 6(4) mechanism modalities and procedures thus still appears possible at this stage, but it remains to be seen if States Parties decide to develop new modalities and procedures for the Article 6(4) mechanism or instead opt to largely replicate the CDM rules as-is.

No matter whether changes are integrated into modalities and procedures or not, one possible improvement for TD&T under the Article 6(4) mechanism could come as a result of the abolition of the Annex/non-Annex dichotomy among States Parties under the Paris Agreement. Dechezleprêtre and his colleagues, in their analysis of climate TD&T through patent data, indeed observed that while international transfer of climate-mitigation technologies has historically occurred mostly between developed countries, there appears to be great potential for North-South

⁶¹⁸ *Article 6 Draft Text*, *supra* note 614 at Annex para 30.

transfers as well as South-South exchanges, particularly since countries from the global South may have developed inventions that are better tailored to the needs of other developing countries.⁶¹⁹ Could the fact that the Paris Agreement Article 6(4) mechanism, by allowing participation of all States Parties either as project developers or as hosts, open the door to an increase in these types of transfers? It appears possible. The role of dedicated UNFCCC TD&T norms and institutions could then grow to include fostering a regulatory environment conducive to this new reality.

In parallel to the centralized mechanism described above, Articles 6(2) and (3) of the Paris Agreement provide the basis for the integration of emissions reductions achieved through decentralized cooperative approaches into State Parties' NDCs. These reductions, which could originate from diverse initiatives such as bilateral or regional emissions trading systems, crediting programmes or direct government-to-government collaboration,⁶²⁰ are to be accounted for, in a transparent and robust manner, as internationally transferred mitigation outcomes (ITMOs).⁶²¹ Japan's Joint Crediting Mechanism (JCM) is one pre-existing initiative considered as a "pilot" Article 6(2) cooperative approach.⁶²² Established in 2013, the JCM is a bilateral program between Japan and 17 countries whose objective is stated as "facilitating diffusion of leading decarbonization technologies, products, systems, services, and infrastructure as well as implementation of mitigation actions, and contributing to sustainable development of developing countries."⁶²³ The program is implemented through private sector projects, which generate credits

⁶¹⁹ Dechezleprêtre et al, *supra* note 508 at 124.

⁶²⁰ Andrew Howard, "Voluntary Cooperation (Article 6)" in Klein et al, eds, *supra* note 446 at 185.

⁶²¹ *Paris Agreement*, *supra* note 2 at art. 6(2).

⁶²² Elena Kosolapova, *Delivering Climate Ambition Through Market Mechanisms: Capitalizing on Article 6 Piloting Activities* (2021), online: IISD <<https://sdg.iisd.org/commentary/policy-briefs/delivering-climate-ambition-through-market-mechanisms-capitalizing-on-article-6-piloting-activities/>>.

⁶²³ Global Environment Centre Foundation, *Overview of the Joint Crediting Mechanism (JCM)*, online: GEC <<https://gec.jp/jcm/about/>>.

shared among the Japanese and host country governments as well as the participating entities. The JCM project cycle is similar to the CDM's, but a joint committee of supervising entities from the countries participating to the project replaces the centralized CDM executive board.⁶²⁴ Currently, JCM credits are non-tradable but they are set to become so as ITMOs once Paris Agreement Article 6 is operationalized.⁶²⁵ A memorandum of understanding for an upscaling of the JCM was signed between the World Bank and Japan's ministry of environment in 2019: there is thus a possibility for Japan's mechanism to become a widely used framework for bilateral activities under Article 6(2).⁶²⁶ As stated in the JCM's objective, TD&T is central to the mechanism: if Japan's initiative is indeed scaled up or replicated through the implementation of Article 6(2), it could lead to improved TD&T.

The third Paris Agreement flexibility mechanism is the framework for non-market approaches (NMAs) established under Articles 6(8) and (9). It is interesting to note that Article 6(8) is the only paragraph of Article 6 to directly refer to TD&T: it states that "Parties recognize the importance of integrated, holistic and balanced non-market approaches [...] including through, inter alia, [...] technology transfer."⁶²⁷ The NMA framework is new and has no previous equivalent in the UNFCCC regime. As such, its implementation is still in its earlier stages when compared to the Article 6(2) and 6(4) mechanisms. Indeed, the latest draft proposal decisions by the CMA president, which date from 2019, set out a work programme for the NMA framework, while they include draft annexes fully operationalizing the other two mechanisms. The language of the draft

⁶²⁴ Government of Japan, *Recent Development of The Joint Crediting Mechanism (JCM)* (2019), online: Government of Japan <https://www.carbon-markets.go.jp/document/20190819_JCM_goj_eng.pdf> at 6.

⁶²⁵ *Ibid* at 5.

⁶²⁶ Government of Japan, *Press Release: Memorandum of cooperation between the World Bank and the Ministry of the Environment of Japan on collaboration for scaling-up of the Joint Crediting Mechanism (JCM)* (August 2019), online: Government of Japan <<http://www.env.go.jp/en/headline/2415.html>>.

⁶²⁷ *Paris Agreement*, *supra* note 2 at art. 6(8).

work programme is quite vague as to the exact modalities of the NMA framework: to quote the UNFCCC web page on the topic, the NMA mechanism “can be anything and everything, provided it’s not market based”.⁶²⁸ The latest negotiations on the Article 6(8) framework hint towards approaches to international carbon pricing and other fiscal measures, but according to one researcher on the topic, discussions to date have also included incentives towards more efficient technologies and energy switching.⁶²⁹ It thus appears useful to analyze the draft NMA framework proposal to see how it could be implemented in a way to support enhanced action for TD&T.

TD&T is referred to in the principles guiding the work programme for the NMA framework: according to these principles, the framework is to “enhance linkages and create synergies between, inter alia, emissions reductions, adaptation, climate finance, technology transfer and capacity-building.”⁶³⁰ The draft CMA decision for the work programme further identifies “mitigation activities, which recognize [...] technology development and transfer” as one potential area of work.⁶³¹ In regard to governance of the NMA framework, the draft work programme provides for the establishment of an NMA forum to implement the framework and work programme.⁶³²

Direct involvement of non-state actors, including of actors from the private sector, is planned as part of the NMA work programme. Its draft modalities indeed include “meetings with [...] private sector stakeholders, including technical experts, businesses, civil society organizations and

⁶²⁸ UNFCCC, *What are Market and Non-Market Mechanisms?*, online: UNFCCC <<https://unfccc.int/topics/what-are-market-and-non-market-mechanisms>>.

⁶²⁹ Howard, *supra* note 620 at 190.

⁶³⁰ *Draft Text on Matters relating to Article 6 of the Paris Agreement: Work programme under the framework for non-market approaches referred to in Article 6, paragraph 8, of the Paris Agreement. Proposal by the President – Version 3 of 15 December 00:20 hrs*, UN Doc DT.CMA2.i11c.v3 (2019) at Annex para 1 a) ii) [provisional].

⁶³¹ *Ibid* at para 5e).

⁶³² *Ibid* at Annex para 4.

financial institutions and publication of the outcomes of such meetings”,⁶³³ as well as “submissions from [...] private sector stakeholders.”⁶³⁴ Paragraph 6 of the draft decision proposal further “encourages Parties and public and private sector stakeholders to actively engage in the research, development and implementation of non-market approaches”.⁶³⁵ The work programme also hints towards possibilities for institutional linkages between the NMA forum and other UNFCCC bodies: Article 9c) of the draft work programme indeed sets out modalities for reports on its progress to be communicated to the CMA: these reports are to include “recommendations on how to enhance support for NMAs including through engagement with relevant bodies [...] related to, inter alia, [...] technology development and transfer”.⁶³⁶

The NMA work programme as outlined in the draft proposal displays several characteristics of a polycentric initiative. For example, one of the measures to be implemented as part of the activities of the NMA work programme consists in identifying and sharing relevant information, best practices, lessons learned and case studies for developing and implementing NMAs: this includes information on how to replicate successful approaches in the local, subnational, national and global contexts, as well on how to enhance the engagement of the private sector, and of vulnerable and impacted sectors and communities.⁶³⁷ By attempting to foster learning across scales and to create linkages among a broad range of stakeholders without relying on market instruments, the NMA framework could serve as a novel tool for TD&T cooperation alongside the Article 6(2) and 6(4) market mechanisms. The Article 6(8) NMA framework, while still in its infancy, thus appears to

⁶³³ *Ibid* at Annex para 7b).

⁶³⁴ *Ibid* at Annex para 7c).

⁶³⁵ *Ibid* at para 6.

⁶³⁶ *Ibid* at Annex para 9c).

⁶³⁷ *Ibid* at Annex para 8b)ii).

have the potential to fulfill a unique role as a polycentric tool for climate TD&T within the Paris Agreement. Depending on how it is implemented, it could have positive implications for TD&T going forward.

5.4 Conclusion

This chapter consisted in a comprehensive analysis of the norms, mechanisms and institutions for climate TD&T within UNFCCC treaty law as seen through the lens of the thesis' theoretical perspective. It highlighted the polycentric character of climate TD&T, its role in the innovation process as defined in the UNFCCC regime and its link with capacity-building. It also traced the progress of TD&T within the UNFCCC through the two main treaty channels for it: the dedicated technology institutions and processes of the EGTT, the TM and TNAs on one hand, and the de-facto channel of the Kyoto Protocol CDM on the other. For both channels, it identified recurring challenges as well as new paths for progress in the wake of the Paris Agreement. The Paris Agreement, through its novel MRV obligations and flexibility mechanisms, opens up possibilities for improved TD&T through enhanced cooperation, innovation, learning and trust-building. By incorporating elements of a polycentric governance approach, it has the potential to better fulfill its role as an instrument to coordinate the behaviour of the wide range of actors involved in climate TD&T, notably of non-state actors, which is essential for the achievement of its overarching goal of limiting the increase in global temperature to well under 2°C. It however remains to be seen if TD&T is to be implemented in a way to fulfill its potential going forward. The role of climate law as understood through the thesis' theoretical perspective is to induce, ensure and enforce cooperation, notably through MRV and compliance mechanisms. As of today, and despite the guidance provided by the Katowice Rulebook, it still is not clear how the MRV of TD&T, and of

non-state actor performance more generally, is to be carried out in practice. Are there any lessons to be learned from TD&T institutions in other regimes of international environmental law? Or, on the contrary, could the enactment of the new Paris Agreement norms for climate TD&T be hindered by other spheres of international law? This is what the next chapter will explore.

6. Technology Development and Transfer beyond the UNFCCC: Normative Synergies and Conflicts

The analysis carried out in the previous chapter underlined how new normative developments under the Paris Agreement, notably the adoption of more thorough MRV rules and mechanisms, open the door to improved coordination for TD&T within the UNFCCC regime. It however remains to be seen whether these improvements will lead to tangible results, since a number of them, such as transparency framework reporting, the global stocktake and the Article 6 mechanisms, have yet to be fully set in motion. As was explained in Chapter 3, this is the gamble taken by the Paris Agreement: first garner broad participation by imposing less defined, “shallower” initial commitments, then aim for a subsequent deepening of these commitments through the repeated fulfillment of binding procedural obligations by States Parties.

In parallel to carrying out their Paris Agreement commitments, States are bound by an array of other global and bilateral treaties. Commitments undertaken as part of these treaties, environmental or other, can affect States’ willingness or ability to undertake certain forms of climate action. When understood through Ostrom’s polycentric governance theory, different treaty regimes can be conceptualized as different collective-choice arenas for rule- and decision-making. This variety of arenas must be taken into account when attempting to understand the management of a CPR since “most frequently, several collective-choice arenas affect the set of operational rules actually used [...] in a CPR”.⁶³⁸ Similarly, when applying Lessig’s pathetic dot model, different treaties can be understood as distinct modalities of legal regulation influencing the behaviour of the actor, in this

⁶³⁸ Ostrom, *Governing the Commons*, *supra* note 334 at 54-55.

case the State. Understanding how these complementary modalities of regulation interact, with a view of enhancing normative synergies and minimizing conflict, can provide useful insights when attempting to assess the effectiveness of treaty law. This holds true not only for TD&T norms, but also for UNFCCC treaty law more generally.⁶³⁹

In contrast to the previous chapter, which analyzed the norms and institutions for TD&T within the UNFCCC, the analysis carried out in this chapter extends beyond the climate regime to identify potential cases of regime interplay. Regime interplay can be defined as the “situations when the contents, operation or consequences of one institution (the recipient regime) are significantly affected by another (the tributary regime).”⁶⁴⁰ One typology of regime interplay developed by political scientist Stokke distinguishes between three main types: utilitarian interplay, where actions taken within one regime affect the actions of another by altering the costs and benefits of these actions; normative interplay, where norms within one regime confirm or contradict norms in another; and ideational interplay, through which one regime can learn from another and adapt solutions, either normative or institutional, to reach its own objectives.⁶⁴¹ Stokke explains that while the three categories are mutually exclusive, concrete cases of regime interplay can display more than one type simultaneously.⁶⁴² As this chapter will illustrate, this is often the case regarding the interplay between the UNFCCC and other international treaty regimes in regard to TD&T.

⁶³⁹ Philipp Pattberg et al, “Linkages: Understanding their Role in Polycentric Governance » in Jordan et al, eds, *supra* note 401 at 178.

⁶⁴⁰ Olav Schram Stokke, *The Interplay of International Regimes: Putting Effectiveness Theory to Work*, FNI Report 14/2001 (Oslo: Fridtjof Nansen Institute, 2001) online: FNI <<https://www.fni.no/getfile.php/132044-1469870045/Filer/Publikasjoner/FNI-R1401.pdf>> at 2.

⁶⁴¹ *Ibid* at 10-11.

⁶⁴² *Ibid* at 12.

The Paris Agreement TF recognizes the importance of taking the interactions between different treaty regimes into account. As one of its objectives under its key theme on collaboration and stakeholder engagement, it is stated that “activities for cooperation on technology development and transfer across relevant organizations, institutions and initiatives should be harmonized and synergized to avoid duplication and ensure consistency and coherence.”⁶⁴³ One of the prescribed actions linked to this objective theme consists in “enhancing collaboration and synergy with relevant international organizations, institutions and initiatives [...] to leverage their specific expertise, experience, knowledge and information”.⁶⁴⁴ In addition to this, the TF also underlines the importance of creating and enhancing an enabling environment for TD&T.⁶⁴⁵ This concept was defined in the TF’s predecessor, the TTF, as the sum of “government actions, such as fair trade policies, removal of technical, legal and administrative barriers to technology transfer, sound economic policy, regulatory frameworks and transparency, all of which create an environment conducive to private and public sector technology transfer.”⁶⁴⁶ Improved understanding of the interplay between relevant treaty regimes can also point to improvements for an enabling environment.

The collective-choice arenas for the management of environmental resources can be distinguished vertically, along the geographical scale they operate. This scale can be sub-national, national, regional or global. At the global scale, they can also be distinguished horizontally, along the field of international law they regulate. This chapter will thus analyze a number of relevant international treaty regimes which operate as complementary arenas at the horizontal level, in order to analyze

⁶⁴³ FCCC Dec 15/CMA.1, Annex, *supra* note 466 at para 19.

⁶⁴⁴ *Ibid* at Annex para 20d).

⁶⁴⁵ *Ibid* at Annex para 13.

⁶⁴⁶ FCCC Dec 4/CP.7, Annex 1, *supra* note 434 at para 12.

their interplay with UNFCCC TD&T norms. In its first section, it will identify existing or potential linkages, which constitute opportunities for improvements to climate TD&T through synergies and learning. In its second section, it will analyze two areas of international law which, if not taken into account, risk of acting as obstacles to the enabling environment the UNFCCC is attempting to create for TD&T. One new governance framework, the 2030 Agenda for Sustainable Development, has the ambition of operating at the global level alongside these different treaty regimes, in order to catalyze action towards a set of overarching, cross-cutting sustainable development goals. The final section of this chapter will outline the structure and role of this new framework, assessing its implications for climate TD&T.

6.1 Identifying and reinforcing potential synergies

As explained above, the identification and strengthening of synergies through an analysis of regime interplay could be beneficial for climate TD&T. In the field of international environmental law, a number of MEAs include provisions or mechanisms for TD&T.⁶⁴⁷ All of these represent possible sources of linkages or mutual learning with UNFCCC TD&T norms and institutions. A comprehensive review of these MEAs lies outside of the scope of this chapter, but two regimes presenting specifically strong potential for linkages with the UNFCCC will be analyzed in more detail. They are the regimes for the protection of biological diversity and of the ozone layer.

⁶⁴⁷ MEAs featuring a technology component but not analyzed in this chapter include the Basel Convention on the transboundary movement of hazardous wastes, the Convention on International Trade of Endangered Species (CITES) and the Stockholm Convention on Persistent Organic Pollutants. For an outline of technology transfer under these MEAs, see UNEP-UNCTAD, *A Preliminary Analysis of MEA Experiences in Identifying and Facilitating the Transfer of Technology* (Nairobi and Geneva: UNEP-UNCTAD, 2007), online: UNEP <https://unep.ch/etb/areas/pdf/MEA%20Papers/MEA_EGS%20Paper.pdf>.

6.1.1 The international regime for the protection of biological diversity

In the biological diversity regime, both the Convention on Biological Diversity (CBD) and its Nagoya Protocol on Access and Benefit-Sharing contain references to TD&T. The Convention sets a general commitment for it in its Article 16.⁶⁴⁸ TD&T is further referred to in three more specific Articles: Article 17 on the exchange of information, Article 18 on technical and scientific cooperation, and Article 19 on the handling of biotechnology and the distribution of its benefits.⁶⁴⁹

TD&T within the biodiversity regime has been a contentious issue: together with Article 19, Article 16 has been described as “probably the most controversial article”⁶⁵⁰ in the CBD. This is because in addition to dealing with technologies “that are relevant to the conservation and sustainable use of biological diversity”, it addresses those that “make use of genetic resources”⁶⁵¹, expanding its application to a broader set of technologies including for example certain pharmaceutical products. In doing so, TD&T norms under the CBD address a broader set of interactions and introduce additional points of contention. Indeed, private actors, most often based in developed countries, sometimes require access to genetic resources exclusively available on the territory of another State Party, often a developing country, in order to develop technologies from them. In this context, CBD treaty law attempts to regulate both the access to the resource as well as the sharing of benefits of the technology made from it. The broad scope of application of Article 16 introduces complex questions related to the IPRs over both the technologies themselves as well as the genetic resources at their root. In an attempt to address this complicated issue, the Nagoya Protocol to the CBD, adopted in 2010, sets forth more detailed modalities for the access to genetic

⁶⁴⁸ *Convention on Biological Diversity*, 5 June 1992, 1760 UNTS 79 at art. 16 [CBD].

⁶⁴⁹ *Ibid* at arts. 17(2), 18(4), 18(5) and 19.

⁶⁵⁰ Lyle Glowka et al, *A guide to the Convention on Biological Diversity* (Gland: IUCN, 1994) at 84.

⁶⁵¹ *CBD*, *supra* note 648 at art. 16(1).

resources and the sharing of benefits arising from their utilization. Transfer, collaboration and cooperation on technology that make use of these resources is addressed in its Article 23.⁶⁵²

The legal issues related to access and benefit-sharing of genetic and other biological resources do not have any direct equivalent in the climate regime. As the IPCC notes, “since the CBD is concerned directly with access to and use of genetic resources, IPRs have played a more central role than seems likely in the context of climate change.”⁶⁵³ As we have seen, climate TD&T covers the “technologies, practices and processes that control, reduce or prevent anthropogenic emissions of greenhouse gases”⁶⁵⁴. In contrast to CBD technology, IPRs over climate technology are generally clearly established: the main goal of climate treaty norms for TD&T then becomes to foster cooperation and enhance the diffusion of these technologies, or in other terms to induce the established rights owners into sharing their IP. In regard to the contentious issue of access and benefit sharing of genetic resources and their resulting technologies, there thus appears to be little potential for synergies or learning between the CBD and UNFCCC regimes.

Alongside its norms on access and benefit-sharing, other CBD measures for TD&T engage with technology cooperation in a manner more similar to the UNFCCC. Articles 17 and 18 respectively set out commitments for exchange of information and for scientific and technical cooperation on the development and use of technologies. A Programme of Work on technology

⁶⁵² *Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization to the Convention on Biological Diversity*, 29 October 2010, UN Doc UNEP/CBD/COP/DEC/X/1, at art. 23 [*Nagoya Protocol*]. For an overview of the technology transfer component of the Nagoya Protocol, see Elisa Morgera, Elsa Tsioumani & Matthias Buck, *Unraveling the Nagoya Protocol* (Leiden: Brill, 2015) at 314-321.

⁶⁵³ Metz et al, *supra* note 13 at 91.

⁶⁵⁴ *UNFCCC*, *supra* note 1 at art. 4(1)c).

transfer and technological and scientific cooperation was first elaborated in 2006,⁶⁵⁵ followed two years later by an Implementation strategy⁶⁵⁶. The Clearing-house mechanism (CHM), established under article 18(3) of the CBD, was positioned through this programme as a central mechanism for technology information-sharing and cooperation in the biodiversity regime.⁶⁵⁷ Under the Strategic Plan for Biodiversity 2011-2020, the CHM's role has been to “contribute [...] through effective information services and other appropriate means in order to promote and facilitate scientific and technical cooperation, knowledge sharing and information exchange, and to establish a fully operational network of Parties and partners.”⁶⁵⁸ A complementary objective of the 2011-2020 strategic plan was to develop a biodiversity knowledge network, including a database and network of practitioners, whose contributions would be made available through the CHM.⁶⁵⁹ The two main members of this knowledge network are the Bio-Bridge Initiative and the Consortium of Scientific Partners on Biodiversity (CSP). Bio-Bridge was established in 2014 by the Republic of Korea⁶⁶⁰ and consists of a helpdesk, a web platform through which actors in need of assistance as well as providers can directly interact, a channel for the organization of meetings and roundtables and a small seed funding facility.⁶⁶¹ The CSP was established in 2006 and is composed of 25 member institutions, most of them operating at the national scale, offering information, tools

⁶⁵⁵ CBD, *Programme of Work on technology transfer and technological and scientific cooperation*, (Montreal: Secretariat of the Convention on Biological Diversity, 2006), online: CBD <<https://www.cbd.int/doc/publications/ttc-brochure-01-en.pdf>> [*Programme of Work*].

⁶⁵⁶ *Strategy for the practical implementation of the Programme of Work on technology transfer and scientific and technological cooperation*, UNEP/CBD/COP/DEC/IX/14 (2008) at 4.

⁶⁵⁷ *Programme of Work*, *supra* note 655 at para 2.1. An Access and Benefit-Sharing Clearing-House (ABSCH) was also established according to article 14 of the Nagoya Protocol. It operates as part of the CHM.

⁶⁵⁸ *Mission, goals and objectives of the Clearing-House Mechanism for the period 2011-2020*, UNEP/CBD/COP/DEC/X/15 (2010) at 3.

⁶⁵⁹ *Review of progress in providing support in implementing the objectives of the Convention and the Strategic Plan for Biodiversity 2011-2020, and enhancement of capacity-building, technical and scientific cooperation and other initiatives to assist implementation*, UNEP/CBD/COP/DEC/X/2 (2010) at para 22.

⁶⁶⁰ *Enhancing support in implementing the objectives of the Convention and its Strategic Plan for Biodiversity 2011-2020*, UNEP/CBD/COP/DEC/XII/2 (2014) at para 13.

⁶⁶¹ CBD, “The Bio-Bridge Initiative”, online: CBD <<https://www.cbd.int/biobridge/about>>.

and services leveraged from their respective successes to inform international action.⁶⁶² It holds meetings in parallel to the biennial CBD COP meetings.⁶⁶³

The implementation of CBD commitments under Articles 17 and 18 has so far led to progress for scientific cooperation and information-sharing, but there is little evidence of tangible results for TD&T.⁶⁶⁴ As noted by the Executive Secretary of the CBD, despite the establishment of initiatives such as Bio-Bridge and the CSP, “the number of successful cases of technology transfer in the context of the Convention on Biological Diversity remains low”.⁶⁶⁵ For the Bio-Bridge initiative, evaluation of effectiveness is further complicated by the fact that a monitoring and evaluation framework has yet to be implemented.⁶⁶⁶ This slow process towards tangible results holds true for much of the CBD’s norms and mechanisms. Indeed, much like the climate regime before the Paris Agreement, the main success of the CBD regime has so far been to set the topic on the global agenda and to develop the normative and institutional basis for coordination.⁶⁶⁷ More defined objectives and improved MRV processes now need to be adopted in order for the regime to foster

⁶⁶² CBD, “Consortium of Scientific Partners on Biodiversity”, online: CBD <<https://www.cbd.int/cooperation/csp/>>. For the text of the Memorandum of Understanding establishing the Consortium, see CBD, *Memorandum of Understanding* (Curitiba, 27th March 2006), online: CBD <<https://www.cbd.int/doc/agreements/agmt-museums-2006-03-27-mou-en.pdf>>.

⁶⁶³ For an up-to-date archive of CSP meeting reports, see CBD, “Reports of the Meetings of the Consortium of Scientific Partners on Biodiversity”, online: CBD <<https://www.cbd.int/cooperation/csp/documents.shtml>>.

⁶⁶⁴ See *Activities that Support Technology Transfer and Scientific and Technological Cooperation of Relevance to the Convention: Compilation of Activities and Gap Analysis*, UNEP/CBD/COP/11/INF/9 (2012) at paras 12-14.

⁶⁶⁵ *Revised Draft Proposals to Strengthen Technical and Scientific Cooperation in Support of the Post-2020 Global Biodiversity Framework*, UNEP/CBD/POST2020/WS/2020/2/2 (2020) at para 3 [*Biodiversity Draft Proposals*].

⁶⁶⁶ CBD, *Bio-Bridge Initiative Action Plan (2017-2020)* (2016), online: CBD <<https://www.cbd.int/bio-bridge/BBI-Action-Plan-2017-2020.pdf>> at 28.

⁶⁶⁷ For a review of the progress under the CBD and of some remaining challenges, see Braulio F. S. Dias, *The Slow but Steady Progress in the Implementation of the Biodiversity Agenda* (2020), online: IUCN <<https://www.iucn.org/news/world-commission-environmental-law/202007/slow-steady-progress-implementation-biodiversity-agenda>>.

measurable progress. In order to achieve this, a post-2020 Global Biodiversity Framework is currently being developed.

A review of the draft proposals to strengthen technical and scientific cooperation in the post-2020 Biodiversity Framework reveals interesting ideas being put forth to further the objectives of CBD Article 18. Specifically, these proposals address cooperation for the use and development of technologies, as well as the establishment and promotion of joint research programmes and joint ventures for the development of technologies.⁶⁶⁸ In developing the post-2020 Framework, CBD actors appear to be drawing from the experience gathered in the UNFCCC regime. For example, one of the three different options for institutional mechanisms and modalities put forth in the draft consists of a global technical and scientific cooperation support centre which “could operate in a manner similar to [...] the CTCN.”⁶⁶⁹ It is interesting to note that the importance for this eventual centre to feature robust reporting process and to benefit from consistent funding, two weak points of the UNFCCC CTCN highlighted in the previous chapter, are textually referred to in the draft proposals.⁶⁷⁰

Another aspect for which potential interplay between the post-2020 CBD Framework and the UNFCCC regime exist is MRV mechanisms. Indeed, the zero draft of the post-2020 Framework sets out a system for planning, reporting and review based on national reports and a global stocktake, which greatly resembles the MRV obligations under the Paris Agreement and its

⁶⁶⁸ See *Biodiversity Draft Proposals*, *supra* note 665 at para 1.

⁶⁶⁹ *Ibid* at para 17.

⁶⁷⁰ *Ibid* at paras 19-20.

Katowice rules.⁶⁷¹ As the MRV processes of the Paris Agreement are enacted over the coming years, their successes and weaknesses could be used as information for the development of their counterparts in the biodiversity regime. Adopting similar formal requirements between the two regimes when possible could also make equivalent processes less burdensome on participating actors, which could improve participation and increase effectiveness.

The examples of TD&T institutions and MRV processes show how recent progress made in the UNFCCC regime could potentially inform its more complex counterpart in the biodiversity regime as to the successful implementation of institutional structures and processes for TD&T cooperation. The possibilities for interplay appear to be mostly ideational in nature, the CBD regime learning from UNFCCC initiatives with a view to adapting it to its own context. Stronger interplay, for example through an organizational clustering similar to the three international chemicals conventions of Basel, Stockholm and Rotterdam, does not appear to be a possibility.⁶⁷² An institutional forum for interplay between the two regimes does exist in the Joint Liaison Group of the Rio Conventions, but this Group does not appear to have been active since 2016.⁶⁷³ An active Joint Liaison Group could be useful as a forum for discussing the synergies between the two regimes going forward.

⁶⁷¹ *Update of the Zero Draft of the Post-2020 Global Biodiversity Framework*, UNEP/Annex, UN Doc CBD/POST2020/PREP/2/1 (2020) at paras 15-18.

⁶⁷² See Nils Goeteyn & Frank Maes, “The clustering of multilateral environmental agreements: Can the clustering of the chemicals-related conventions be applied to the biodiversity and climate change conventions?” in Frank Maes et al, eds, *Biodiversity and Climate Change: Linkages at International, National and Local Levels* (Cheltenham: Edward Elgar, 2013) 147 at 175.

⁶⁷³ The latest meeting report of the Joint Liaison Group uploaded to the CBD website indeed dates from 2016. There, it is stated that its next meeting should be scheduled “sooner than later”. See CBD, *Fourteenth meeting of the Joint Liaison Group of the Rio Conventions, 24 August 2016 @ 14:00, Room 1511, Langer Eugen, UN Campus, Bonn Germany: Report of the meeting* (2016), online: CBD <<https://www.cbd.int/doc/reports/jlg-14-report-en.pdf>> at 2.

In sum, TD&T norms in the CBD regime present few similarities to the norms of the climate regime: this is notably due to the broader scope of technologies covered by the biodiversity treaties. Despite these differences however, direct references to UNFCCC processes and mechanisms in the post-2020 CBD Framework draft texts point to possibilities for ideational interplay between the two regimes at an important moment for the CBD. Indeed, decisions taken in the early stages of the development of this new framework could significantly influence the final form of this instrument, which is likely to coordinate global action for the protection of biological diversity in the years to come.

6.1.2 The regime for the protection of the ozone layer

In contrast to the climate change and biodiversity regimes, the mechanism for TD&T in the international regime for the protection of the ozone layer is well-established and well-understood. Indeed, the Vienna Convention for the Protection of the Ozone Layer⁶⁷⁴ and its Montreal Protocol⁶⁷⁵ have been in force for over thirty years their role in the reduction of ozone-depleting substances represents one of the major success stories in international environmental law.⁶⁷⁶

Provisions for TD&T are present in both the Vienna Convention and the Montreal Protocol. Under the Convention, Parties conduct research and scientific assessments on alternative substances that may affect the ozone layer as well as on alternative substances and technologies.⁶⁷⁷ Parties shall

⁶⁷⁴ *Vienna Convention*, *supra* note 104.

⁶⁷⁵ *Montreal Protocol on Substances that Deplete the Ozone Layer*, 16 September 1987, 1522 UNTS 3 [*Montreal Protocol*].

⁶⁷⁶ The United States National Space Agency (NASA) indeed reports that “scientists have shown through direct satellite observations of the ozone hole that levels of ozone-destroying chlorine are declining, resulting in less ozone depletion”. See NASA, “NASA Study: First Direct Proof of Ozone Hole Recovery Due to Chemicals Ban”, online: NASA <<https://www.nasa.gov/feature/goddard/2018/nasa-study-first-direct-proof-of-ozone-hole-recovery-due-to-chemicals-ban>>.

⁶⁷⁷ *Vienna Convention*, *supra* note 104 at art. 3(1)e) and f).

also cooperate in promoting the development and transfer of technology and knowledge. Article 4 of the Convention specifies that this cooperation is to be carried out through facilitating the acquisition of alternative technologies, of information and equipment for these technologies, and through the appropriate training of scientific and technical personnel.⁶⁷⁸ The Protocol builds on the Convention's provisions, most notably by introducing legally binding reduction targets for ozone-depleting substances (ODS). For TD&T, it introduces obligations for research, development, public awareness, exchange of information and technical assistance.⁶⁷⁹ The adoption of the 1990 London amendment to the Montreal Protocol led to two further important developments for TD&T. The amendment introduces a dedicated provision for TD&T in Article 10A, which requires Parties to take every practicable step to ensure that the best available, environmentally safe substitutes and related technologies are expeditiously transferred to Parties qualifying as developing countries under the criteria laid out in Article 5 of the Protocol. These transfers are to occur under fair and most favourable conditions.⁶⁸⁰ The amendment also establishes the Multilateral Fund (MLF), whose role includes compensating Article 5 Parties for the incremental costs occurred in complying with the phasing-out of ODS as well as financing clearing-house functions with a view to facilitate access to information and relevant technical expertise.⁶⁸¹ Since its inception, the MLF has supported over 8,600 projects spanning from industrial conversion to technical assistance, training and capacity building.⁶⁸²

⁶⁷⁸ *Ibid* at art. 4(2).

⁶⁷⁹ *Montreal Protocol*, *supra* note 675 at arts. 9 and 10.

⁶⁸⁰ *Amendment to the Montreal Protocol on Substances that Deplete the Ozone Layer*, UNEP/ODS, 2nd Sess, Annex II, UN Doc UNEP/OzL.Pro.2/3 at para U [*London Amendment*].

⁶⁸¹ *Ibid* at para T.

⁶⁸² UNEP, *About Montreal Protocol*, online: UNEP <<https://www.unep.org/ozonaction/who-we-are/about-montreal-protocol>>.

TD&T provisions were central to the success of the regime for the protection of the ozone layer. Together with the imposition of gradual trade restrictions on ozone-damaging substances and funding for developing States Parties through the Multilateral Fund, they allowed the industry and developing countries to phase out ozone-depleting technologies by facilitating access to less damaging alternatives.⁶⁸³ The Montreal Protocol TD&T process is led by the Technology and Economic Assessment Panel (TEAP), one of the panels of experts created to carry out the assessment and review of the Protocol's control measures under Article 6. The TEAP, alongside the technology-specific technical options committees (TOCs), works to analyse and present relevant technical information and make technical recommendations when requested.⁶⁸⁴ It presents the technical and economic information relevant to policy, but does not evaluate policy issues nor recommend policy.⁶⁸⁵ The TEAP is composed of experts from government and academia, as well as from the industries involved in the use and production of ODS. Its membership is structured to represent both developed and developing States Parties.⁶⁸⁶ This structure has enabled the TEAP to shape ozone TD&T through direct interaction with States Parties and important industry actors, working together with them to find alternatives to ODS uses and share solutions among each other.⁶⁸⁷ A group of experts led by Stephen Andersen, former co-chair of the TEAP, explains that this process of continuous technological innovation and diffusion lies at the heart of the success of

⁶⁸³ Stephen O. Andersen, K. Madhava Sarma & Kristen N. Taddonio, *Technology Transfer for the Ozone Layer: Lessons for Climate Change* (Oxford: Earthscan, 2007) at 2. For a summarized overview of the lessons learned from the Montreal Protocol, see Expert Group on Technology Transfer, *supra* note 491 at 63.

⁶⁸⁴ *Terms of reference, code of conduct and disclosure of conflict of interest guidelines for the Technology and Economic Assessment Panel and its technical options committees and temporary subsidiary bodies*, MOP Dec XXIV/8, UNEP/OP, 24th Sess, Annex, UN Doc UNEP/OzL.Pro.24/10 at para 1.

⁶⁸⁵ *Ibid.*

⁶⁸⁶ Suely Machado Carvalho, "Technology Assessment for the Montreal Protocol" in Philippe G. Le Prestre, John D. Reid & E. Thomas Morehouse Jr., eds, *Protecting the Ozone Layer: Lessons, Models, and Prospects* (Berlin: Springer, 1998) 143 at 144.

⁶⁸⁷ *Ibid* at 145.

the Montreal Protocol.⁶⁸⁸ This has led his co-authors to qualify the Montreal Protocol not as a chemical treaty, but rather as an “environmental technology treaty.”⁶⁸⁹

TD&T in the ozone regime revolved around the mandatory replacement of ozone-depleting technologies with less damaging alternatives. These technologies cover 114 substances⁶⁹⁰ used in thousands of products. The challenge of finding alternatives to these technologies, while significant, pales in comparison to the problem of greenhouse-gas emitting technologies, where a major part of the world’s economic activity, whether through transport, heating or energy-generation, depends on damaging fossil fuel sources. With fewer technologies to regulate, it might have been easier to phase-out damaging ones and to promote the diffusion of alternatives by encouraging the industry to adopt specific technologies in the ozone context, a process known in business circles as “picking winners”. Another difference between the two regimes is that industry actors in the ozone context respected the science underpinning the ozone problem and were proactive in solving it since the start. As Andersen and his co-authors explain, although there were concerns that including industry participants could be counterproductive, the fact that they served alongside representatives from competitors and knowledgeable academics created a critical check against undue influence.⁶⁹¹ All TEAP members are also bound by a code of conduct which served to avoid conflicts of interest and resolve any that occurred.⁶⁹² In contrast, oil companies, which

⁶⁸⁸ Andersen, Sarma & Taddonio, *supra* note 683 at 295.

⁶⁸⁹ K. Madhava Sarma & Kristen N. Taddonio, “The Role of Financial Assistance by the Multilateral Fund in Technology Change to Protect the Ozone Layer” in Christos Zerefos, Georgios Contopoulos & Gregory Skalkeas, eds, *Twenty Years of Ozone Decline: Proceedings of the Symposium for the 20th Anniversary of the Montreal Protocol* (Berlin: Springer, 2009) at 443.

⁶⁹⁰ *Montreal Protocol*, *supra* note 675 at Annex A-E. For an up-to-date list of these substances, see Ozone Secretariat, *Handbook for the Montreal Protocol on Substances that Deplete the Ozone Layer*, 13th ed (2019) online: UNEP <https://ozone.unep.org/sites/default/files/2019-07/MP_Handbook_2019.pdf> at 31-35.

⁶⁹¹ Andersen, Sarma & Taddonio, *supra* note 683 at 300-301.

⁶⁹² See MOP Dec XXIV/8, *supra* note 684 at paras 5-6.

count among the main industry actors in the climate context, have been accused of slowing down the process of addressing the climate crisis by sponsoring misleading scientific reports on the subject.⁶⁹³

Another key to the Montreal Protocol's success has been its well-functioning dedicated funding mechanism, the MLF. In comparison with the GEF's role in climate TD&T, the MLF plays a more active role in the funding of TD&T projects and processes. As part of its role in covering the incremental costs incurred by Article 5 developing countries in fulfilling their commitments, the MLF has the mandate of supplying funds for the conversion of existing production facilities and the establishment of new facilities, as well as for covering the costs of patents and designs associated with these.⁶⁹⁴ The provision of similar investment capital for climate TD&T is not part of the GEF's prerogatives.⁶⁹⁵ A majority of the technology relied upon for ODS reduction was in the public domain, and in cases where access to patented technology was required, patent holders were often eager to sell the rights to their use on favourable terms. In cases where negotiation was necessary, the MLF could directly negotiate with technology providers.⁶⁹⁶ The MLF also differs from the GEF from an organizational perspective. It is directly integrated within the Montreal Protocol structure: the members of its executive committee are endorsed by the MOP, while still enjoying freedom and flexibility in carrying out its activities.⁶⁹⁷ The MLF operates as the single

⁶⁹³ See e.g. Naomi Oreskes & Erik M. Conway, *Merchants of Doubt: How a Handful of Scientists Obscured the Truth on Issues from Tobacco Smoke to Global Warming* (London: Bloomsbury press, 2010).

⁶⁹⁴ *Report of the Fourth Meeting of the Parties to the Montreal Protocol on Substances that Deplete the Ozone Layer*, UNEP/ODL, Annex VIII, UN Doc UNEP/OzL.Pro.4/15 (1992) at para 2.

⁶⁹⁵ Thomas F. McInerney, *Experience Involving Technology Transfer, Capacity Building, and Information Exchange for the International Treaty on Plant Genetic Resources for Agriculture*, Plant Treaty Research Study 5 (Rome: FAO, 2014), online: FAO <<http://www.fao.org/3/bq488e/bq488e.pdf>> at para 26

⁶⁹⁶ Expert Group on Technology Transfer, *Strategy Paper*, *supra* note 491 at Annex III paras 2d) and 3.

⁶⁹⁷ Multilateral Fund, *Terms of reference of the Executive Committee as modified by the Meeting of the Parties in its decisions IX/16, XVI/38 and XIX/11*, online: MLF <<http://www.multilateralfund.org/aboutMLF/executivecommittee/default.aspx>>.

central funding mechanism for the Protocol, which avoids confusion as well as the duplication of activities.⁶⁹⁸ The fact that the funding of the MLF has been regularly replenished every three years has also improved predictability and allowed it to fulfill its mandate to its full potential.⁶⁹⁹

Although TD&T mechanisms for the protection of the ozone layer operate in a markedly different context than their climate equivalents, their success provides a useful example of a functioning solution developed under an MEA to foster TD&T. The Montreal Protocol experience notably shows that an active and fruitful participation of non-state actors and developing country Parties in the TD&T process is possible. As Andersen and his co-authors explain, the secret to Montreal's success "starts with the leadership of an astonishing variety of organizations, people from governments, international organizations, NGOs, scientists, engineers and many other who took early action".⁷⁰⁰ The Paris Agreement integrates this lesson from the Montreal Protocol: its decentralized approach allows for a greater participation by developing States Parties and non-State stakeholders than was possible under the UNFCCC and its Kyoto Protocol. It however comes short of implementing a mechanism for TD&T directly involving scientific and industry experts, in an analogous manner to the TEAP, as well as of moving towards a more integrated funding system similar to the MLF.

Beyond the possibility for the successes of the Montreal Protocol to serve as sources of ideational interplay for the Paris Agreement, a more direct form of normative interplay between the two regimes can also be observed. Indeed, as the UNEP Ozone Secretariat states, "it is evident that

⁶⁹⁸ Expert Group on Technology Transfer, *Strategy Paper*, *supra* note 491 at Annex III para 1b)vi).

⁶⁹⁹ Andersen, Sarma & Taddonio, *supra* note 683 at 312.

⁷⁰⁰ *Ibid* at 295.

both the ozone and climate regimes endeavour to protect the atmosphere from anthropogenic emissions that affect adversely human health and the environment, and that the contracting parties to both regimes may wish to undertake their relevant obligations in a collaborative and mutually supporting manner.”⁷⁰¹ This collaborative approach has historically extended to substances which act as both greenhouse gases and as ODS. These substances had previously been excluded from climate commitments and were instead regulated as part of the regime for the protection of the ozone layer. The UNFCCC’s Article 4 commitments, for example, refer to “greenhouse gases not controlled by the Montreal Protocol”. HCFCs, whose phasing out was accelerated through the application of an adjustment to the Montreal Protocol adopted in 2007,⁷⁰² are examples of substances dangerous to both the ozone layer and the climate being regulated through the ozone regime.

In addition to gases which are damaging to both the ozone layer and the climate, the wording of the Vienna Convention also make it possible for the ozone regime to regulate substances which, while not being ODS, are introduced as alternatives to them and have effects on human health or the environment, including the climate.⁷⁰³ HFCs are one such type of substances now regulated by the Montreal Protocol. Since the entry into force of the Montreal Protocol, HFCs had previously been relied upon as less ozone-damaging alternatives to other ODS. They are however very damaging to the climate, with a global warming potential of up to several thousand times that of

⁷⁰¹ Ozone Secretariat, *Briefing Note on Legal Aspects in the context of HFC Management under the Montreal* (Geneva, 2016), online: UNEP <https://ozone.unep.org/sites/default/files/2020-06/Briefing_note_on_legal_synergies.pdf> at 2 [Ozone Secretariat, *Briefing Note*].

⁷⁰² *Adjustments to the Montreal Protocol with regard to Annex C, Group I, substances (hydrochlorofluorocarbons)*, MOP Dec XIX/6, UNEP/OP, 19th Sess, UN Doc UNEP/OzL.Pro.19/7 (2007).

⁷⁰³ *Vienna Convention*, *supra* note 104 at arts. 1(4), 2(1) and 6(4)k). See Ozone Secretariat, *Briefing Note*, *supra* note 701 at 5.

CO₂. As such, they were originally to be regulated under the Paris Agreement. Because the role of HFCs as replacements to CFCs contributed to their proliferation, Parties to the Montreal Protocol recognized that organizing their phasing-down was part of their responsibilities. They adopted an amendment in this sense in Kigali in 2016.⁷⁰⁴ The Kigali Amendment, which came into force in 2019, aims to gradually reduce the consumption and production of HFCs through 2050: it sets out differentiated reduction timelines for developed and developing countries, the former starting from 2019 and the latter from 2024.⁷⁰⁵

The adoption of the Kigali Amendment turns what could have been an element of normative conflict between two environmental treaty regimes into a source of normative synergy. Indeed, if HFCs had not been regulated in the ozone regime, the two treaties would have sent contradictory regulatory signals which would have been counterproductive for their respective objectives. Instead of this potential conflict, the Montreal Protocol now contributes to the overarching temperature stabilization goal of the climate regime: the phasing down of HFCs through the Kigali Amendment is set to avoid up to 0.4°C of warming by 2100.⁷⁰⁶ A discussion paper mandated for the German Agency for International Cooperation highlights two possibilities for further strengthening of the normative interplay between the Montreal Protocol as amended in Kigali and the Paris Agreement. First, MRV mechanisms and data reporting for HFCs under both agreements could be synchronized.⁷⁰⁷ The inclusion of data on HFC emissions reported as part of Parties'

⁷⁰⁴ *Further Amendment of the Montreal Protocol*, MOP Dec XXVIII/1, UNEP/OP, 28th Sess, UN Doc UNEP/OzL.Pro.28/12 (2016).

⁷⁰⁵ *Ibid* at Annex arts. 2 and 5.

⁷⁰⁶ UNEP & IEA, *Cooling Emissions and Policy Synthesis Report* (Nairobi: UNEP, 2020), online: UNEP <<https://wedocs.unep.org/bitstream/handle/20.500.11822/33094/CoolRep.pdf>> at 12 .

⁷⁰⁷ Axel Michaelowa et al, *Interaction between Art.6 of the Paris Agreement and the Montreal Protocol/Kigali Amendment* (Perspectives Climate Group: Freiburg, 2019) online: University of Zurich <https://www.perspectives.cc/fileadmin/user_upload/Art.6-MPKA_discussion_paper.pdf> at 36.

Montreal Protocol obligations into their Paris Agreement NDCs would improve the quality of data available for the assessment of progress under the Paris Agreement. Second, the Kigali Amendment phase-down schedule could be relied upon as a baseline for the accounting of HFC reductions, notably for any eventual Article 6 mechanisms.⁷⁰⁸ Doing so would simplify the baseline-setting process in the climate regime and ensure that reductions achieved under the Kigali phase-down are properly accounted for in the Paris Agreement mechanisms.

The phasing down of HFCs under the Kigali Amendment is set to be fulfilled in no small part through the development and transfer of alternative substances and technologies, in an analogous manner to the phasing-out of other ODS under the Montreal Protocol. The TEAP was mandated by the MOP to “provide technological and economic assessments of the latest available and emerging alternatives”⁷⁰⁹ to HFCs. As part of its latest report, the TEAP’s Energy Efficiency Task Force produced a draft framework to catalogue technology options for energy efficiency and phasing down of HFCs in the refrigeration, cooling and heat-pump sector, which had previously been identified as a priority sector for TD&T under the Kigali Amendment.⁷¹⁰ The TD&T institutions of the ozone regime, by contributing to technological improvements for the climate, can be understood as an additional driver of positive normative interplay between the two regimes. Previously, climate improvements resulting from Montreal Protocol TD&T initiatives occurred as co-benefits to ODS reduction. By moving towards actively promoting the development and transfer of alternative technologies to HFCs and focusing on energy efficiency, the Montreal

⁷⁰⁸ *Ibid.*

⁷⁰⁹ *Decision related to the amendment phasing down hydrofluorocarbons*, MOP Dec XXVIII/2, UNEP/OP, 28th Sess, UN Doc UNEP/OzL.Pro.28/12 (2016) at para 4.

⁷¹⁰ TEAP, *Report of the Technology and Economic Assessment Panel Volume 4: Decision XXXI/7 - Continued Provision of Information on Energy-Efficient and Low-Global-Warming-Potential Technologies* (UNEP: Nairobi, 2021) online: UNEP <<https://ozone.unep.org/system/files/documents/TEAP-EETF-report-may2021.pdf>> at 81.

Protocol TD&T institutions go further, broadening their mandate to directly contribute to the objectives of the UNFCCC regime.

In sum, the regime for the protection of the ozone layer can be understood as a source of regime interplay, both ideational and normative, with the climate regime. While some of the lessons from the ozone regime appear difficult to apply to climate TD&T as it stands, they can still be relied upon as inspiration for further improvement. The Montreal Protocol, as adopted in 1987, was but a small first step towards its final result: it originally only required a 50 percent reduction in consumption of five CFCs and a freeze on consumption of three gases by 2000.⁷¹¹ This first step however gave confidence to its Parties in strengthening the Protocol through adjustments and amendments. A similar gradual approach is what the Paris Agreement now preconizes: by learning from the successes of the Montreal Protocol, it can maximize its own chances at success. With the entry into force of the Kigali amendment to the Montreal Protocol, the ozone regime and its TD&T institutions are also positioning themselves to contribute directly to climate action, which, given their history of success, appears likely to yield positive results.

6.1.3 TD&T in the United Nations Convention on the Law of the Sea

Other global treaty regimes with which interplay can be identified lie outside the field of international environmental law. The United Nations Convention on the Law of the Sea (UNCLOS) regime is one of them. The UNCLOS⁷¹², adopted in 1982, is a legally binding agreement which sets the rules for the equitable use of the ocean. The result of consensus or broad

⁷¹¹ Andersen, Sarma & Taddonio, *supra* note 683 at 299.

⁷¹² *United Nations Convention on the Law of the Sea*, 12 December 1982, 1833 UNTS 3, 21 ILM 1261 (entered into force 16 November 1994) [UNCLOS].

agreement among about 160 States, its adoption and entry into force 12 years later have been hailed as significant successes in the history of international law.⁷¹³

Several provisions for TD&T can be found in the text of the UNCLOS. Part XIV of the convention, entitled “Development and Transfer of Marine Technology”, explicitly covers it. Article 266 notably states that the development and transfer of marine technology is to be carried out under “fair and reasonable terms and conditions”.⁷¹⁴ TD&T is also directly referred to in Part XI, which covers the Area beyond national jurisdiction.⁷¹⁵ Other parts of the UNCLOS, while not referring directly to TD&T, cover neighboring concepts. Part XII on the protection and preservation of the marine environment contains provisions for “technical assistance”,⁷¹⁶ while a provision of Part XIII on marine scientific research refers to “publication and dissemination of information and knowledge”.⁷¹⁷ These provisions are relevant because technical and information cooperation is a key for scientific capacity development, which is itself an objective of TD&T.⁷¹⁸

Although the UNCLOS text provides a normative basis for TD&T, the implementation of the above-mentioned provisions has until today been relatively limited.⁷¹⁹ A significant step was made in 2003 when the Intergovernmental Oceanographic Commission (IOC), part of the United Nations

⁷¹³ Myron H. Nordquist, Satya N. Nandan & James Kraska, eds, *UNCLOS 1982 Commentary* (Leiden: Brill, 2012) at ix.

⁷¹⁴ *UNCLOS*, *supra* note 712 at art. 266(1).

⁷¹⁵ *Ibid* at art. 144.

⁷¹⁶ *Ibid* at arts. 202-203.

⁷¹⁷ *Ibid* at art. 244

⁷¹⁸ Harriet Harden-Davies, “Research for regions: Strengthening marine technology transfer for Pacific Island Countries and biodiversity beyond national jurisdiction” (2017) 32(4) *Int’l Mar & Coast L* 797 at 801.

⁷¹⁹ Ronán Long, “Marine Science Capacity Building and Technology Transfer: Rights and Duties Go Hand in Hand Under the 1982 UNCLOS” in Myron Nordquist et al, eds, *Law, Science & Ocean Management* (Leiden: Brill, 2007) 299 at 308, as quoted in Stephen Minas, “Marine Technology Transfer under a BBNJ Treaty: A Case for Transnational Network Cooperation” (Paper delivered at the AJIL Symposium on Governing High Seas Biodiversity, 9 June 2018), (2018) 112 *AJIL Unbound* 144 at 145.

Educational, Scientific and Cultural Organization (UNESCO) and the recognized competent international organization in the field of marine scientific research and TD&T, adopted its Criteria and Guidelines on Transfer of Marine Technology.⁷²⁰ The IOC Criteria and Guidelines notably establish an official definition of marine technology,⁷²¹ which had not been defined in the UNCLOS text. They also set forth guidelines for implementation, which include the establishment of a “clearing-house mechanism for the transfer of marine technology”⁷²² similar to the one operating under the CBD. As Minas notes however, these measures have only been partially implemented: the clearing-house mechanism preconized by the IOC, for example, has not been established as of 2021.⁷²³

The interest in further examining marine TD&T under the UNCLOS lies in the fact that the world’s oceans, like the atmosphere, constitute globally shared natural resources. These two resources interact: the ocean indeed plays an important role in the regulation of the global carbon cycle by being responsible for the capture and storage of a third of the CO₂ emitted by humankind.⁷²⁴ With this in mind, improved scientific understanding of the oceans, especially of their currently underexplored areas lying beyond national jurisdiction, is likely to benefit climate science and policy as well. Positive interplay between the UNFCCC and UNCLOS regimes would thus be beneficial even though they are part of two different fields of public international law. While not directly related to the climate regime, the current negotiations towards a new UNCLOS Agreement on the conservation and sustainable use of marine biological diversity in areas beyond national

⁷²⁰ IOC, *IOC Criteria and Guidelines on the Transfer of Marine Technology (CGTMT)* (Paris: UNESCO, 2005) online: UNESCO <<http://unesdoc.unesco.org/images/0013/001391/139193m.pdf>>.

⁷²¹ *Ibid* at para A.2).

⁷²² *Ibid* at para C.1)a).

⁷²³ Minas, *supra* note 719 at 146.

⁷²⁴ Alex D. Rogers et al, *The High Seas and Us: Understanding the Value of High-Seas Ecosystems* (Oxford: Global Ocean Commission, 2014) online: OpenChannels <<https://www.openchannels.org/literature/7720>> at 10.

jurisdiction (BBNJ Agreement) are an example of the increasing recognition of the crosscutting nature of the law of the sea and international environmental law. As stated in its draft text, the overall goal of this agreement would be to ensure the long-term conservation and sustainable management of biological diversity in areas which are located beyond national jurisdiction,⁷²⁵ where its status is not as clearly defined as it is in areas under the jurisdiction of coastal states.⁷²⁶

The draft text of the BBNJ Agreement, in its current form, hints towards new norms and mechanisms for marine TD&T. Draft provisions for capacity-building and the transfer of marine technology can be found in its Part V. Article 44 states that transfer of marine technology is to be carried out through a needs assessment process, while Article 47 lays out the modalities for the monitoring and review of TD&T activities by the COP.⁷²⁷ Article 51 of the draft establishes a clearing-house mechanism consisting of a web-based platform and a network of experts and practitioners: this clearing-house mechanism would tentatively be managed by IOC, the competent international organization who had established official guidelines on the subject in 2005.⁷²⁸ The BBNJ Agreement draft also discusses an innovative financial mechanism: one proposal calls for it to be funded through mandatory sources, which could include contributions from States Parties, royalties resulting from the utilization of marine genetic resources as well as payments made for the utilization of these marine genetic resources.⁷²⁹ The draft text of the BBNJ Agreement is likely to change from now until its adoption, but these draft articles, if adopted, could lead to interesting

⁷²⁵ *Revised Draft text of an agreement under the United Nations Convention on the Law of the Sea on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction*, UNGAOR, 4th Sess, UN Doc A/CONF.232/2020/3 at Annex art. 2 [BBNJ Draft].

⁷²⁶ Yasuko Tsuru, “Institutional Interplay between Marine Biodiversity beyond National Jurisdiction—A New Agreement?” in Carlos Espósito et al, eds, *Ocean Law and Policy: 20 Years under UNCLOS* (Leiden: Brill, 2016) 344 at 347.

⁷²⁷ *BBNJ Draft*, *supra* note 725 at arts. 45 and 47.

⁷²⁸ *Ibid* at art. 51(2) and (6).

⁷²⁹ *Ibid* at art. 52(5).

developments for TD&T in the UNCLOS regime. Going forward, it will be interesting to see if negotiators apply the lessons learned from the implementation of TD&T in the climate and ozone regimes, notably in regard to the importance of stable funding for TD&T institutions and to the crucial role of MRV norms in promoting compliance. The establishment of a self-funded financial mechanism under the BBNJ Agreement, which was one of the keys to the success of TD&T under the Montreal Protocol, could be interpreted as one form of positive ideational interplay between international environmental law and the law of the sea if enacted as such. It will be interesting to follow the development of norms and mechanisms for marine TD&T under this new agreement, as the resulting regulation is likely to contribute to a better understanding of marine biological diversity and of high seas ecosystems more generally. Given the role played by these ecosystems, this would likely be beneficial to climate science and policy.

6.2 Harmonization of conflicts

One of the goals for collaboration and stakeholder engagement under Paragraph 19 of the TF is “to avoid duplication and ensure consistency and coherence” between relevant organizations, institutions and initiatives.⁷³⁰ Inconsistencies between the climate regime and other areas of international law could constitute obstacles to the effective transfer of climate technologies. This part of chapter will analyse some cases of negative regime interplay, with the objective of providing an improved understanding of the issues at play which could minimize their impacts.

⁷³⁰ FCCC Dec 15/CMA.1, Annex, *supra* note 466 at para 19.

6.2.1 International IP law

One field of international law with which normative conflicts could occur is IP law. Indeed, as Sullivan notes, “the delivery of [technology transfer] obligations rests not with the governments of the States Parties, but substantially with the private sector”.⁷³¹ The private actors who develop climate technology, most often located in developed countries, operate with the objective of getting compensated for this technology development. To do so, they generally rely on IP law and specifically on the patent system. As will be explained, some uncertainties regarding the interaction between IP and climate law could potentially have negative implications for climate TD&T.

IP law can be defined as “very broadly, (...) the legal rights which result from intellectual activity in the industrial, scientific, literary and artistic fields”.⁷³² IP law is the set of rules related to these rights: it encompasses trademark law, copyright law, patent law, trade-secret law and the individual right of publicity.⁷³³ In line with the rapid technological developments that have occurred over the last century, IP law has evolved significantly from its beginnings until today. Merges indeed points out that “much more money is at stake in IP legislation than in the past”.⁷³⁴ Because of the increasing economic value of the assets covered by IP, increased lobbying for their protection followed.⁷³⁵ This lobbying led to the expansion of IP law.

⁷³¹ Karen Sullivan, “Technology Transfer and Climate Change: Additional Considerations under the UNFCCC” (2011) 7:1 Law Environment and Development Journal 3 at 15.

⁷³² WIPO, *WIPO Intellectual Property Handbook: Policy, Law and Use* (Geneva: WIPO, 2004), online: WIPO <<http://www.wipo.int/about-ip/en/iprm/>> at 3.

⁷³³ William Fisher, “Theories of Intellectual Property” in Stephen R. Munzer, ed, *New Essays in the Legal and Political Theory of Property* (Cambridge: Cambridge University Press, 2001) 168 at 168.

⁷³⁴ Robert P. Merges, “One Hundred Years of Solicitude: Intellectual Property Law, 1900-2000” (2000) 88 Cal L Rev 2187 at 2190.

⁷³⁵ *Ibid.*

Concretely, IP law is part of countries' bodies of domestic law. As such, it is generally limited to each country's territory, and its scope and degree of enforcement varies from one country to another. As Long explains, this variation usually reflects countries' respective priorities⁷³⁶: developed countries, many of them major producers of IP, are interested in protecting their property while developing countries, facing other challenges, often have less interest or capacity for strong and broad IP laws. As such, "the level of protection in industrialized countries is generally high, whereas intellectual property protection in the developing world varies widely, with many products excluded from protection altogether".⁷³⁷ The international community reacted to this by adopting a number of international agreements on IP, of which the universal Berne Convention for the Protection of Literary and Artistic Works⁷³⁸ and the Paris Convention for the Protection of Industrial Property⁷³⁹ constitute two well-established examples.⁷⁴⁰

More recently, IP law has been addressed at the international level as part of the regime of international trade law. Specifically, in order to bridge the gap between the level of IP protection in developed and developing countries, the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS)⁷⁴¹ was adopted in 1994 as part of the WTO Uruguay Round Agreements. The Agreement notably includes obligations regarding the establishment of standardized IP

⁷³⁶ Clarisa Long, "Intellectual Property Rights in the Developing World" (1997) 1:2 Intellectual Property Practice Group Newsletter, online: Federalist Society <<https://fedsoc.org/commentary/publications/intellectual-property-rights-in-the-developing-world>>.

⁷³⁷ *Ibid.*

⁷³⁸ *Berne Convention for the Protection of Literary and Artistic Works*, 9 September 1886, 1161 UNTS 3 (revised at Paris 24 July 1971).

⁷³⁹ *Paris Convention for the Protection of Industrial Property, as last revised at the Stockholm Revision Conference*, 20 March 1883, 828 UNTS 305 (revised at Stockholm 14 July 1967).

⁷⁴⁰ For an analysis of these two Conventions and of other multilateral IP treaties, see Henning Grosse Ruse-Khan, *The Protection of Intellectual Property in International Law* (Oxford: Oxford University Press, 2016) at 69.

⁷⁴¹ *Agreement on Trade-Related Aspects of Intellectual Property Rights*, 15 April 1994, 1869 UNTS 299 [TRIPS].

rights⁷⁴² as well as the enforcement of these rights.⁷⁴³ In doing so, it establishes minimum levels of protection that each WTO Member State must provide, with the goal of setting common international rules for the protection of IP rights.⁷⁴⁴ TRIPS states “transfer and dissemination of technology”⁷⁴⁵ as part of its objectives. It requires developed States Parties to provide incentives to enterprises and institutions in their territories for the purpose of promoting and encouraging technology transfer to developing States Parties.⁷⁴⁶ It also requires developed States Parties to provide technical and financial cooperation to developing States Parties, notably on the preparation of laws and regulation on the protection and enforcement of IPRs and on the establishment of relevant offices or agencies.⁷⁴⁷

Another significant actor for IP at the international level is the World Intellectual Property Organization (WIPO).⁷⁴⁸ Established in 1967, its mission is “to promote through international cooperation the creation, dissemination, use and protection of works of the human mind for the economic, cultural and social progress of all mankind”.⁷⁴⁹ To fulfill this mission, WIPO works at a number of levels. It notably assists developing countries in the preparation and enforcement of IP laws and supports research concerning “the place of intellectual property in the wider framework of emerging issues such as traditional knowledge, folklore, biological diversity, environmental protection and human rights”.⁷⁵⁰ WIPO and the WTO cooperate to achieve their

⁷⁴² *Ibid* at arts. 9-40.

⁷⁴³ *Ibid* at arts. 41-61.

⁷⁴⁴ Emmanuel Hassan, Ohid Yaqub & Stephanie Diepeveen, *Intellectual Property and Developing Countries: A review of the literature*, (Santa Monica: RAND, 2010) at xiii.

⁷⁴⁵ TRIPS, *supra* note 741 at art. 7.

⁷⁴⁶ *Ibid* at art. 66(2).

⁷⁴⁷ *Ibid* at art. 67.

⁷⁴⁸ *Convention Establishing the World Intellectual Property Organization (WIPO)*, 14 July 1967, 828 UNTS 3.

⁷⁴⁹ WIPO, *supra* note 732 at 5.

⁷⁵⁰ *Ibid* at 6. The WTO has established an online portal hosting the annual reports provided by developed countries and intergovernmental organizations on technical and financial cooperation in favour of developing and least-

respective goals for international IP: they have signed a cooperation agreement to this effect in 1995⁷⁵¹.

When analyzed in the context of climate TD&T, the question arises as to how the compensation of technology developers, who own the right to their technology through patents, should be balanced against the need for effective and equitable diffusion of climate technologies, specifically by developed countries who often rely on less developed IP law frameworks. Sarnoff notes that the private sector's insistence on continuing to rely on the patent system in the context of climate TD&T has historically caused tensions during UNFCCC negotiations. Developed country Parties have been in favor of relying on patents and markets, while developing country Parties have over the years pushed for commitments which would have put significant limitations to the traditional operation of this system.⁷⁵² An example of this enduring difference of opinion can be found in the negotiating draft text of the Paris Agreement. Leading up to the negotiations on the draft article on TD&T, different options regarding IPRs were set forth by the AWG on the Durban Platform. Among these were options for meeting the costs of IPRs, either through funding by the Green Climate Fund or directly by developed States Parties.⁷⁵³ Another option discussed was the establishment of an international mechanism on IPRs to facilitate access to technology alongside the UNFCCC TM.⁷⁵⁴ Lack of consensus among States Parties however led to IPRs not being

developed country Members. See WTO, "E-TRIPS Gateway: Reports by Developed Country Members on Technical Cooperation Activities under TRIPS Art. 67", online: WTO <<https://e-trips.wto.org/En/Search/TechnicalCooperationActivities>>.

⁷⁵¹ *Agreement Between the World Intellectual Property Organization and the World Trade Organization (of December 22, 1995)*, online: WIPO <http://www.wipo.int/treaties/en/text.jsp?file_id=305457>.

⁷⁵² Joshua Sarnoff, "The Patent System and Climate Change" (2011) 16:2 Va JL & Tech 302 at 306.

⁷⁵³ *Negotiating Text*, *supra* note 181 at para 132.4.

⁷⁵⁴ *Ibid.*

addressed in the final text of the Paris Agreement.⁷⁵⁵ With no agreement on how to address IPRs in the UNFCCC regime, Sarnoff warns that tensions are likely continue to play out at the national level through domestic patent policies, which in turn could generate international disputes.⁷⁵⁶

At the root of the divergence among States Parties on IPRs in the context of TD&T lies the fact that some of them, mainly developing country Parties, argue that a too strict reliance on the patent system risks acting as a barrier to the acquisition of technologies necessary for their enactment of climate commitments. Developed States Parties, on the other hand, argue that IPRs are necessary in order to encourage innovation and technology development: without the monetary reward guaranteed by IPRs, climate technologies would be underdeveloped. Some of the literature on the topic supports the position of developing countries: Shashikant and Khor, for example, argue that strong patent regimes can make technology transfer more difficult by allowing technology suppliers to charge more for their technology than they could in absence of patent protection.⁷⁵⁷ They also argue that by granting strong rights to technology suppliers, patents can “deepen negotiating imbalances and lead to the imposition of abusive practices that restrain competition”.⁷⁵⁸ They underline the attitude of multinational pharmaceutical companies during the HIV/AIDS crisis as an example of abusive behaviour towards developing countries.⁷⁵⁹ In a context where all countries face the common challenge of climate change but where significant imbalances

⁷⁵⁵ Matthew Rimmer, “Beyond the Paris Agreement: Intellectual Property, Innovation Policy, and Climate Justice” (2019) 8:1 *Laws* 7 at 11 [Rimmer, “Beyond the Paris Agreement”].

⁷⁵⁶ Sarnoff, *supra* note 752 at 360.

⁷⁵⁷ Sangeeta Shashikant & Martin Khor, “Intellectual Property and Technology Transfer Issues in the Context of Climate Change” (Penang: Third World Network, 2010), online: TWN <<https://www.twn.my/title2/IPR/pdf/ipr14.pdf>> at 5.

⁷⁵⁸ *Ibid.*

⁷⁵⁹ *Ibid* at 29.

already exist between developed and developing state Parties in regards to their capacity to react to this challenge, these imbalances must be minimized.

Other scholars however question the idea that IPRs constitute significant barriers to climate TD&T. Singh Ghaleigh, for example, underlines the fact that the core of the argument made against IPRs is not specific to climate change considerations, but rather relies on general IP theory.⁷⁶⁰ He further argues that the claim of IPRs acting as significant barriers to climate TD&T is not based on empirical evidence. In support of this, he cites an authoritative 2007 empirical study by law professor John H. Barton on IPRs in the renewable energy sector: this study concludes that in the few cases where IP concerns arise, they are likely to involve at most the payment of small royalties.⁷⁶¹ IP law scholar Eric Lane is of a similar opinion, highlighting nine cases of climate TD&T enacted in 2009 where IP rights either played a positive role or were not a factor in the transfer.⁷⁶² While perhaps not directly transposable to the climate context as the technology involved differs, the lessons learned from the ozone regime also point towards the fact that IPRs do not represent significant impediments to environmental TD&T.⁷⁶³

Whether IPRs represent a barrier to TD&T in practice or not, one conclusion which can safely be drawn is that the non-engagement of international climate TD&T norms with IP law contributes to a legal grey zone as to the relationship between UNFCCC States Parties' national commitments

⁷⁶⁰ Navraj Singh Ghaleigh, "Barriers to Climate Technology Transfer – The Chimera of Intellectual Property Rights" (2011) 5:2 Carbon & Climate Law Review 220 at 230.

⁷⁶¹ John H. Barton, *Intellectual Property and Access to Clean Technologies in Developing Countries: An Analysis of Solar Photovoltaic, Biofuel and Wind Technologies*, ICTSD Issue Paper No. 2 (Geneva: ICTSD, 2007) at 18, as quoted in *Ibid* at 232.

⁷⁶² Eric Lane, "Clean Tech Reality Check: Nine International Green Technology Transfer Deals Unhindered by Intellectual Property Rights" (2012) 26:4 Santa Clara Computer & High Tech LJ 533.

⁷⁶³ McInerney, *supra* note 695 at para 19.

for TD&T and IP owners' private rights to exclude others from accessing their IP through technology transfer.⁷⁶⁴ In a context where increased cooperation is needed for the transfer and deployment of climate change technologies, the modalities for interplay between IP law and climate TD&T provisions should be further clarified.

A number of potential solutions to this challenge have been put forth in the literature. Some of them rely on the patent system: Sarnoff, for example, suggests measures such as broader patent eligibility exclusions and licensing options, which could “hedge against the risks to innovation and access”⁷⁶⁵ and form a compromise between full IPR protection or no protection at all. These solutions would imply applying some exceptions to the default patent rules of some developed countries but would still be able to operate within these rules. Other authors instead suggest alternatives that fall outside of the patent system entirely: the idea of a prize-based system that would reward the development and transfer of climate technologies is one such solution.⁷⁶⁶ Taubman discusses a variety of other options, such as technology pools, open source environmental technologies and patent commons.⁷⁶⁷ He draws attention to the Eco-Patent Commons initiative, established by the World Business Council for Sustainable Development (WBCSD). The initiative “encourages companies to donate patents for inventions which, while not essential to their own business development, provide ‘environmental benefits.’ These are published in a searchable website and made available for use by anyone free of charge.”⁷⁶⁸ Zhuang

⁷⁶⁴ Abbe E.L. Brown, “Intellectual Property and Climate Change” in Rochelle Dreyfus and Justine Pila, eds, *The Oxford Handbook of Intellectual Property Law* (Oxford: Oxford University Press, 2018) 959 at 968.

⁷⁶⁵ Sarnoff, *supra* note 752 at 308.

⁷⁶⁶ Jerome Reichman et al, *Intellectual Property and Alternatives: Strategies for Green Innovation - Chatham House Energy, Environment and Development Programme Paper No. 08/03*, online: Duke University <https://scholarship.law.duke.edu/cgi/viewcontent.cgi?article=2915&context=faculty_scholarship> at 21.

⁷⁶⁷ Anthony Taubman, “Sharing technology to meet a common challenge”, March 2009, online: WIPO <http://www.wipo.int/wipo_magazine/en/2009/02/article_0002.html>.

⁷⁶⁸ *Ibid.*

suggests a balanced and pro-competitive interpretation of the relevant TRIPS provisions, which could be strengthened by the adoption of a Declaration on IPRs and climate change, as well as by international guidelines for the licensing of IP-protected climate technologies.⁷⁶⁹

Yet another alternative to the solutions suggested in the literature would be the elaboration of cooperative approaches to offset patent costs, enacted under the Paris Agreement Article 6(8) non-market approaches. As was outlined in the previous chapter, TD&T was identified as a potential area of activity for these approaches: a mechanism through which developing States Parties or local companies participating in TD&T could recover costs incurred as a result of the application of IPRs appears possible. If the costs associated with IPRs are relatively low, as empirical evidence suggests, such an offsetting scheme could be useful, as it would address developing country concerns at a reasonable cost to developed States Parties, while not weakening IPRs. A cooperative mechanism to offset the costs associated with climate technology IPRs could be a reasonable compromise and contribute to increased international cooperation for TD&T.

At the international level, two recent developments are worth noting. The first is the entry into force in 2017 of an amendment to TRIPS allowing developing countries and LDCs lacking the capacity to produce medication domestically to acquire it from third country producers through compulsory licensing arrangements.⁷⁷⁰ This significantly increases these countries' capacity to access the medication necessary to face public health issues. While not related to climate TD&T

⁷⁶⁹ Wei Zhuang, *Intellectual Property Rights and Climate Change: Interpreting the TRIPS Agreement for Environmentally Sound Technologies* (Cambridge: Cambridge University Press, 2017) at 5.

⁷⁷⁰ TRIPS, *supra* note 741 at art. 31 *bis* and Annex 2. For more information on the amendment, see WTO News, "WTO IP rules amended to ease poor countries' access to affordable medicines", online: WTO <https://www.wto.org/english/news_e/news17_e/trip_23jan17_e.htm>.

per se, this amendment is interesting insofar as it could inspire the establishment of a similar scheme for the transfer of climate technologies to developing countries under the TRIPS agreement. A second interesting development is the recent announcement by the United States government of its support of waiving patent protection for COVID-19 vaccines in the wake of the pandemic. While the practical consequences of this announcement are still unclear,⁷⁷¹ this shift by the Biden administration shows some level of openness by the United States, a major international actor, to consider exceptions to the patent system, at least when facing what US trade representative Katherine Tai calls “extraordinary circumstances”.⁷⁷² It however remains to be seen whether these developments translate into any progress for IPRs and climate TD&T.

6.2.2 International trade law

Another possibility to avoid conflicts between technology transfer and IP law would be to foster the development of climate technologies in the countries who would be using the technology themselves. The TEC’s objective of strengthening NSIs in developing countries⁷⁷³ is one initiative in this direction. To further encourage this, Ockwell and Byrne for example suggest funding and supporting national-level climate relevant innovation-system builders (CRIBs), which “would play a strategic, facilitating role, linking up relevant national actors, targeting and coordinating project and programme-level interventions to maximize benefits to NSIs”.⁷⁷⁴ The CTCN “would act to network CRIBs internationally, facilitating knowledge flows and access to international

⁷⁷¹ See John Zarocostas, “What next for a COVID-19 intellectual property waiver?” (2021) 397:10288 *The Lancet* 1871.

⁷⁷² Amy Maxmen, “In shock move, US backs waiving patents on COVID vaccines” *Nature* (06 May 2021), online: <https://www.nature.com/articles/d41586-021-01224-3>.

⁷⁷³ TEC, *Strengthening NSIs*, *supra* note 495 at 1.

⁷⁷⁴ David Ockwell & Rob Byrne, “Improving technology transfer through national systems of innovation: climate relevant innovation-system builders (CRIBs)”, (2016) 16:7 *Climate Policy* 836 at 848.

technological capabilities based on a more detailed understanding of local capabilities and needs”.⁷⁷⁵

Depending on the measures taken to encourage the development of these systems however, conflicts could arise with other norms of international trade law. Indeed, as the 2013 *Canada - Renewable Energy*⁷⁷⁶ case shows, some measures, while potentially useful for climate TD&T, could be subject to disputes under World Trade Organization (WTO) rules.⁷⁷⁷ The disputed measure in this case was a feed-in tariff program set up by the government of Ontario to encourage the development of renewable energy technologies in the province. Through the program, the Ontarian government guaranteed to buy electricity produced in the province through certain forms of renewable energy at a set minimum rate.⁷⁷⁸ In order to be eligible for the program, electricity producers had to use facilities that met “Minimum Required Domestic Content Levels”⁷⁷⁹, which means that a certain percentage of the facilities had to be built using equipment produced in Ontario. The WTO Panel and Appellate Body judged that while the guaranteed rates were not considered subsidies and as such were allowed, the domestic content requirements were inconsistent with Article 2.1 of the TRIMS Agreement as well as Article III:4 of the WTO’s General Agreement on Tariffs and Trade (GATT) and had to be modified.⁷⁸⁰ In June 2014, Canada notified the WTO that it had complied with the WTO judgement.⁷⁸¹

⁷⁷⁵ *Ibid* at 849.

⁷⁷⁶ *Canada — Certain Measures Affecting the Renewable Energy Generation Sector (Complaint by Japan)* (2013), WTO Doc WT/DS412/AB/R (Appellate Body Report), online: WTO <<https://docs.wto.org/>> [*Canada Renewable Energy*].

⁷⁷⁷ See Kati Kulovesi, “International Trade Disputes on Renewable Energy: Testing Ground for the Mutual Supportiveness of WTO Law and Climate Change Law” (2014) 23:3 RECIEL 342.

⁷⁷⁸ *Canada Renewable Energy*, *supra* note 776 at para 1.3.

⁷⁷⁹ *Ibid* at para 1.4.

⁷⁸⁰ *Ibid* at para 6.1b)v.

⁷⁸¹ *Canada — Certain Measures Affecting the Renewable Energy Generation Sector* (2013), WTO Doc WT/DS412/19 (Communication from Canada), online: WTO <<https://docs.wto.org/>>.

As Cosbey and Mavroidis explain, the WTO dispute resolution bodies' decision in *Canada – Renewable Energy* case raises questions about the relationship between the GATT regime and measures to promote the diffusion of climate change technology. More specifically, the two authors argue that while the WTO ruling that the feed-in tariff is itself acceptable can appear as positive from an environmental perspective, it does not offer a definitive answer to the question and could thus lead to further uncertainty and less environmentally friendly rulings in the future.⁷⁸² Two subsequent recent WTO judgements have weighed in on the compatibility of measures taken to support local renewable energy industries with WTO trade law.⁷⁸³ These judgements further confirmed the incompatibility of domestic content requirement provisions and GATT Article III and TRIMS Article 2.1, but did not re-examine the question of feed-in tariffs as subsidies.⁷⁸⁴

In parallel to disputes on domestic content requirements, two complaints based on claims of “forced technology transfer” were recently filed by the United States and the European Union against China. The United States complaint alleges that China, by requiring foreign investors to enter into joint ventures with Chinese companies, deprives these investors of their ability and protect their IP rights on technologies and to freely negotiate the licensing of these rights in

⁷⁸² Aaron Cosbey & Petros C. Mavroidis, *A turquoise mess: green subsidies, blue industrial policy and renewable energy: the case for redrafting the subsidies agreement of the WTO*, EUI Working Paper RSCAS 2014/17, (San Domenico di Fiesole: European University Institute, 2014), online: EUI <<http://cadmus.eui.eu/handle/1814/29924>> at 13.

⁷⁸³ *India — Certain Measures Relating to Solar Cells and Solar Modules (Complaint by the United States)* (2016), WTO Doc WT/DS456/AB/R (Appellate Body Report), online: WTO <<https://docs.wto.org/>>; *United States — Certain Measures Related to the Renewable Energy Sector (Complaint by India)* (2019), WT/DS510/R (Panel Report), online: WTO <<https://docs.wto.org/>>.

⁷⁸⁴ For an analysis of the WTO jurisprudence on the subject, see Umberto Celli Junior, “The Impact of WTO Case Law on the Use of Local Content Requirements” in Alberto do Amaral Júnior, Luciana Maria de Oliveira Sá Pires & Cristiane Lucena Carneiro, eds, *The WTO Dispute Settlement Mechanism: A Developing Country Perspective* (Berlin: Springer, 2019) 83.

contravention of TRIPS Articles 3.1 and 28 since it gives these Chinese companies the ability to learn and later replicate patented technology.⁷⁸⁵ The EU complaint alleges similar behaviour but bases its argument on certain provisions contained in China’s protocol of accession to the WTO, which created specific obligations for it, instead of on TRIPS.⁷⁸⁶ The merit of both complaints appears unclear. Sykes for example argues that China’s requirement of a specific corporate structure (the joint-venture structure) does not directly entail limitations on the IPRs of foreign companies nor force any transfer of technology on their part, and would thus not be in contravention to either TRIPS or its protocol of accession.⁷⁸⁷ He more generally argues that from an economic perspective, the “global welfare implications of [corporate structure requirements] are uncertain and ultimately depend on empirical issues, but there is little basis for a belief that it is systematically harmful.”⁷⁸⁸ The technology transfer resulting from such requirements indeed “disseminates technology to new producers who can take advantage of lower local input prices to use it more efficiently. It also introduces greater competition into imperfectly competitive markets, which are surely common in industries with important proprietary technologies.”⁷⁸⁹

The outcome of the two complaints is still to be determined: the US case was suspended at the request of the complaining Party in June 2019,⁷⁹⁰ while the EU case is still at the consultations stage. Future developments on these disputes are relevant for climate TD&T and should be

⁷⁸⁵ *China— Certain Measures Concerning the Protection of Intellectual Property Rights (Complaint by the United States)* (2018), WTO Doc WT/DS452/8 (Request for the Establishment of a Panel by the United States), online: WTO <<https://docs.wto.org/>>.

⁷⁸⁶ *China— Certain Measures on the Transfer of Technology (Complaint by the European Union)* (2019), WTO Doc WT/DS459/1/Rev.1 (Request for Consultations by the European union), online: WTO <<https://docs.wto.org/>>.

⁷⁸⁷ Alan O. Sykes, “The Law and Economics of ‘Forced’ Technology Transfer and Its Implications for Trade and Investment Policy (And the U.S.-China Trade War)” (2021) 13:1 *Journal of Legal Analysis* 127 at 133-137.

⁷⁸⁸ *Ibid* at 154-155.

⁷⁸⁹ *Ibid*.

⁷⁹⁰ *China— Certain Measures Concerning the Protection of Intellectual Property Rights (Complaint by the United States)* (2018), WTO Doc WT/DS452/10 (Communication from the Panel), online: WTO <<https://docs.wto.org/>>.

followed. Indeed, the improvement of local technological capacity through international trade and foreign direct investment has historically been an important channel for the transfer of climate technologies: as discussed in the previous chapter, much of the TD&T realized under the Kyoto Protocol CDM was enacted through such schemes. Depending on their outcomes, these disputes could thus affect how climate TD&T is carried out in the future.

Finally, two less encouraging developments regarding the general interplay between climate change and trade law must be mentioned. First, negotiations towards an Environmental Goods Agreement (EGA) between 46 WTO member States, which had been launched in 2014, appear to have made little progress since 2016.⁷⁹¹ An agreement on tariff cuts for 54 environmental goods concluded in 2012 between the 21 member states of the Asia-Pacific Economic Cooperation (APEC) forum⁷⁹² was seen as a step towards progress at on the WTO EGA, but its legality under WTO rules is still debatable in the absence of a global, legally-binding agreement in this sense.⁷⁹³ Second, outside of the WTO regime, new regional trade agreements such as the Comprehensive and Progressive Trans-Pacific Partnership (CPTPP)⁷⁹⁴ and the United States-Mexico-Canada Agreement (USMCA),⁷⁹⁵ both adopted in 2018, only briefly address the topic of trade and the environment and do not directly mention climate change once in their text. These characteristics of the agreements have been described as potentially undermining the spirit and intent of the Paris

⁷⁹¹ Zaker Ahmad, *WTO Law and Trade Policy Reform for Low-Carbon Technology Diffusion* (Leiden: Brill, 2021) at 106.

⁷⁹² Asia-Pacific Economic Cooperation, *2012 Leaders' Declarations: Annex C – APEC List of Environmental Goods*, online: APEC <https://www.apec.org/meeting-papers/leaders-declarations/2012/2012_aelm/2012_aelm_annexc.aspx>.

⁷⁹³ See Petros C. Mavroidis & Damien J. Neven, “Greening the WTO Environmental Goods Agreement, Tariff Concessions, and Policy Likeness” (2019) 22:3 J Int'l Econ L 373 at 386.

⁷⁹⁴ *United States-Mexico-Canada Agreement* (2018), online: Canada-Mexico-United States Secretariat <<https://can-mex-usa-sec.org/secretariat/assets/pdfs/usmca-aceum-tmec/agreement-eng.pdf>>.

⁷⁹⁵ *Comprehensive and Progressive Trans-Pacific Partnership* (2018), online: Institute for International Law and Justice <<https://www.iilj.org/wp-content/uploads/2018/03/CPTPP-consolidated.pdf>>.

Agreement,⁷⁹⁶ although it is difficult to currently measure their practical consequences because of their recent adoption.

The WTO reaffirmed its commitment to sustainable development and its willingness to cooperate with UNEP and other intergovernmental environmental organizations in 2001:⁷⁹⁷ clearer guidelines concerning the relationship between WTO rules and measures to promote climate technology are needed to improve the interplay between the legal regimes for trade and the environment. One proposal in this sense put forth in the literature would be the adoption of a common declaration on IP and climate by the UNFCCC, the WTO and WIPO. As suggested by Rimmer, “such a declaration could deal with matters of intellectual property management, protection, and enforcement. Moreover, such a declaration could also deal with possible intellectual property flexibilities – such as public licensing, technology transfer, compulsory licensing, parallel importation, and patent pools.”⁷⁹⁸ Another group of authors identify 22 policy options, ranging from increased informal cooperation between like-minded members to amendments of WTO treaties: they admit that the latter appear difficult to enact in the near future given the current political climate, but argue that incremental change through other channels such as regional trade cooperation would be a realistic possibility for short-term progress.⁷⁹⁹

Domestic IP law, a highly complex field of law with norms that vary from country to country, has been left out of this section’s analysis. However, as this subsection has outlined, a clarification of

⁷⁹⁶ Matthew Rimmer “Article 10: Technology Development and Transfer” in Geert Van Calster & Leonie Reins, eds, *The Paris Agreement on Climate Change: A Commentary* (Cheltenham: Edward Elgar, 2021) 237 at 258-259.

⁷⁹⁷ *Ministerial Declaration (adopted on 14 November 2001)*, WTO Doc WT/MIN(01)/DEC/1, 4th Sess at 6.

⁷⁹⁸ Rimmer, “Beyond the Paris Agreement”, *supra* note 755 at 9.

⁷⁹⁹ Katsuri Das et al, “Making the International Trade System Work for the Paris Agreement: Assessing the Options” (2019) 49:6 *Environmental Law Reporter* 10553 at 10577.

the interplay between the international regimes of climate law, IP law and trade law is necessary in order for climate TD&T to be fully operationalized. While not a direct instrument for linking the climate, IP and trade regimes, one recent political initiative has the potential to foster interplay between the three in an integrated manner: the SDG framework. The final section of this chapter will outline this framework and analyze its implications for climate TD&T.

6.3 Orchestrating climate action as part of the SDGs? The 2030 Agenda for Sustainable Development

The cases of interplay analyzed in the previous sections occur between international legal regimes who operate at the same level of authority by governing distinct areas of international law. The analysis of these cases has highlighted some possibilities for the fostering of synergies and harmonization of potential normative conflicts, which could lead to improved governance of climate TD&T in the fragmented field of public international law. One recent global political initiative can be understood as an attempt to further orchestrate the interplay of the various actors for climate governance within the even larger governance framework for sustainable development. This initiative is the 2030 Agenda for Sustainable Development (Agenda 2030) and its SDGs. The final section of this chapter will draw an outline of the SDG framework and briefly analyze its relationship with the UNFCCC, focusing on interplay for climate TD&T.

6.3.1 Agenda 2030 and the SDGs

The SDGs consist of 169 targets grouped under 17 global goals to stimulate action in a way that balances “the three dimensions of sustainable development: the economic, social and

environmental.”⁸⁰⁰ The result of two years of negotiations, they were unanimously adopted in September 2015 and came into effect on 1 January 2016.⁸⁰¹ The SDGs build on the Millennium Development Goals (MDGs), a similar but narrower set of 8 goals and 22 targets elaborated as a result of the 2000 Millennium Declaration and to be reached by 2015.⁸⁰² The 17 SDGs reflect the three dimensions mentioned: they range from the social (goals for the reduction of poverty and hunger), to the environmental (goals for climate action and the protection of marine and terrestrial life) and economic (goals for inclusive economic growth, infrastructure and innovation).

Because Agenda 2030 is not a treaty, the SDGs are not binding under international law. Indeed, as Rabinovych explains, it cannot qualify as such since it was adopted through a Resolution of the UNGA rather than concluded between States, the UNGA not empowered to adopt binding international law as part of its functions and powers under the UN Charter.⁸⁰³ Agenda 2030 is rather an international soft law instrument: it has been described as an instrument for governance through goals, a novel approach to global governance characterized by weak institutional arrangements, broad stakeholder engagement and a high level of national discretion in implementing its objectives.⁸⁰⁴ The main institutional organ for the governance of SDGs is the High-Level Political Forum (HLPF). As a universal, inter-state forum, the HLPF constitutes a unique hybrid UN institution. It brings together UN member states, intergovernmental organizations within and outside of the UN system as well as non-state actors, which are

⁸⁰⁰ *Agenda for Sustainable Development*, *supra* note 403 at 1.

⁸⁰¹ *Ibid* at 6.

⁸⁰² *United Nations Millennium Declaration*, GA Res 55/2, UNGAOR, 55th Sess, UN Doc A/RES/55/2 (2000).

⁸⁰³ Maryna Rabinovych, “Legal Status and Effects of the Agenda 2030 Within the EU Legal Order” (2020) 16:2 *Journal of Contemporary European Research* 182 at 189.

⁸⁰⁴ Frank Biermann, Norichika Kanie & Rakhyun E. Kim, “Global governance by goal-setting: the novel approach of the UN Sustainable Development Goals” (2017) 26 *Current Opinion in Environmental Sustainability* 26 at 26-27.

represented under the category of major groups and other stakeholders.⁸⁰⁵ The HLPF meets every year under ECOSOC at the ministerial level and every four years under the UNGA at the head-of-state level.⁸⁰⁶ In governing the soft law SDG framework, the HLPF can be understood as governing through orchestration, which Abbott and Bernstein define as “working indirectly through other actors and organizations, and using soft modes of influence to guide and support their actions”.⁸⁰⁷ The orchestration approach is preconized since the HLPF lacks the legal authority or material resources to govern more directly.

The SDG framework, although non-binding, does establish a follow-up and review process.⁸⁰⁸ In a similar manner to the Paris Agreement MRV process, the SDG process provides for a national review component as well as a global one. At the national level, UN member states prepare Voluntary National Reviews (VNRs) of their National Sustainable Development Strategies (NSDSs), which are then submitted and presented as part of the yearly HLPF meetings under ECOSOC. As is the case for Paris Agreement NDCs, the NSDS process is country-led and allows flexibility in form and content. In order to facilitate reporting and promote coherence, voluntary common reporting guidelines for the reporting of VNRs were prepared by the UN Secretary-General in 2015: they have since been updated every two years as the VNR process evolves.⁸⁰⁹ Participation in the national follow-up and review process appears to be good so far: between 2016

⁸⁰⁵ *Format and organizational aspects of the high-level political forum on sustainable development*, GA Res 67/290, UNGAOR, 67th Sess, UN Doc A/RES/67/290, (2013) at paras 14-17.

⁸⁰⁶ *Ibid* at paras 6-7.

⁸⁰⁷ Kenneth W. Abbott & Steven Bernstein, “The High-Level Political Forum on Sustainable Development: Orchestration by Default and Design” (2015) 6:3 *Global Policy* 222 at 223.

⁸⁰⁸ *Agenda for Sustainable Development*, *supra* note 403 at 31.

⁸⁰⁹ UN Department of Economic and Social Affairs, *Voluntary common reporting guidelines for voluntary national reviews at the High-Level Political Forum on Sustainable Development (HLPF)* (2021), online: United Nations <https://sustainabledevelopment.un.org/content/documents/27171SG_Guidelines_2021.final.pdf>.

and 2020, 168 countries submitted and presented at least one VNR.⁸¹⁰ VNR reporting is supported by follow-up and review at the global level. At each yearly HLPF meeting under ECOSOC, progress towards the 2030 Agenda is reviewed under a specific theme, through which a subset of the 17 Goals is reviewed in depth.⁸¹¹ In addition to this yearly thematic review, the HLPF, meeting every four years under the UNGA, provides high-level political guidance on the Agenda and its implementation, identifies progress and emerging challenges, and mobilizes further actions to accelerate implementation.⁸¹² Together, these two HLPF processes form a quadrennial comprehensive review cycle.

The SDG framework also includes initiatives for TD&T. The first is the Technology Facilitation Mechanism (TFM), which had been established as part of the Addis Ababa Action Agenda but subsequently launched as part of Agenda 2030.⁸¹³ The TFM is formed of three main components: an inter-agency task team (IATT), a multi-stakeholder forum on science, technology and innovation (STI Forum) and a UN online technology platform for the SDGs (2030 Connect). The IATT represents the executive branch of the TFM: it is formed of representatives from other relevant United Nations agencies, funds and programmes, which work alongside 10 representatives from civil society, the private sector and the scientific community to promote coordination, coherence and cooperation on science, technology and innovation (STI) matters within the UN system. One of its current initiatives in this respect is the development of guidelines and methodologies for STI roadmaps, country-led technology strategies in a similar vein to the

⁸¹⁰ UN Department of Economic and Social Affairs, *High-Level Political Forum on Sustainable Development: 2020 Voluntary National Reviews Synthesis Report* (2021), online: United Nations: <https://sustainabledevelopment.un.org/content/documents/27027VNR_Synthesis_Report_2020.pdf> at 4.

⁸¹¹ *Follow-up and review of the 2030 Agenda for Sustainable Development at the global level*, GA Res 70/2, UNGAOR, 70th Sess, UN Doc A/RES/70/299 (2016) at paras 2-5.

⁸¹² *Agenda for Sustainable Development*, *supra* note 403 at 34.

⁸¹³ *Agenda for Sustainable Development*, *supra* note 403 at para 70.

UNFCCC TNAs.⁸¹⁴ The IATT is also responsible for developing the online platform and preparing the annual STI forum. This forum is held before the annual HLPF: its discussions and findings are summarized and presented to the meeting under ECOSOC. The online platform consists in a knowledge base which aims to “establish a comprehensive mapping of, and serve as a gateway for, information on existing science, technology and innovation initiatives, mechanisms and programs, within and beyond the United Nations”.⁸¹⁵ It appears set to fulfill a similar role to those of the CHMs of MEAs such as the CBD.

The second initiative for TD&T in Agenda 2030 is the Technology Bank for the LDCs, which was inaugurated in 2018 and whose operationalization represents the fulfillment of SDG 17.8. The Technology Bank is composed of two operational units: the Science, Technology and Innovation Supporting and Enabling Mechanism (STIM) and the IP Bank.⁸¹⁶ The STIM’s mandate is to strengthen LDC knowledge and research capacity, while the IP Bank’s is to facilitate technology transfer to the LDCs on voluntary and mutually agreed terms and, in the process, accelerate their integration into the global IP system.⁸¹⁷ As the Technology Bank has only recently been inaugurated, the precise manner through which its operational units are to carry out their mandates is still to be determined. It notably remains to be seen whether the IP Bank will be given the mandate of playing an active role in the negotiation and acquisition of IPRs, in a similar manner

⁸¹⁴ Technology Facilitation Mechanism, *Science, Technology and Innovation for the SDGs Roadmaps – Framework and Working Method*, IATT Policy Brief on Science, Technology and Innovation for the SDGs Roadmaps #1 (2018), online: United Nations <<https://sdgs.un.org/documents/policy-brief-1-science-technology-and-innovation-sdgs-roadmaps-framework-and-working>> at 2.

⁸¹⁵ *Agenda for Sustainable Development*, *supra* note 403 at para 70.

⁸¹⁶ *Charter of the Technology Bank for the Least Developed Countries*, UNGAOR, 71st Sess, UN Doc A/71/363, (2016) at para 4 a) iii).

⁸¹⁷ UNOHRLLS, *Supporting the operationalization of the Technology Bank for the Least Developed Countries: A 3-year Strategic Plan* (2016), online: United Nations <<http://unohrlls.org/custom-content/uploads/2016/08/Strategic-Plan-of-the-Technology-Bank-for-the-LDCs-8-August-2016.pdf>> at 2.

to the Montreal Protocol MLF, or if it will rather fulfill a more passive facilitative function analogous to the UNFCCC CTCN.

6.3.2 Interplay between the SDG framework and the Paris Agreement

Although Agenda 2030 was adopted a few months before the Paris Agreement, neither it nor the SDGs are referred to in the latter's text. Additionally, many of the Paris Agreement Parties' initial NDCs, although containing objectives for sustainable development going beyond climate action, are not formulated in a way that aligns with the 17 goals set forth in Agenda 2030. As Dzebo and his colleagues explain, the reason for this is that although the two instruments were negotiated in parallel, the SDGs were still under negotiation and had not been finalized when UNFCCC States Parties were elaborating their NDCs.⁸¹⁸ The deference shown towards the UNFCCC regime as the primary global arena for climate change during these parallel negotiations also led to less emphasis on climate action in the SDG framework text. As Georgeson and Maslin note, "without the Paris Agreement, the SDGs would have offered little on climate change."⁸¹⁹ They point out the fact that change is not integrated as a threat multiplier across the SDGs, despite the fact that climate impacts are likely to affect both human prosperity and the stability of other natural systems. Although institutional coordination between the UNFCCC Secretariat and the SDGs has been improved since the adoption of the Paris Agreement and Agenda 2030,⁸²⁰ the initial lack of integration between the two texts represents a missed opportunity for positive normative interplay.

⁸¹⁸ Adis Dzebo et al, *Exploring connections between the Paris Agreement and the 2030 Agenda for Sustainable Development* (Stockholm: Stockholm Environment Institute, 2017), online: SEI <<https://www.sei.org/publications/connections-paris-agreement-2030-agenda/>> at 2.

⁸¹⁹ Lucien Georgeson & Mark Maslin, "Putting the United Nations Sustainable Development Goals into practice: A review of implementation, monitoring, and finance" (2018) 5:1 *Geo: Geography and Environment*, online: Wiley <<https://rgs-ibg.onlinelibrary.wiley.com/doi/10.1002/geo2.49>> at 5.

⁸²⁰ See UN Department of Economic and Social Affairs, *UN System SDG Implementation: UNFCCC* (2019), online : United Nations <<https://sustainabledevelopment.un.org/content/unsurvey/organization.html?org=UNFCCC>>.

By simultaneously setting goals for climate action and socio-economic development, the SDGs still have the potential to orchestrate towards more holistic decision-making in regard to IP, trade and climate change, which could in turn lead to progress for climate TD&T. Goal 17, “strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development”, sets targets in that regard. Target 17.6, for example, aims to “enhance cooperation on and access to science, technology and innovation [...] including through improved coordination among existing mechanisms, in particular at the United Nations level”.⁸²¹ More generally, targets 17.14 and 17.16 respectively call for enhanced policy coherence for sustainable development and enhanced partnerships for the mobilization and sharing of knowledge, expertise and technology. As Abbott and Bernstein suggest, one way for the HLPF to enhance inter-regime coherence would be to formally “call-upon” other international bodies to consider and address particular issues, in a manner similar to other forums such as the G20. By doing so, the HLPF could “act as a problem-solving forum, helping to solve inter-institutional impasses that constrain progress on sustainable development. For example, where organizations such as the WTO and UNEP hold conflicting visions on issues such as [IP] and green technology diffusion, the HLPF could sponsor analytic work and exercise political leadership to forge compromise.”⁸²² This overarching coordinating and problem-solving role would be useful in the polycentric governance system for climate TD&T, where fragmentation and overlap among many rule- and decision-making fora has been a recurring obstacle. The IP bank, one of the operational units of the Technology Bank for the LDCs, could then play a complementary role in realizing the technology coordination orchestrated by the HLPF by assisting technology recipient countries on a project-based level.

⁸²¹ *Agenda for Sustainable Development*, *supra* note 403 at 27.

⁸²² Abbott & Bernstein, *supra* note 807 at 228.

The HLPF, in its objective to govern the fragmented sustainable development system, faces significant challenges,⁸²³ and despite strong initial support from member states, its success appears uncertain.⁸²⁴ In order for it to maximize its ability to carry out its ambitious mandate, the SDG framework could also learn from the Paris Agreement and other MEAs. It appears difficult to directly apply the lessons gathered through this chapter’s analysis of international legal regimes to the non-binding SDG framework, but one possibility for interplay can nonetheless be identified. The SDG framework review processes could indeed learn from the successes and the challenges faced by their respective counterparts in the global climate, biological diversity and ozone treaty regimes. More specifically, if it is to be successful, the SDG framework will have to implement its MRV processes in a way to ensure the accountability necessary to foster cooperation among the numerous actors involved. The legally binding review processes and the technology institutions of the Paris Agreement, whose implementation is more advanced, could serve as a useful blueprint for the SDG institutions in that regard. The Paris and SDG MRV processes, while not identical, bear some resemblance to each other insofar as they are both based on national reporting complemented by a periodical global review. Increased coherence between NDC and NSDS reporting could thus be one path for improvement. NDC-SDG Connections, an online tool mapping out the synergies between actions registered as part of Paris NDCs and the SDGs, could

⁸²³ See Arild Underdal & Rakhyun E. Kim, “The Sustainable Development Goals and Multilateral Agreements” in Norichika Kanie & Frank Biermann, eds, *Governing through Goals: Sustainable Development Goals as Governance Innovation* (Boston: MIT Press, 2017) 241 at 249-253.

⁸²⁴ Marcel M.T.A. Brus, “Soft Law in Public International Law: A Pragmatic or a Principled Choice? Comparing the Sustainable Development Goals and the Paris Agreement” in Pauline Westerman et al, eds, *Legal Validity and Soft Law* (Berlin: Springer, 2018) 243 at 257.

be relied upon to inform a more streamlined planning, reporting and review of both NDCs and NSDSs.⁸²⁵

6.4 Conclusion

This chapter analyzed the interplay between the UNFCCC regime and other international treaties with a specific focus on TD&T. It first analyzed TD&T provisions within three other treaty regimes, namely biological diversity, ozone and the law of the sea. It identified several sources for positive interplay between the Montreal Protocol and the Paris Agreement, while concluding that the two other treaty regimes appear to have been less successful than the climate regime in implementing TD&T mechanisms and could thus learn from it. The chapter then assessed potential normative conflicts between the legal regimes for climate, IP and international trade. The main conclusion drawn from this assessment was that the persisting uncertainty on the interaction between UNFCCC norms on one hand and IP and trade norms on the other must be clarified in order for climate TD&T to be carried out to its full potential. Lastly, the chapter briefly outlined one new political initiative with the potential of acting as an overarching framework and fostering the interplay between the different legal regimes involved in climate TD&T: the SDG framework. While this framework is still in the early stages of its implementation, the chapter's analysis shows that it has the potential to coordinate action for climate TD&T through orchestration. The sheer size of its mandate and its slow implementation however cast doubt on whether it will have the capacity to do so. Some of the SDG framework's institutions and processes resemble those of the

⁸²⁵ Adis Dzebo et al, *Connections between the Paris Agreement and the 2030 Agenda: The case for policy coherence* (Stockholm: Stockholm Environmental Institute, 2019), online: SEI <<https://www.sei.org/publications/connections-between-the-paris-agreement-and-the-2030-agenda/>> at 30.

Paris Agreement, who are further along in their implementation: it could thus be possible for the orchestrator to learn from the orchestrated in this case.

7. General conclusion

7.1 Summary of findings

Through its five chapters, the thesis attempted to address the following two main research questions. First, in the wake of the Paris Agreement, to what extent can TD&T contribute to the overall objective of the UNFCCC regime? Second, what are the legal issues surrounding the effective implementation of climate TD&T? By analyzing the legal issues linked to the implementation of TD&T in the evolving international climate governance landscape, the main objective of the research project was to determine to what extent improved understanding of UNFCCC law could contribute to effective implementation of climate TD&T. The research project posited that effective TD&T is an essential component to the achievement the Paris Agreement's overall mitigation goal. Its importance resides in its ability to enable developing country States Parties' sustainable socioeconomic development as well as to encourage greater participation of non-state actors such as those from the private sector. In order to answer its two research questions, the thesis first articulated its conceptualization of the Paris Agreement structure and of the role of law within it. It then focused on TD&T to illustrate some issues at play within this polycentric governance system. It did so first by focusing on TD&T within the UNFCCC regime, before looking outwards to its interaction with other international legal and governance regimes.

The thesis was organized into two parts. In the first part, which was divided in three chapters, the normative and theoretical foundation of the thesis were laid out. Chapter one outlined the evolution of international climate change law from 1992 to the adoption of the Paris Agreement. It reviewed UNFCCC agreements, institutions, norms and principles, shedding some light on the context of their adoption. In doing so, it highlighted how the regime evolved in a non-linear fashion, through

what can be described as two constitutional/regulatory cycles.⁸²⁶ The first such cycle can be seen as spanning the period from the adoption of the UNFCCC to the end of the Kyoto Protocol's CP2 in 2020. The second cycle's constitutional phase began in 2005, at the start of the negotiations for what would become the Paris Agreement. This cycle's regulatory phase is now just beginning, with many of the Paris Agreement's first round of procedural obligations set to be reviewed at the end of 2021 under COP26. In analyzing the context of UNFCCC negotiations, the chapter highlighted how recurring disagreements between groups of States Parties, most often aligned along their level of industrialization, led to obstacles to effective cooperation under the first cycle. It also highlighted how the Paris Agreement's bottom-up structure represents an attempt to work around this long-standing division between developed and developing States Parties. The political context since the Agreement's adoption has led to slow progress on its implementation, and although there are grounds for cautious optimism, many questions remain on the ability of the Paris Agreement to lead to tangible greenhouse gas emission reductions.

Chapter two outlined the thesis' theoretical foundation. It first defined the four core terms of law, regulation, policy and governance. Given the fact that international environmental law instruments often rely on both legal as well as non-legal norms and mechanisms, it appeared necessary to clarify the scope of these four neighboring but different terms as relied upon in this thesis. The chapter then laid out the theoretical perspective of the thesis. This perspective relies on the economic analysis of law as a starting point. It further builds on this school of thought by integrating elements from three related theories, namely the new Chicago school theory, the polycentric governance theory and the innovation and law theory. The chapter summarized these

⁸²⁶ Bodansky, Brunnée & Rajamani, *International Climate Change Law*, *supra* note 11 at 102-108.

theories, explaining their relationship to each other and justifying their relevance to the topic at hand.

Chapter three then applied the theoretical perspective to international environmental law and to the UNFCCC treaty regime specifically. In this sense, this chapter can be understood as a synthesis of the first two. As part of this synthesis, the chapter assessed some of the climate regime's successes so far as well as some perduring obstacles, from the 1992 UNFCCC to the Paris Agreement. This assessment led the chapter to conclude that the Kyoto Protocol, despite its shortcomings, led to some progress towards the effective governance of the global climate resource. It did so by setting the groundwork for emissions accounting through its flexibility mechanisms, as well as by fostering improvements in climate science which in turn helped define the global temperature goal the UNFCCC aligns itself with today. Understood through the lens of the thesis' theoretical perspective, the Paris Agreement builds on the climate regime's successes while attempting to further coordinate global mitigation action. The chapter demonstrated that it does so by positioning itself within a polycentric model of climate governance, a model which, this thesis has argued, can lead to success in managing globally shared resources sustainably.

Building on this theoretical foundation, the second half of the thesis then focused on the legal issues for climate TD&T as they stand following the adoption of the Paris Agreement. Chapter four first justified the thesis' focus on TD&T by highlighting the concept's polycentric character and its importance for innovation. It then carried out a thorough analysis of TD&T provisions within the international climate regime, assessing past and current initiatives. It finally highlighted possibilities for improved climate TD&T through the implementation of new norms and

mechanisms under the Paris Agreement. The main conclusion that can be drawn from this chapter is that both pre-Paris UNFCCC channels for TD&T, namely the regime's dedicated technology institutions as well as its flexibility mechanisms, have faced significant obstacles in enacting the transfer of climate technologies to developing States Parties. Developments under the Paris Agreement open the door to improvements through better MRV of technology cooperation, but it remains to be seen if these improvements translate into tangible results.

Finally, chapter five looked beyond the UNFCCC regime. It analyzed TD&T norms in other international treaties, identifying synergies between them and the Paris Agreement as well as assessing potential conflicts between UNFCCC norms and other international legal regimes. Three main conclusions can be drawn from this chapter. First, there are possibilities for positive interplay between the UNFCCC regime and other international treaties: the Montreal Protocol appears as the greatest source of positive interplay for climate TD&T, while it appears more likely for the CBD and the UNCLOS to learn from the UNFCCC than the other way around. Second, in regard to normative conflicts, the chapter concludes that the persisting uncertainty regarding the interaction between UNFCCC, IP and international trade norms must be clarified in order for climate TD&T to maximize its potential. Thirdly, there appear to be some possibilities for the global political initiative of Agenda 2030 and its SDGs to enhance climate TD&T through orchestration, although slow implementation of the SDG framework casts doubts on its ability to do so.

The insights garnered from the thesis' five chapters point towards the conclusion that the normative basis for an improved contribution of TD&T to the UNFCCC's overall objective is

present in the Paris Agreement. The thesis identified the successes and shortcomings of past approaches, as well as possibilities for their improvement through better financing and more thorough MRV of their performance. It also highlighted some key elements of success for TD&T in the MEA regime for the protection of the ozone layer, which could serve as references for further institutional developments. The thesis finally assessed some potential obstacles for effective enactment of climate TD&T through an analysis of the UNFCCC's interplay with IP law and international trade law. This led it to conclude that while uncertainties regarding the interaction between international climate, IP and trade law exist, the obstacles these uncertainties introduce are not unsurmountable.

Despite the thesis' optimistic outlook however, it must be kept in mind that the Paris Agreement's implementation ultimately depends on political will, and as such may also fail. At the eve of COP26, the current political climate allows for cautious optimism. Through four years of non-cooperation by one of the world's biggest greenhouse gas emitters, the United States, implementation has progressed slower than hoped. This period of uncertainty has tested the resilience of the Paris Agreement, and of the polycentric climate governance system more generally, but the actions of the Biden administration appear to be giving the regime some long-needed positive momentum. Will the COVID-19 pandemic and the extreme climate events felt around the world further mobilize the international community and lead to significant progress? Or will the damage done by four years of lack of leadership prove to have been too much for the

Paris Agreement to reach its target in time? As the most recent IPCC report reminds us, the decisions taken over the next decade will be critical: action by our world leaders must start now.⁸²⁷

7.2 Possibilities for further research

As mentioned throughout the thesis, the implementation of the Paris Agreement is still ongoing. Avenues for further research would thus include an updated analysis of further developments within the UNFCCC framework as well as under the regimes where interplay was explored. Analysis of the proposed new frameworks for biological diversity and marine biodiversity under the UNCLOS, if adopted, appear especially interesting. Ostrom's polycentric model teaches us that solutions to global commons governance problem do not always originate from action at the international level. Another possible path for further research would thus be an examination of initiatives for TD&T at regional, national and local levels in order to better understand how their successes could best be scaled up at the global level.

The two paths mentioned above would consist in deeper research on topics explored through the thesis. In parallel to these, some emerging climate technologies introduce a number of unique legal issues and were therefore not covered in the thesis: they are known as climate engineering technologies. These potentially paradigm-shifting technologies are currently not addressed through UNFCCC TD&T provisions but raise a number of issues for international climate law. Additional research on these issues is thus warranted. A thorough exploration of the legal issues

⁸²⁷ IPCC, "2021: Summary for Policymakers", in Valérie Masson-Delmotte et al, eds, *Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change* (Cambridge: Cambridge University Press, 2021) at 17.

associated with climate engineering technologies lies outside the scope of this conclusion, but an overview of the topic nonetheless appears relevant.

7.2.1 Disruptive Technological Innovation: The Case of Climate Engineering

Most climate technologies are understood as having relatively limited negative impacts. Even in cases where they do, these impacts are generally local in scale. The harm caused by wind turbines on migrating birds is one example of a relatively localized negative impact of climate technology. Some radically different forms of climate technology are however being developed by scientists and engineers: they are the various climate engineering initiatives. The global scope, scale and impact of these initiatives set them apart from the “traditional” climate technologies subject to TD&T and covered in this thesis.

Climate engineering, also called geo-engineering, is defined as “the use of scientific methods to artificially control the environment, particularly the world’s temperature, in order to deal with the problem of climate change”.⁸²⁸ As Bonnheim notes, “the modern concept of geo-engineering as a response to anthropogenic climate change evolved from much earlier proposals to modify regional weather events”,⁸²⁹ which date back to the mid 1900s. Originally seen as a marginal concept, it began to attract more scientific and policy attention over the last decade as concerns grew over the lack of political will to effectively reduce greenhouse gas emissions. The IPCC, for example, held an expert meeting on geo-engineering in 2011⁸³⁰ and devoted a section in its 2014 Synthesis Report

⁸²⁸Roz Combley et al, eds, *Cambridge Business English dictionary* (Cambridge: Cambridge University Press, 2018) *sub verbo* “geo-engineering”.

⁸²⁹Noah Byron Bonnheim, “History of climate engineering” (2010) 1:6 WIREs Climate Change 891 at 892.

⁸³⁰See Ottmar Edenhofer et al, eds, *IPCC Expert Meeting on Geoengineering - Meeting Report* (Potsdam: IPCC, 2011).

to the concept, in which it discusses the various geo-engineering options and the technologies' possible roles.⁸³¹

Kintisch explains that two main categories of climate engineering technologies currently receive the majority of scientific and policy attention: solar radiation management (SRM) and carbon dioxide removal (CDR).⁸³² SRM consists in modifying the amount of sunlight received by the Earth by altering its reflexivity, or albedo. Two main plausible methods to achieve this are currently being investigated: the first method would be to increase the reflexivity of clouds by injecting them with particles which would “brighten” them,⁸³³ while the second would be to directly spray sulphur particles into the upper atmosphere to reflect sunlight in a way that mimics the cooling effect of volcanic eruptions.⁸³⁴ CDR, as its name implies, consists in removing carbon dioxide from the atmosphere. Three main CDR techniques are currently being considered. The first would be by increasing the ocean's capacity to store carbon dioxide: this could notably be done by “fertilizing the ocean”,⁸³⁵ which would encourage and accelerate the marine food chain, a natural process through which carbon is removed from the air and deposited in the deep sea. The second would be to improve the carbon storage capacity of land-based sources, such as trees, soil and algae.⁸³⁶ The third would be to develop technologies allowing to directly capture the carbon dioxide from the air and stock it.⁸³⁷

⁸³¹ IPCC, *Climate Change 2014*, *supra* note 4 at 89.

⁸³² Eli Kintisch, “Overview of Climate Engineering” in National Academy of Engineering, *Frontiers of Engineering: Reports on Leading-Edge Engineering from the 2012 Symposium* (Washington, DC: The National Academies Press, 2013) 6 at 6.

⁸³³ Lynn M. Russel, “Offsetting Climate Change by Engineering Air Pollution to Brighten Clouds” in *ibid* 19 at 20.

⁸³⁴ Clive Hamilton, *Earthmasters* (New Haven: Yale University Press, 2013) at 57.

⁸³⁵ *Ibid* at 25.

⁸³⁶ *Ibid* at 42.

⁸³⁷ Christopher W. Jones, “Removing Carbon Dioxide from the Atmosphere: Possibilities and Challenges of Air Capture” in National Academy of Engineering, *supra* note 832 13 at 14.

The Paris Agreement TF’s general objective for innovation states that actions for innovation “should accelerate and scale up innovation in different stages of the technology cycle”.⁸³⁸ Here, the question arises as to which “stages of the technology cycle” the objective refers to. The initial draft of the TF, in its footnotes, refers to the TEC’s key messages on innovation.⁸³⁹ There, the stages are listed as “the research, development, demonstration, deployment, and diffusion of a technology”, the stages through which “technology (...) evolves from an idea to widespread use”.⁸⁴⁰ A comparison of the TEC’s definition with the one relied upon in the innovation and law theory reveals a significant difference between the two. Indeed, Butenko and Larouche, in their general working definition of innovation, identify three main elements: “ (1) a novel idea or invention; (2) its diffusion or adoption by users, customers or citizens—as the case may be; and (3) a positive social impact, in the form of an increase in welfare or a contribution to the achievement of public policy aims – here as well as the case may be, depending also on the analytical perspective”.⁸⁴¹ The major difference between two definitions lies in the fact that the impact element is absent from the TEC’s. This difference reveals a potential gap in regard to climate engineering technologies and their potential global impacts. This gap could have implications for the UNFCCC regime going forward.

Indeed, SRM technologies, as well as many CDR initiatives, display common characteristics which differentiate them from traditional local climate technologies. First, by interfering with the

⁸³⁸ FCCC Dec 15/CMA.1, *supra* note 466 at para 7.

⁸³⁹ *Initial draft of the technology framework under Article 10, paragraph 4, of the Paris Agreement*, UNFCCCOR, 48th Sess, Annex, FCCC Doc SBSTA48.Informal.1 (2018) at footnote 5.

⁸⁴⁰ TEC, *Technological Innovation*, *supra* note 494 at 4.

⁸⁴¹ Butenko & Larouche, *supra* note 355 at 56.

climate system, they could have far-reaching global consequences on earth systems such as rainfall patterns and the ozone layer,⁸⁴² risks most climate technologies do not introduce. These potential consequences are still misunderstood. Second, climate engineering technologies could potentially be unilaterally deployed at a global scale by states or private actors. Unilateral deployment could risk undermining cooperation under the UNFCCC and could even lead to geopolitical conflicts. Third, relying on climate engineering too heavily, even if done multilaterally, would create a dependency to those solutions. If after being deployed for some time these technologies were to be suspended for one reason or another, warming would resume in a more sudden and more damaging way than if the technologies had never been deployed in the first place. This is what is known as the “termination problem”.⁸⁴³

As noted above, the TEC definition of innovation does not refer to the technologies’ impact. This is potentially problematic since an important issue related to climate engineering is the risk of the technologies having far reaching negative impacts on other facets of the Earth’s systems. In line with the innovation and law theory, impact must be taken into account alongside invention and diffusion if innovation is to be properly governed and regulated: this is especially true for innovations that “touch upon sensitive goods”⁸⁴⁴, which the Earth’s climate system qualifies as. The absence of reference to impact in the TEC definition, and by extension in the text of the TF, is thus a sign that the risks associated with the impacts of climate engineering may currently not be properly taken into account by the main technology institution of the UNFCCC regime.

⁸⁴² Edenhofer et al, eds, *supra* note 830 at 89.

⁸⁴³ Hamilton, *supra* note 834 at 65.

⁸⁴⁴ Butenko & Larouche, *supra* note 355 at 56.

Seen through the lens of the thesis' theoretical perspective, climate engineering technologies should be treated with caution. Indeed, the thesis posits that the main accomplishments of the climate treaties have been building the institutional structures and fostering scientific understanding in a way to provide a stable framework for cooperation in governing the climate resource. Allowing States Parties to pursue climate engineering initiatives risks undermining the established structure of the climate regime by introducing new technological variables that blur the understanding of what is required to respect the Earth's climate boundary. As Ostrom explains, "changing the rules at any level of analysis will increase the uncertainty that individuals [or a regime] will face. Rules provide stability of expectations, and efforts to change rules can rapidly reduce that stability. [...] Analyses of deeper layers of rules are more difficult for scholars and participants to make."⁸⁴⁵ Climate engineering technologies risk introducing fundamental changes affecting the rules of the UNFCCC regime by altering the functioning of the climate system as we know it. Changes to the rules of the Earth's climate system would be very difficult to analyse and would lead to deep uncertainty. They should therefore be avoided.

Lessig, referring to humankind's ability to alter the fundamental code of cyberspace to solve emerging problems, asks: "rather than resolve the dispute between [two people] by making one of them change his or her behaviour, why not change the laws of nature to eliminate the conflict altogether?" Further, he asks: "what does it mean to live in a world where problems can be programmed away? And when, in that world, *should* we program problems away?"⁸⁴⁶ The emergence of climate engineering technologies hint towards a world where humans can alter the laws of their physical environment in a similar manner to the way they are able to program

⁸⁴⁵ Ostrom, *Governing the Commons*, *supra* note 334 at 53-54.

⁸⁴⁶ Lessig, *Code*, *supra* note 323 at 13.

cyberspace. This introduces several fundamental questions for the role of law which could be explored further.

Measures for the governance of climate engineering going forward have been suggested in the literature. Some of these could be integrated in the UNFCCC regime itself. Hemming and Hagler, for example, argue in favour of an “integrated risk assessment/risk management decision framework”⁸⁴⁷ to evaluate “the immediate and down-stream implications associated with changes in the major climate system components.”⁸⁴⁸ If such a mechanism was to be articulated as part of the UNFCCC TM , it would enable the TM to better evaluate the possible impacts of climate engineering solutions. The TEC’s mandate includes recommending guidance on climate technology policies and programmes⁸⁴⁹ as well as promoting coherence across technology activities.⁸⁵⁰ It could thus play a role in the development of the UNFCCC regime’s capacity to govern climate innovation by advocating for increased policy attention to ideas such as a risk assessment mechanism. As it stands however, no concrete initiative appears to have been undertaken by the TEC to address the question of climate engineering technologies.

Some steps towards the regulation of climate engineering have also been taken under other international agreements. States Parties to the CBD agreed in 2010 to a moratorium on climate-related geoengineering activities that may affect biodiversity.⁸⁵¹ Similarly, Parties to the 1996 Protocol to the 1972 London Convention for the Prevention of Marine Pollution adopted an

⁸⁴⁷ Brooke L. Hemming & Gayle S.W. Hagler, “Geoengineering: Direct Mitigation of Climate Warming” in Frank T. Princiotta, ed, *Global Climate Change - The Technology Challenge* (Berlin: Springer, 2011) 273 at 294.

⁸⁴⁸ *Ibid.*

⁸⁴⁹ TEC, *Overview: Mandate*, online: UNFCCC <<http://unfccc.int/ttclear/tec>>.

⁸⁵⁰ *Ibid.*

⁸⁵¹ *Biodiversity and Climate Change*, UNEP/COP, 10th Sess, Agenda Item 5.6, UN Doc UNEP/CBD/COP/DEC/X/33 (2010) at para 8w).

amendment providing for the regulation of geoengineering activities based on the manipulation of the marine environment, such as ocean fertilization. The amendment stipulates that such activities are to be carried out only when authorized through the deliverance of a permit, whose issuance is conditional to compliance with a risk assessment process.⁸⁵² A resolution calling for UNEP to commission a report on research and planning related to CDR and SRM was however blocked by the US and Saudi Arabia in 2019, signalling a lack of consensus on eventual regulation of climate engineering.⁸⁵³ The issues surrounding climate engineering technologies appear nonetheless set to be further addressed by the IPCC in their AR6 synthesis report:⁸⁵⁴ as scientific research on these technologies continues to progress, the topic thus remains one to follow.

⁸⁵² *On the Amendment to the London Protocol to Regulate the Placement of Matter for Ocean Fertilization and Other Marine Geoengineering Activities*, Resolution LP.4(8), IMOOR, 8th Sess, Agenda Item 15, UN Doc LC 35/15 (2013) at Annex 4.

⁸⁵³ Jean Chemnick, “U.S. Blocks U.N. Resolution on Geoengineering” (March 15, 2019), online: Scientific American <<https://www.scientificamerican.com/article/u-s-blocks-u-n-resolution-on-geoengineering/>>.

⁸⁵⁴ *Scoping of the IPCC Sixth Assessment Report (AR6)*, IPCCOR, 46th Sess, Agenda Item 7.4, UN Doc IPCC-XLVI/Doc.6 (2017) at 12.

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