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Ecological restoration under the law of the sea – which framework for great whale restoration as a climate change mitigation tool?

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"There's nothing wrong with enjoying looking at the surface of the ocean itself, except that when you finally see what goes on underwater, you realize that you've been missing the whole point of the ocean."

– Dave Barry

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Index of abbreviations

CBD	Convention on Biological Diversity
CO_2	Carbon dioxide
COP	Conference of the Parties
EU	European Union
FAO	Food and Agriculture Organization
GBF	Global Biodiversity Framework
GHG	Greenhouse gas
ICJ	International Court of Justice
ICRW	International Convention for the Regulation of Whaling
IMF	International Monetary Fund
IPCC	International Panel on Climate Change
IWC	International Whaling Commission
MEA	Millennium Ecosystem Assessment
nm	Nautical mile
PCA	Permanent Court of Arbitration
SER	Society for Ecological Restoration
SDG	Sustainable Development Goal
UN	United Nations
UNCLOS	United Nations Convention on the Law of the Sea
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
VCLT	Vienna Convention on the Law of Treaties
WCN	World Charter for Nature
WWF	World Wildlife Fund

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1 Introduction

1.1 Background

1.1.1 Context

The years 2021-2030 have been declared by the United Nations (UN) both as the UN Decade on Ocean Sciences for Sustainable Development[1] and as the UN Decade on Ecosystem Restoration[2]. As a crossway between those two major ambitions for the upcoming years, the present thesis aims at building bridges between the general law of the sea and the law of ecological restoration by examining the potential framework for ecological restoration under the law of the sea, using the restoration of great whales' populations as a case study.

As the following Chapter will demonstrate more comprehensively, great whales act as ecosystem and climate engineers. In addition to enhancing the primary productivity of the ocean ecosystems, they help fertilize the oceans and sequester carbon dioxide (CO_2 – cf. 2.1 and 2.2).[3] In a world where climate change increasingly threatens human health and habitat, as well as ecosystem health and biodiversity[4], the functions naturally carried by whales could help mitigate the adverse effects of global warming.

The latest IPCC report notes that '[a]bout 17% of historical cumulative net CO_2 emissions since 1850 occurred between 2010 and 2019'[5] and that '[w]ithout a strengthening of policies beyond those that are implemented by the end of 2020, [greenhouse gas] GHG emissions are projected to rise beyond 2025, leading to a median global warming of 3.2 [2.2 to 3.5]°C by 2100'.[6] Such

[1] UNGA Resolution A/RES/72/73 on Oceans and the law of the sea 2017.

[2] UNGA Resolution A/RES/73/284 on the United Nations Decade on Ecosystem Restoration (2021-2030).

[3] Joe Roman and others, 'Whales as Marine Ecosystem Engineers' (2014) 12 Frontiers in Ecology and the Environment 377, 377.

[4] 'IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change' (IPCC) para D.1.1.

[5] ibid B.1.3.

[6] ibid C.1.

an increase in temperature would go well-beyond the targeted rise of a maximum of 2°C above pre-industrial levels as agreed upon in the Paris Agreement.[7]

Faced with such a challenge to reduce drastically GHG emissions and, more specifically, CO_2 emissions, this thesis supports that every action that can help their reduction should be assessed and considered. While tackling those emissions at source should remain the first priority, mitigation responses should also be given weight. Mitigation aims at reducing the severity of the impacts of climate change by preventing or reducing GHG emissions into the atmosphere, either by reducing the sources of these gases or by enhancing their storage.[8] It is in this context that this thesis intends to assess ecological restoration as a climate change mitigation tool.

1.1.2 Terminology

A few terminology considerations have to be addressed. It is noteworthy that ecological restoration does not have, in law and in itself, one authoritative definition.[9] Nonetheless, the Society for Ecological Restoration (SER), which is the prominent global network of professionals in this field, defines ecological restoration as 'the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed'.[10] As highlighted by Akhtar-Khavari and Richardson, this approach emphasises three main ideas: (i) that restoration has a spatial dimension; (ii) that restoration is centred towards sustaining the ecosystem's health and integrity; and (iii) that human intervention is necessary.[11] Yet, this definition does not reflect the common values and beliefs which form the rationale behind ecological restoration.[12] This is why some authors have suggested to complete the definition by adding the wording '… to reflect values regarded as inherent in the ecosystem and to provide goods and services that

[7] Paris Agreement to the United Nations Framework Convention on Climate Change 2015 (UNTS 3156) s 2.1(a).

[8] 'What Is the Difference between Adaptation and Mitigation? — European Environment Agency' <https://www.eea.europa.eu/help/faq/what-is-the-difference-between>.

[9] Afshin Akhtar-Khavari and Benjamin J Richardson, 'Ecological Restoration and the Anthropocene' in Afshin Akhtar-Khavari and Benjamin J Richardson (eds), *Ecological restoration law: concepts and case studies* (Routledge 2020) 4.

[10] Geaorge D Gann and others, 'International Principles and Standards for the Practice of Ecological Restoration. Second Edition' (2019) 27 Restoration Ecology S1, S7.

[11] Akhtar-Khavari and Richardson (n 9) 5.

[12] David M Martin, 'Ecological Restoration Should Be Redefined for the Twenty-First Century' (2017) 25 Restoration Ecology 668, 668.

people value'.[13] An addition that clearly shows the anthropocentric nature of ecological restoration.

The discussion on whether the SER definition should be complemented to reveal the motivation behind ecological restoration is highly theoretical and is not necessary for the purpose of this thesis. However, it is notable that the lexicon surrounding ecological restoration comprises of other terms which are not always easily distinguishable from 'ecological restoration'.

The first of those terms, particularly ambiguous, is *rewilding* which can be defined as 'promoting the self-reorganization or regeneration of wilderness in an ecologically degraded landscape with minimal ongoing intervention'.[14] While both definitions can look similar from afar, restoration implies the return to a former condition or state while rewilding means 'returning wildness, which is untamed, imperfect, unruly and always changing'.[15] Both terms are thus conceptually different[16], and it can be said that rewilding aims at going further than restoration.

The second of those terms is *ecosystem* restoration. While the SER focuses on *ecological* restoration, it defines the term referring to 'ecosystems' (cf. supra) and the UN website for the Decade on *ecosystem* restoration uses the SER definition of *ecological* restoration.[17] As a result, it seems that both terms are interchangeable. This thesis adopts the view, however, that those terms are slightly different. It endorses the opinion that ecological restoration does not necessarily occur at the level of an ecosystem and can concern individual species, a view which finds support in the scholarly literature.[18] Consequently, ecosystem and ecological restoration have the same objectives – the return to a former state – but differ in their scope (cf.

[13] ibid 670.

[14] Johan T du Toit and Nathalie Pettorelli, 'The Differences between Rewilding and Restoring an Ecologically Degraded Landscape' (2019) 56 Journal of Applied Ecology 2467, 2468.

[15] ibid.

[16] ibid.

[17] 'What Is Ecosystem Restoration?' (*UN Decade on Restoration*) <http://www.decadeonrestoration.org/what-ecosystem-restoration> accessed 16 June 2022.

[18] See e.g., du Toit and Pettorelli (n 14) 2469; Andrew J Plumptre and others, 'Where Might We Find Ecologically Intact Communities?' (2021) 4 Frontiers in Forests and Global Change 2.

Table **1** in Annexes), with ecological restoration being a sub-component of ecosystem restoration.

1.2 Objectives

The overall objective of this thesis is to contribute to the existing scholarship concerning the areas of ecological restoration and law of the sea, with an overarching intention to advocate for great whale restoration as a climate change mitigation tool and for an upgraded framework for its achievement.

The specific objectives of this thesis are to:

1. Asses the role of great whale restoration as a climate change mitigation tool in light of their role as ecosystem engineers;

2. Increase the understanding the law of ecological restoration and its interweaving with the law of the sea;

3. Identify the legal issues and gaps surrounding ecological restoration under the current/existing law of the sea framework;

4. Examine how/in which way an improved framework for ecological restoration under the law of the sea could help mitigate climate change.

1.3 Research questions

In order to accomplish the above-mentioned objectives, this thesis aims at answering the following research question: to what extent can legal principles, standards and rules on ecological restoration be used for great whale restoration with a climate change mitigation ambition?

This primary question is supplemented and implemented by several secondary questions which read as followed:

1. By what means do great whales help mitigate climate change?

2. To what extent is ecological restoration included in and regulated under the general law of the sea?

3. (How) can general principles on ecological restoration be transplanted for great whale restoration?

4. Are existing principles on ecological restoration sufficient to mitigate climate change through great whale restoration?

1.4 Scope delimitation

This thesis lies within the broader framework of, and at the crossroad between, general law of the sea, international environmental law and climate change law. In addition to legal considerations, which will form the main body of the thesis, scientific considerations will also be taken into account regarding climate change and its effects on oceans, as well as the importance of healthy and thriving great whales' populations in climate change mitigation.

While it is recognised and accepted that a healthy marine environment as a whole is important to fight climate change, this thesis will focus on the role of great whales. This special focus is explained by the length limit of the thesis, which is submitted in partial fulfilment of the LL.M. program in law of the sea, and as the use of a case-study will allow for a more comprehensive and a more consistent thesis. As whales have been made into a symbol of environmental protection, controversies around their hunt have arisen. These debates impact greatly indigenous peoples with traditional whale hunting activities. It is noteworthy that indigenous people's rights as regards whaling fall outside the scope of this thesis. This is justified by the meagre relevance of this specific aspect in light of the overall objective and purpose of this thesis to focus on international environmental law.

1.5 Sources and Methodology

Methodology is the 'systematic procedure that a scholar applies as part of an intellectual enterprise'.[19] Be that as it may, this thesis adopts the doctrinal legal research methodology. It examines existing principles, standards and/or rules on ecological restoration stemming from, *inter alia*, the 1982 UN Convention on the Law of the Sea (UNCLOS),[20] the 1992 UN

[19] Elisabeth Fisher and others, 'Maturity and Methodology: Starting a Debate about Environmental Law Scholarship' (2009) 21 Journal of Environmental Law 213, 226.

[20] United Nations Convention on the Law of the Sea 1982 (UNTS 1833, 1834, 1835) entered into force on 16 November 1994.

Framework Convention on Climate Change (UNFCCC),[21] and the 1992 Convention on Biological Diversity (CBD)[22] and its post-2020 Global Biodiversity Framework.[23] Referring to section 3 of Part III of the Vienna Convention on the Law of Treaties (VCLT), this thesis interprets the provisions of the above-mentioned Conventions with a special perspective on great whale restoration.

While including international sectoral conventions in the scope of this thesis would give it a more holistic approach, an analysis of conventions such as the 1994 United Nations Convention to Combat Desertification[24] or the 1971 Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat[25] will not be conducted in this thesis. This is explained by the length limit of this paper and by their tenuous link with the law of the sea.

Following the list of legal sources contained in article 38 of the Statute of the International Court of Justice (ICJ),[26] and in addition to hard law instruments, this research reviews and analyses secondary sources of law such as reports, legal articles, and book chapters.

This thesis further adopts a critical research angle. Besides examining the existing framework on ecological restoration (*lex lata*), it evaluates its scope and advocates for a wider framework for great whale restoration (*lex ferenda*) with the objective of mitigating climate change.

Yet, this research is also interdisciplinary. This is due to the fact it largely focuses on environmental law, which is by nature interdisciplinary, both due to its origins[27] and to the fact

[21] United Nations Framework Convention on Climate Change 1992 (A/RES/48/189) entered into force on 21 March 1994.

[22] Convention on Biological Diversity 1992 (1760 UNTS 79, 31 ILM 818 (1992)) entered into force on 29 December 1993.

[23] First Draft of the Post-2020 Global Biodiversity Framework 2021 [CBD/WG2020/3/3].

[24] United Nations Convention to Combat Desertification 1994 (1954 UNTS 3, 33 ILM 1328 (1994), [2000] ATS 18) entered into force on 26 December 1996.

[25] Ramsar Convention on Wetlands of International Importance Especially as Waterfowl Habitat 1971 (1971 UNTS 996) entered into force on 21 December 1975.

[26] Statute of the International Court of Justice 1945.

[27] Dave Owen and Caroline Noblet, 'Interdisciplinary Research and Environmental Law' (2015) 41 Ecology Law Quarterly 888, 894; Mary Jane Angelo, 'Harnessing the Power of Science in Environmental Law: Why We Should, Why We Don't, and How We Can' (2008) 86 Texas Law Review 1527, 1527.

it calls for interdisciplinary knowledge and recognition of non-legal disciplines.[28] As interdisciplinarity is 'both a reality and a methodological expectation of environmental law scholarship',[29] this research also adopts the interdisciplinary methodology which can be defined as

> a mode of research by teams or individuals that integrates information, data, techniques, tools, perspectives, concepts, and/or theories from two or more disciplines or bodies of specialized knowledge to advance fundamental understanding or to solve problems whose solutions are beyond the scope of a single discipline or area of research practice.[30]

In practice, this means this thesis relies in part on scientific scholarship, particularly in the field of marine biology and oceanography, as such scientific literature and data is necessary to better understand the narrative and reasoning behind this legal research project. The use scientific scholarship is only meant to inform this thesis and is not meant to contribute to the development of any scientific discipline.[31]

1.6 Outline/Structure

Following this introductory chapter, chapter 2 assesses to which extent great whales can act as a climate change mitigation tool by looking at scientific data on how great whales store carbon and participate to the natural fertilization of the ocean. Chapter 3 then aims at producing an overview of the existing framework regulating ecological restoration. It looks both at soft law and hard law instruments related to ecological restoration. It analyses UNCLOS with regard to restoration and appraises to which extent principles on ecological restoration can be transferred to the ocean space. Finally, and following the identification of shortcomings in the existing regime, chapter 4 advocates for a novel and improved framework for ecological restoration, with a focus on the law of the sea.

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[28] Ole W Pedersen, 'The Limits of Interdisciplinarity and the Practice of Environmental Law Scholarship' (2014) 26 Journal of Environmental Law 423, 425.

[29] Fisher and others (n 19) 234.

[30] National Academy of Sciences, National Academy of Engineering, and Institute of Medicine (eds), 'The Drivers of Interdisciplinary Research', *Facilitating Interdisciplinary Research* (National Academies Press 2004) 26 <https://doi.org/10.17226/11153>.

[31] Pedersen (n 28) 427.

2 On the role of great whales in climate change mitigation

This chapter aims at demonstrating the ecological role of great whales and at assessing to which extent restoring whales' populations could mitigate climate change. Great whale is a group of marine mammals which 'includes all baleen whales (*Mysticeti*) and the sperm whale (*Physeter macrocephalus*)', [32] the latter being the largest member of the toothed whale family (*Odontoceti*). This list of thirteen cetacean species does not refer, as such, to a taxonomic classification, as great whales are mostly defined by their size and their historical commercial value.[33] Because they do not form a recognized biological family, this thesis will refer equally to 'great whales' or 'whales' to name those thirteen cetaceans.

This chapter will elaborate that whales provide important ecosystem services. Their role is examined here through two lenses: as ocean primary productivity enhancer (2.1) and as carbon sequester (2.2). While these two roles lead, *in fine*, to the removal of carbon from the atmosphere, they are the object of two distinct sections to facilitate their separate understanding. A third section explores the benefits of whales' restoration for climate change mitigation (2.3).

2.1 Whales enhance the ocean primary productivity

Primary productivity is

> the rate at which energy is converted to organic substances by photosynthetic producers (photoautotrophs), which obtain energy and nutrients by harnessing sunlight, and chemosynthetic producers (chemoautotrophs), which obtain chemical energy through oxidation.[34]

While primary productivity is generated by trees and other land plants in terrestrial environments, in marine environments the two principal producers are pelagic phytoplankton and benthic algae.[35] In the ocean, primary productivity is limited by the (un)availability of

[32] Roman and others (n 3) 31.

[33] ibid.

[34] The Editors of Encyclopaedia Britannica and others (eds), 'Primary Productivity', *Encyclopaedia Britannica* (2022).

[35] ibid.

macronutrients (mostly nitrogen) and micronutrients (principally iron)[36], with iron limiting primary productivity in 'up to one third of the world's oceans'.[37]

In those circumstances, great whales provide an important ecosystem service as they promote productivity by transporting both nitrogen and iron.[38] This is due to the fact whales consume preys outside of the photic zone, which is the 'layer [of the ocean] closer to the surface that receives enough light for photosynthesis to occur',[39] and release nutrient-rich faeces and urine that persist in the photic zone[40], where phytoplankton resides. This mechanism, referred to as the 'whale pump',[41] improves the availability of those nutrients in otherwise nutrient poor waters and stimulate phytoplankton growth[42] which, in turn, removes more carbon from the atmosphere. It is in fact estimated that whales' faecal plumes 'have an [iron] concentration at least 10 million times greater than ambient levels'.[43]

More comprehensively, whales participate in the biomixing of the ocean, which is 'the action of organisms swimming through the pycnocline and thereby mixing nutrient rich water into the euphotic zone'.[44] Mixing do not occur solely vertically, as whales also transport nutrients horizontally across oceans.[45] As a matter of fact, the reproductive migrations of baleen whales

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[36] Andrew J Pershing and others, 'The Impact of Whaling on the Ocean Carbon Cycle: Why Bigger Was Better' (2010) 5 PLoS ONE e12444, 1.

[37] Hanan Schoffman and others, 'Iron–Nutrient Interactions within Phytoplankton' (2016) 7 Frontiers in Plant Science <http://journal.frontiersin.org/Article/10.3389/fpls.2016.01223/abstract> accessed 8 June 2022.

[38] Roman and others (n 3) 378.

[39] The Editors of Encyclopaedia Britannica and others (eds), 'Photic Zone', *Encyclopaedia Britannica* (1998).

[40] Trish Lavery and others, 'Iron Defecation by Sperm Whales Stimulates Carbon Export in the Southern Ocean' (2010) 277 Proceedings of the Royal Society B: Biological Sciences 3527, 3530; Roman and others (n 3) 379.

[41] Roman and others (n 3) 379; Joe Roman and James J McCarthy, 'The Whale Pump: Marine Mammals Enhance Primary Productivity in a Coastal Basin' (2010) 5 PLoS ONE e13255, 1; Steven J Lutz and Angela H Martin, 'Fish Carbon: Exploring Marine Vertebrate Carbon Services' (GRID-Arendal and Blue Climate Solutions 2014) 17.

[42] Lavery and others (n 40) 3527; Lutz and Martin (n 41) 17.

[43] Roman and others (n 3) 381.

[44] TJ Lavery and others, 'Can Whales Mix the Ocean?' (European Geosciences Union 2012) 8390 <https://bg.copernicus.org/preprints/9/8387/2012/> accessed 7 June 2022.

[45] Roman and others (n 3) 379.

and their simultaneous transfer of nitrogen has been referred to as a 'great whale conveyor belt'.[46]

It is estimated that whales and seals are responsible 'for replenishing $2.3x10^4$ metric ton of [nitrogen] per year in the Gulf of Maine's [photic] zone'.[47] Similarly, 'Southern Ocean sperm whales defecate 50 tons of iron into the photic zone each year'.[48] It is moreover noteworthy that while the amount of nitrogen transported by whales is limited, it is constant as whales sleep only 7% of a day.[49] Moreover, nitrogen is an element that is highly beneficial due to the fact 'phytoplankton have little ability to store nutrients'.[50]

Thus, this data demonstrates that whales participate greatly in ocean fertilization, an activity that enhance the primary productivity of the ocean, helping phytoplankton to grow and, subsequently, capturing carbon.

2.2 Whales sequester carbon

The ocean is the largest carbon sink on the planet, with 93% of the earth's carbon dioxide being stored through it.[51] It is notable that whales act as such a carbon sink by removing more carbon from the atmosphere than they release during respiration.[52]

In a sense, whales are not exceptional as all living creature store carbon in their biomass.[53] However, carbon stored in animal tissues must be constantly maintained by feeding, and the rate at which carbon is respired by an animal depends on its mass.[54] As a result, 'larger animals require less food per unit mass and thus, they are more efficient at storing carbon than smaller animals'[55] – making great whales really effective carbon sinks. In fact, the carbon accumulated in the body of a whale remains out of the atmosphere for the entirety of the animal's life,[56]

[46] ibid 381.
[47] Roman and McCarthy (n 41) 1.
[48] Lavery and others (n 40) 3527.
[49] Matt Kaplan, 'Researchers Sneak up on Sleeping Whales' [2008] Nature.
[50] Lavery and others (n 44) 8395.
[51] Lutz and Martin (n 41) 6.
[52] Lavery and others (n 40) 3527; Lutz and Martin (n 41) 9.
[53] Lutz and Martin (n 41) 19.
[54] Pershing and others (n 36) 2.
[55] ibid.
[56] ibid.

resulting in carbon sequestration in the tissues of marine vertebrate, and most specifically great whales, being the only mechanism in the ocean 'comparable to the centennial timescale of carbon storage associated with terrestrial forests'.[57] A report from the International Monetary Fund (IMF) indeed estimated that each great whale sequesters approximately 33 tons of carbon, equivalent to 30,000 trees.[58]

This is even more true that this effect persists after the death of the whale through what is called the 'whale falls',[59] a term which refers to the sinking of whales' carcasses to the deep ocean floor, transferring carbon from the photic zone to the deep ocean, where it can be sequestered for hundreds to thousands of years.[60] It is indeed estimated that whale falls from eight baleen whale taxa currently transfer 28 000 tons of carbon per year from the atmosphere to the ocean floor.[61]

These elements, whether they concern ocean productivity or carbon storage, demonstrate the valuable role of great whales in the regulation of the Earth climate. They are the scientific basis to claim great whales are so beneficial that their thriving population could help mitigate climate change.

2.3 Whales' restoration as a climate change mitigation tool

2.3.1 The benefits of whales' restoration as a climate change mitigation tool

It is believed that whales populations have declined by 66% to 90% during the hundreds years of commercial whaling, with a reduction in whale biomass of approximately 85% (cf. Table 2 in Annexes).[62] Simultaneously, it is estimated that, in the last century, phytoplankton abundance has declined in eight out of ten oceanic regions[63], a drop that can be explained by

[57] Lutz and Martin (n 41) 19.

[58] Ralph Chami and others, 'Nature's Solution to Climate Change' (2019) 56 Finance & Development 34.

[59] Pershing and others (n 36) 4; Vicki James and others, 'Whales - Their Future Is Our Future' (Whale and Dolphin Conservation 2021) 1; Roman and others (n 3) 377; Craig Smith, 'Bigger Is Better: The Role of Whales as Detritus in Marine Ecosystems' in James A Estes and others (eds), *Whales, Whaling and Ocean Ecosystems* (University of California Press 2007) 287.

[60] Pershing and others (n 36) 4.

[61] ibid.

[62] Roman and others (n 3) 377.

[63] Roman and McCarthy (n 41) 2.

the warming of the ocean over this period, but also by the decline in whales' populations.[64] Relying on the scientific evidence summarized in sections 2.1 and 2.2 above, it is argued that recovery in whales' populations could help counter the impacts of the decline in nutrients for phytoplankton growth[65] and ultimately remove more carbon from the atmosphere.

It is indeed projected that the restoration of great whales' populations to pre-industrial levels 'would lead to an increase in [carbon] export comparable in magnitude to the hypothetical [iron]-fertilisation [climate engineering] projects intended to mitigate climate change'.[66] More specifically, it is estimated that, before commercial whaling began, migration of blue whales would have allowed phytoplankton to fix an additional 140 000 tons carbon per year[67] and that the reduction in sperm whales numbers due to whaling has resulted in the non-removal of 2 000 000 tons of carbon remaining in the atmosphere each year.[68]

Marine vertebrates, foremost among which are great whales, are not included in the majority of carbon cycling models.[69] However, some studies show that the restoration of all whales' populations to pre-industrial levels would export 160 000 tons of carbon per year, that is the 'equivalent to preserving 843 hectares of forest each year'[70], with some numbers going as far as showing pre-whaling flux of carbon due to whales amounting to 1 900 000 tons carbon per year.[71]

To put these numbers into perspective, the most successful ocean iron fertilization experiment to this day, in terms of measured carbon export, exported a maximum of 900 tons of carbon – it would thus take 200 such blooms to match the export of fully restored whales' populations.[72] As a result, it has been argued that 'conserving populations of large marine vertebrates may represent a more ecologically sound alternative'.[73]

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[64] ibid.

[65] ibid.

[66] Roman and others (n 3) 382.

[67] ibid 381.

[68] Lavery and others (n 40) 3529.

[69] Lutz and Martin (n 41) 6.

[70] Pershing and others (n 36) 4.

[71] ibid.

[72] ibid 6.

[73] ibid 5.

2.3.2 Whales' restoration and effects on fisheries

One might think that restoring whales' populations to pre-industrial levels could create conflicts with human activities, such as competition with fisheries.[74] However, it has been found that there is limited data confirming this proposition[75] and studies suggest a 'negligeable effect on fisheries [of marine mammals]'.[76] Even more, some models indicate that the presence of whales results in improved fisheries yield.[77]

Those fears thus appear unfounded and should not be an argument to eschew whale restoration.

3 On ecological restoration and the law of the sea

Thirty years ago, Wilson wrote that 'the next century will (…) be the era of restoration ecology'.[78] Since then, ecological restoration has been described as 'the most popular and significant approach to system recovery'.[79]

This chapter aims at producing an overview of the existing framework regulating ecological restoration. It reviews both soft law as well as hard law instruments of international environmental law dealing with ecological restoration. This chapter further appraises to which extent these principles exist in the field of, or can be transferred to, the law of the sea.

In order to fulfil these objectives, it is first necessary to have a better understanding of what exactly is ecological restoration (3.1). This chapter then examines the international principles and rules relating to ecological restoration found in international soft law and hard law instruments (3.2), before considering ecological restoration in light of the law of the sea (3.3).

[74] Roman and others (n 3) 383.

[75] ibid 378.

[76] Roman and McCarthy (n 41) 4.

[77] Roman and others (n 3) 379.

[78] Edward O Wilson, *The Diversity of Life* (Harvard University Press 1992) 340.

[79] Afshin Akhtar-Khavari, 'The Social Life of Plants and Trees' in Afshin Akhtar-Khavari and Benjamin J Richardson (eds), *Ecological restoration law: concepts and case studies* (Routledge 2020) 40.

3.1 What is ecological restoration?

The introduction of this thesis endeavoured to distinguish ecological restoration from other similar but distinct concepts of environmental law such as rewilding. This section intends to go deeper in defining ecological restoration (3.1.1) while also looking at the reasons driving its pursuit (3.1.2) and its limitations (3.1.3). In a last subsection, it will address the concept of novel ecosystems (3.1.4).

3.1.1 Defining ecological restoration

For many decades and throughout the twentieth century, preservation was the prevailing paradigm for the protection of nature.[80] Under the concept of preservation, nature's key value was its 'naturalness'[81] and, building on the common definition of the term 'preserve', it aimed at keeping something (in our case, the environment) as it is and at protecting it from being damaged.[82] However, in the last two to three decades, a shift has occurred that brought restoration on the centre stage as the new paradigm for nature protection.[83] And for this matter, ecological restoration departs from the traditional existing environmental law. In fact, for restorationists, nature's value does not lie in its lack of humanization, but rather in its thriving biodiversity.[84] Even more, the traditional approaches of environmental law (such as conservation and preservation) support what could be call 'passive restoration', *i.e.* the idea that nature can and will recover by itself once some human activities cease.[85] Ecological restoration has a different mindset as it builds on the belief recovery cannot exist without human intervention. Restoration reckons, as noted by Kotzé, that humans are the ones responsible for

[80] Ned Hettinger, 'Nature Restoration as a Paradigm for the Human Relationship with Nature' in Allen Thompson and others (eds), *Ethical Adaptation to Climate Change: Human Virtues of the Future* (MIT Press 2012) 27.

[81] ibid.

[82] 'Rehabilitation' <https://dictionary.cambridge.org/dictionary/english/rehabilitation> accessed 13 October 2022.

[83] Hettinger (n 80) 27.

[84] ibid.

[85] Anastasia Telesetsky, An Cliquet and Afshin Akhtar-Khavari, *Ecological Restoration in International Environmental Law* (1st edn, Routledge 2019) 7.

environmental degradation but that, simultaneously and ironically, they are also the only specie capable of doing something about it.[86]

Having said this, what exactly is ecological restoration?

As mentioned earlier, ecological restoration does not have one single authoritative and legal definition.[87] However, attempts to define the concept can be found in the doctrine of various scholars. For this matter, Higgs describes ecological restoration as 'the process of intentionally altering a site to establish a defined, indigenous, historic ecosystem. The goal of this process is to emulate the structure, function, diversity and dynamics of the specified ecosystem'.[88] The SER definition follows the same idea by defining ecological restoration as 'the process of assisting the recovery of an ecosystem that has been degraded, damaged or destroyed'.[89] Both definitions are articulated around the common factors that restoration is (i) spatially delimited (at the scale of a specific site or ecosystem, or even specie[90]), (ii) is centred towards sustaining the ecosystem's health and integrity and (iii) necessitates a conscious action from humans.[91] What differentiates those two definitions lies in the fact Higgs includes in his the objectives pursued by ecological restoration while the SER is silent on the matter. As already highlighted, some authors have suggested to complete the SER definition by adding the wording '… to reflect values regarded as inherent in the ecosystem and to provide goods and services that people value'.[92] Such an addition would allow to understand better the primary rationale behind the pursuance of ecological restoration. However, this thesis adopts the view it is not a necessary addition as it could unduly restrict the field of ecological restoration to projects which are only beneficial to humans, while selfless projects that are only centred towards the ecosystem should be equally qualified as ecological restoration.

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[86] Louis J Kotzé, 'Rethinking Global Environmental Law and Governance in the Anthropocene' (2014) 32 Journal of energy & natural resources law 121, 137.

[87] Akhtar-Khavari and Richardson (n 9) 4.

[88] Eric Higgs, *Nature by Design: People, Natural Process, and Ecological Restoration* (MIT Press 2003) 107.

[89] Gann and others (n 10) S7.

[90] *See e.g.* du Toit and Pettorelli (n 14) 4.

[91] *As highlighted in* Akhtar-Khavari and Richardson (n 9) 4.

[92] Martin (n 12) 668.

A central aspect of ecological restoration is the reference to a historic, pre-disturbance reference system.[93] As noted by Rochford, ecological restoration 'presupposes a conceptual "starting point" which is also the valued state to which, it is presumed, the ecology (including its inhabitants) should be returned'.[94] Restoration recognises that something took a wrong turn and that there is a need for reconciliation[95], a need to return to the point in time before it went wrong. It involves a 'conscious consideration of former environmental conditions'.[96] The reference to this historical starting and end point shows that restoration is oriented towards recovery and is thus an optimistic concept.[97] However, as will be discussed below (cf. 3.1.3), this historical reference point can also be a difficulty upon which it is possible to stumble. This is one of the reasons why '[a]lthough the concept of a "reference system" is critical to restoration efforts, it is not imperative that an ecosystem is literally restored to its "historical condition as a target for restoration"'.[98] This thesis indeed supports that the most important aspect of restoration should be for restoration to permit ecosystems to function as they are intended to.

This need to work towards the return of this Eden, from which humans have been casted from by their own actions,[99] but also the fact it is not crucial, show a second important aspect of ecological restoration: that it is highly anthropocentric. This contention can be seen as a paradox: what could be less selfless than bringing back an ecosystem to where it was before human influenced it? In addition to such a goal is in reality impossible, as it would occur only if humans were to vanish, it should not be forgotten, however, that it is suggested restoration's end goal is to restore the perceived human value of an ecosystem (cf. 3.1.2).[100] The anthropocentric nature of restoration is, however, not left unbalanced. While this target puts humans' needs at the centre, it is important to remember ecological restoration aims at recreating pre-existing self-sustaining ecosystems capable of coping with a variety of stresses

[93] *See e.g.* Hendrik Schoukens, 'Ecological Restoration as New Environmental Paradigm - A Legal Review of Opportunities and Challenges within the Context of EU Environmental Law, with a Particular Focus on the EU Nature Directives' (PhD Thesis, Ghent University 2017) 22.

[94] Francine Rochford, 'Designing the Environment – the Paradox of Eco-Restoration' (2017) 26 Griffith Law Review 202, 211.

[95] Emily Barritt, 'Stewardship and Ecological Restoration' in Afshin Akhtar-Khavari and Benjamin J Richardson (eds), *Ecological restoration law: concepts and case studies* (Routledge 2020) 74.

[96] Akhtar-Khavari and Richardson (n 9) 12.

[97] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 22.

[98] Akhtar-Khavari (n 79) 21.

[99] Rochford (n 94) 211.

[100] Martin (n 12) 668.

on their own, without further assistance from humans once restored.[101] In the end, however, while nature's needs (which would amount to an ecocentric approach) and humans needs are both valued through ecological restoration, its anthropocentric motivations are more often than not more valued.

3.1.2 Why pursue ecological restoration?

The answer to the question "why pursue ecological restoration?" has been slightly initiated above, through one of its aspects, but it is multiple.

Ecological restoration carries in itself an important narrative that serves to better understand the rationale behind it. Ecological restoration 'allows people to participate in healing the wounds left on the earth, acknowledging the human power to create as well as to destroy'.[102] It signals a 'virtue',[103] a return to 'a biblical image of Eden as a paradisiacal place uncreated by humans and unharmed by us'.[104] This narrative driver is an inspiration, a motivation to initiate reforms. By assigning a negative value to historical and past actions that led to degradation, and a positive value to what could be achieved through restoration, reform is sort of forced.[105] Without entering into too much of a philosophical discussion, it can be noted that some authors, foremost among which is Katz, argue that restoration is guided by the 'insidious dream of the human domestication of nature'.[106] These authors[107] thus sees restoration as driven by the human wish of substituting themselves to an almighty God. The narrative is no more positive but negative. While this view can easily be understood, and while this thesis does not deny its part of veracity, it also argues that the goal of ecological restoration is still a positive one – to put nature back to an anterior state when it was free of adverse human influence and capable of being self-sustaining. Whether the motivations are praiseworthy should not be what matters the most if the end result is a positive one, as it is the case with ecological restoration. At least,

[101] Akhtar-Khavari (n 79) 41.

[102] Gary Paul Nabhan, 'Restoring and Re-Storying the Landscape' (1991) 9 Ecological Restoration 3, 4.

[103] Rochford (n 94) 206.

[104] Daniel Spencer T, 'Recreating [in] Eden: Ethical Issues in Restoration in Wilderness' in Forrest Clingerman and Mark Dixon (eds), *Placing Nature on the Borders of Religion, Philosophy and Ethics* (Ashgate Publishing 2011) 45.

[105] Rochford (n 94) 208.

[106] Eric Katz, 'The Big Lie', *Nature as Subject: Human Obligation and Natural Community* (Rowman & Littlefield 1997) 95.

[107] Katz (n 106).

balance should be the watchword in trying to understand the underlying motivations behind restoration, and this potential new paradigm should not be thrown away that easily.

This recognition that something went wrong which needs to and can be fixed[108] is not the only driver of ecological restoration. More realistically, the reasons behind ecological restoration are not so much philosophical – they are highly economical and stem from the notion of 'ecosystem services'.

The concept of ecosystem services has been formally established by the Millennium Ecosystem Assessment (MEA) issued in 2005 by the UN.[109] In the decade and a half that has passed since, it has become increasingly popular and has been used to understand and discuss the value of ecosystems for human welfare.[110] Ecosystem services can be defined as 'conditions and processes through which natural ecosystems, and the species that are part of them, help sustain and fulfil human life'.[111] Ecosystem services are 'the direct and indirect contributions of ecosystems to human well-being'[112] and, more simply put, they are 'the benefits people obtain from ecosystems'.[113] The report of the MEA adopts four typologies of ecosystem services which are as follow: provisioning, regulating, cultural and supporting services. As a matter of example, a cultural service of a lake could be the fact it attracts tourists.[114]

Ecosystem services are financially valuable, which means a price can be put on them.[115] For example, and in line with this thesis case study, the IMF estimates the value of the services provided by one average great whale at more than $2 million, with a total value of the current stock of great whales being estimated at over $1 trillion.[116] This high cost comes from the various services provided by whales and explained in Chapter 2, but also from the fact

[108] Barritt (n 95) 74.

[109] Millennium Ecosystem Assessment (Program) (ed), *Millenium Ecosystem Assessment* (Island Press 2005).

[110] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 46.

[111] Gretchen C Daily, 'Introduction: What Are Ecosystem Services?' in Gretchen C Daily (ed), *Nature's Services: Societal Dependence on Natural Ecosystems* (Island Press 1997) 3.

[112] United Nations Environment Program, 'The Economics of Ecosystems and Biodiversity: Mainstreaming the Economics of Nature: A Synthesis of the Approach, Conclusions and Recommendations of TEEB' (2010) 33 <https://wedocs.unep.org/20.500.11822/7851>.

[113] Millennium Ecosystem Assessment (Program) (n 109).

[114] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 50.

[115] ibid 46.

[116] Chami and others (n 58).

reproducing them artificially would be extremely costly and not having them could be dangerous.[117]

One might wonder what the link between ecological restoration and ecosystem services is. The link lies in the fact restoration efforts can increase ecosystem services which are already available.[118] The association of these two concepts have 'the potential of a win-win solution' as they combine both biodiversity conservation objectives with socio-economic development ones.[119] While the current paradigm of ranking everything, including species and ecosystems, according to its monetary value is highly problematic as it creates hierarchies of what is worthy of preservation or restoration, it cannot be denied that economic incentives are an important driver to start a project. It is noteworthy, however, that restoring ecosystem services solely for economic purposes is sometimes incompatible with supporting the extensive diversity of biodiversity.[120] It is one of the reasons why the combination of historical and more nature-oriented drivers with economical ones can lead to a beneficial solution. Going further, increased consciousness of these problematics could maybe even lead to a paradigm shift.

3.1.3 Limitations to ecological restoration

Ecological restoration as a concept is faced with difficulties or limitations in its material application, the first of which following from its lack of unique statutory definition. Indeed, a concept that is not properly defined is more difficult to implement. When it comes to ecological restoration, the lack of a legal authoritative definition, whether it be of 'restoration' or of the obligations it entails, 'undermines [its] legal accountability'.[121] As a result, the field of restoration law needs to be clearer about what it seeks to accomplish to ensure more effective ecological decision making.[122] In this sense, a definition that focuses more on the outcomes to be achieved could be beneficial to the field of restoration ecology, as it is the case in some domestic legal systems like Australia and Brazil.[123]

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[117] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 46.

[118] ibid 50.

[119] José M Rey Benayas and others, 'Enhancement of Biodiversity and Ecosystem Services by Ecological Restoration: A Meta-Analysis' (2009) 325 Science 1121, 1123.

[120] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 61.

[121] Akhtar-Khavari and Richardson (n 9) 7.

[122] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 18, 23.

[123] ibid 28.

Another difficulty of ecological restoration arises from the fact it is both a scientific and a legal concept. However, the two concepts are dissociated. Restoration science evolves at a faster pace than restoration law, and law struggles to hold on to the scientific developments in the field. Thus, environmental laws are often superficial in their response to restoring ecosystems.[124] This also comes from the fact legislation on restoration is silent about the scientific knowledge that should inform restoration projects.[125]

A third limitation, which is perhaps the most challenging to overcome, follows from the core aspect of ecological restoration: the use of a historical reference system against which progress and success must be assessed. As a matter of fact, finding the right historical baseline is a difficult task.[126] How far back in time should one go to identify the ecosystem to recreate? Which elements should be taken into account to decide on this historical reference? When it comes to whales for example, the case-study of this thesis, the reference system is the one predating the rise of commercial whaling.[127] While this reference system does not necessitate to go too far back in time, it might not always be the case. In those situations where the ecosystem of reference is more ancient, knowledge gaps may make restoration an even more difficult task in light of the potential lack of data. In order to circumvent this problem, the historical reference system is, more often than not, a simple target for restoration rather than an imperative objective.[128] This means that a 'substitution' rather than a full recreation of an ecosystem is sometimes deemed preferable than an 'unattainable prior state'.[129] This is in line with what Alagona and others argued, namely that while the use of strict historical baselines 'is fraught with challenges', some historical knowledge of the environment is 'essential for conservation and restoration'.[130] However, this poses the question of whether such an outcome amounts to restoration or to a novel ecosystem (cf. 3.1.4).

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[124] Akhtar-Khavari and Richardson (n 9) 8.

[125] ibid 12.

[126] ibid.

[127] See, e.g., Lutz and Martin (n 41); Lavery and others (n 40).

[128] Akhtar-Khavari (n 79) 40.

[129] Rochford (n 94) 207.

[130] Peter S Alagona, John Sandlos and Yolanda F Wiersma, 'Past Imperfect: Using Historical Ecology and Baseline Data for Conservation and Restoration Projects in North America' (2012) 9 Environmental Philosophy 50.

A fourth limitation to ecological restoration comes from the fact the conditions that existed at the time of the reference system are seldom comparable to the ones that prevail at the time of the restoration project. In fact, restoration 'must understand and predict the spatial and temporal dynamics of natural systems'.[131] This means it would be foolish to assume i) that present conditions are the same than the ones at the time of the reference system and, ii) that present conditions are going to remain static in the future. This argument is even more true with climate change. Undeniably, climate change is a part of the world we are living today. It creates challenges whose outcomes cannot easily be assessed with certitude. It implies that restoration projects intrinsically hold in themselves a degree of uncertainty due to climate change. For example, how to plan restoration of marine ecosystems highly dependent on fixed water temperatures when those temperature are undoubtedly rising? How to recreate previous thriving forests when the soils get poorer and poorer in nutrients? While these questions are left unanswered with the current state of affairs, this thesis supports that a first step would be to call for better cooperation between all scientific fields and law.

In addition to not necessarily taking into account climate change or other dynamics of natural ecosystems, restoration also oftentimes hypothesises restored ecosystems as untainted by human influence.[132] Yet, human influence on ecosystems should at all-time be assumed. Restoration should not be thought only as a philosophical concept but as one that will be implemented in the existing world, with all the constraints it implies.

A last limitation to ecological restoration which can be brought up here relates to the question of financing restoration. This question lies on the edge of the scope of this thesis and will not be further developed. However, it deserves some attention. The costs of ecological restoration are high, it is undeniable.[133] Yet, it is important to recall that these costs should be evaluated against the ecosystem services ecological restoration aim at recreating and which, in the long term, can produce considerable benefits, whether be they economic, environmental or social.[134]

[131] Akhtar-Khavari (n 79) 57.

[132] Rochford (n 94) 207.

[133] Akhtar-Khavari (n 79) 12.

[134] ibid.

3.1.4 The question of novel ecosystems

Primarily in light of the difficulty of ecological restoration to identify a historical reference system for a project, some authors have recently been suggesting that a new term, 'novel ecosystems'[135], would better capture 'the ambitions of an alternative approach to the active recovery of an ecosystem that is not driven by fidelity to historical characteristics'.[136]

A novel ecosystem can be described as

> a system of abiotic, biotic and social components (and their interactions) that, by virtue of human influence, differ from those that prevailed historically, having a tendency to self-organize and manifest novel qualities without intensive human management.[137]

In other words, a novel ecosystem is the (re)creation, through human action, of a unique self-sustaining ecosystem whose value does not lie in its resemblance with a previously existing ecosystem, but within its capacity to render ecosystem services. The concept of novel ecosystems thus goes further than the one of ecological restoration as it focusses on building ecosystems that can adapt to future changes and provide humans (and potentially other species) with desired benefits.[138]

As this thesis supports the view that ecological restoration can help mitigate climate change, it is interesting to question the role of novel ecosystems in this area. Scientific literature has been suggesting that this concept could allow for the introduction of species and habitats more resilient to existing climate conditions.[139] While this appears, at first sight, as a positive outcome, many uncertainties surround the responses of novel ecosystems.[140] These uncertainties can go as far as novel ecosystems not providing the expected ecosystem services

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[135] See, e.g., Richard J Hobbs, Eric Higgs and Carol M Hall, 'Defining Novel Ecosystems' in Richard J Hobbs, Eric Higgs and Carol M Hall (eds), *Novel ecosystems: intervening in the new ecological world order* (John Wiley & Sons 2013).

[136] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 33.

[137] Hobbs, Higgs and Hall (n 135) 58.

[138] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 34–35.

[139] Richard J Hobbs, Eric Higgs and James A Harris, 'Novel Ecosystems: Implications for Conservation and Restoration' (2009) 24 Trends in Ecology & Evolution 599.

[140] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 52.

due to the difficulty in predicting their responses to being designed by humans for human welfare purposes.[141]

The wording 'uncertainty' irrevocably makes one think of the precautionary principle. This principle, enshrined in the 1992 Rio Declaration on Environment and Development,[142] reads as follow: '[w]here there are threats of serious or irreversible damage, lack of full scientific certainty shall not be used as a reason for postponing cost-effective measures to prevent environmental degradation'. [143] In other words, when environmental stakes are high, scientific uncertainty should not be a valid reason to postpone action. Reversely, and in the case of novel ecosystems, uncertainties in those ecosystems' responses, which could be detrimental, should not be undermined. This makes novel ecosystems a more controversial development[144] and lead to favour approaches using a reference model, like ecological restoration, rather than novel ecosystems whose cost-benefit assessment is unbalanced.[145]

Thus, it can be summarized from the above that while ecological restoration would bring numerous positive changes, it appears still as very limited and highly oriented towards human well-being.

3.2 International principles and conventions on ecological restoration

Having discussed more in depth what is ecological restoration, it is now proper to focus on the legal character of ecological restoration. While it has been argued that, in theory, ecological restoration does not need law, legislation on the matter has two advantages.[146] First, law offers 'a driver for action'.[147] Second, law has the power to influence behaviour.[148] These two advantages have led ecological restoration to be used and translated in several biodiversity

[141] ibid.

[142] Rio Declaration on Environment and Development, UN Doc. A/CONF.151/26 (vol. I) 1992.

[143] ibid 15.

[144] Phillipa C McCormack, 'Reforming Restoration Law to Support Climate Change Adaptation' in Afshin Akhtar-Khavari and Benjamin J Richardson (eds), *Ecological restoration law: concepts and case studies* (Routledge 2020) 273.

[145] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 52, 80.

[146] ibid 5.

[147] ibid 5–7.

[148] ibid.

strategies, both at a regional (in the EU for example) and global level (with the CBD for example).[149]

For this matter, this section will have a look at the existing legal principles on ecological restoration (3.2.1). It will then focus on two major international environmental conventions, the Convention on Biological Diversity (CBD) (3.2.2) and the United Nations Framework Convention on Climate Change (UNFCCC) (3.2.3), and examine to which extent they include ecological restoration obligations in their text.

3.2.1 International principles and standards for ecological restoration

After engaging in a discussion regarding the terminological distinction between principles and standards (3.2.1.1), this section aims at examining those relating to ecological restoration, whether they are immediately directed towards this goal (3.2.1.2) or amount to broader principles that can inform restoration activities (3.2.1.3).

3.2.1.1 Distinction between principles and standards

The terms 'principles' and 'standards' are oftentimes used interchangeably by theorists within international law, as opposed to rules.[150] However, some authors distinguish them, and this thesis supports the view they are in fact distinct.[151] It is argued that principles are wider than standards and serve 'as a foundation for particular beliefs'.[152] Principles give general guidance. They intend to orient actors towards objectives, but do not call for, nor prescribe, a particular action; rather, they give large discretion in their application.[153]

Distinct from principles are standards. Standards fix specific goals whose attainment can be quantitatively and qualitatively measured. They are 'prescriptive [and] provid[e] detailed and measurable guidance that limits potentially risky or damaging behavior'. [154] Essentially,

[149] Schoukens (n 93) 23.

[150] An Cliquet and others, 'Upscaling Ecological Restoration: Toward a New Legal Principle and Protocol on Ecological Restoration in International Law' (2022) 30 Restoration Ecology e13560, 2.

[151] See e.g. John Bradford Braithwaite, 'Rules and Principles: A Theory of Legal Certainty' [2002] SSRN Electronic Journal.

[152] Eric Higgs and others, 'On Principles and Standards in Ecological Restoration' (2018) 26 Restoration Ecology 399, 400.

[153] ibid; Cliquet and others (n 150) 3.

[154] Higgs and others (n 152) 400.

standards refine principles by giving them a more tangible substance. As noted by Braithwaite and Drahos, '[p]rinciples bring about mutual orientations between actors [while] [s]tandards are norms that can be applied to measure their performance'.[155]

When it comes to the subject matter of this thesis, there is not one single principle that governs ecological restoration.[156] While the potential need for such an overarching principle on ecological restoration will be considered in a subsection in the next chapter as part of a *lex ferenda* discussion (4.1), there are today principles and standards that either directly inform ecological restoration (3.2.1.2) or exist in the field of environmental law and can be applied to ecological restoration (3.2.1.3).

3.2.1.2 Principles and standards directly informing ecological restoration

3.2.1.2.1 The SER International Standards for the Practice of Ecological Restoration

For more than three decades, the SER has established a succession of policies and best practices to guide the development of ecological restoration in all of its aspects.[157] From discussions in the late 1980s and 1990s on the definition of restoration through the SER International Primer on Ecological Restoration (2004), to the issuance of the International Standards for the Practice of Ecological Restoration (hereafter "SER Standards"), the SER has shaped the debate around the recognition of the legal character of ecological restoration.[158]

The first edition of the SER Standards was launched in 2016 at the CBD Conference of the Parties (COP13) in Cancún, Mexico.[159] A second edition of the SER Standards was issued in 2019 which aims at 'better incorporate[ing] social-economic and cultural factors that can greatly affect outcomes of restoration'.[160]

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[155] John Braithwaite and Peter Drahos, *Global Business Regulation* (Cambridge University Press 2000) 19–20.

[156] Cliquet and others (n 150) 4.

[157] 'About SER - Society for Ecological Restoration' <https://www.ser.org/page/about> accessed 13 September 2022.

[158] See e.g. Higgs and others (n 152) 399–400.

[159] George D Gann and others, 'The SER Standards: A Globally Relevant and Inclusive Tool for Improving Restoration Practice—a Reply to Higgs et Al.' (2018) 26 Restoration Ecology 426, 428.

[160] Gann and others (n 10) S7.

As shown by the existence of an updated version, the SER Standards are not intended to be a definitive proclamation, but rather 'a framework for ongoing refinement and modification according to new scientific insights'.[161] Moreover, these principles and standards are only guiding precepts designed to inform, direct and advise restoration practice. They do not amount to an inclusive and legally driven principle on ecological restoration and their non-fulfilment does not lead to consequences for the stakeholders, as there is no legal obligation upon States to use them. They simply set voluntary global best practices.

The 2019 SER Standards identify eight principles that underpin ecological restoration and against which ecological restoration should be practiced. These principles are as follow: ecological restoration engages stakeholders (Principle 1); ecological restoration draws on many types of knowledge (Principle 2); ecological restoration practice is informed by native reference ecosystems, while considering environmental change (Principle 3); ecological restoration supports ecosystem recovery processes (Principle 4); ecosystem recovery is assessed against clear goals and objectives, using measurable indicators (Principle 5); ecological restoration seeks the highest level of recovery attainable (Principle 6); ecological restoration gains cumulative value when applied at large scales (Principle 7) and; ecological restoration is part of a continuum of restorative activities (Principle 8).[162]

If we were to focus on Principle 6, pursuant to which ecological restoration seeks the highest level of recovery attainable, one would see that the SER introduces several concepts to help achieve this goal-principle. Firstly, the highest level of recovery attainable is measured against six 'key ecosystem attributes', namely i) the absence of threat, ii) the physical conditions, iii) the species composition, iv) the structural diversity, v) the ecosystem function and vi) the external exchanges.[163] These ecosystem attributes, which are defined in the SER Standards, should be used at different stages of a restoration project, from characterizing the reference ecosystem to monitoring the degree of recovery of a restoration site.[164] Without discussing these attributes in a detailed manner, it is interesting to note that they are not necessarily easily assessable. For example, the 'absence of threat' seems unattainable, especially in light of

[161] An Cliquet and Kris Decleer, 'Linking Restoration Science and Law' in Afshin Akhtar-Khavari and Benjamin J Richardson (eds), *Ecological restoration law: concepts and case studies* (Routledge 2020) 125.

[162] Gann and others (n 10) S8–S23.

[163] ibid S14 Table 2.

[164] ibid S14.

climate change. Secondly, principle 6 suggests the use of two tools to track and measure progress being made in those six areas: the Five-Star System (cf. Table 3 in Annexes) and the Ecological Recovery Wheel.[165] The highest rating, five stars, indicates a status where the ecosystem is on a secure trajectory towards the reference system and a self-sustainable trajectory to full-recovery.[166] Used together, these tools aim at providing rigorous criteria for what determines restoration and to 'set up a scale towards full recovery'.[167] Such performance standards, which are by definition measurables, allow for a better management and follow-up of a restoration project.

3.2.1.2.2 The Principles for Ecosystem Restoration to Guide the United Nations Decade

As mentioned in the introduction of this thesis, the years 2021–2030 have been declared by the UN as the UN Decade on Ecosystem Restoration 'with the aim of supporting and scaling up efforts to prevent, halt and reserve the degradation of ecosystems worldwide and raise awareness of the importance of successful ecosystem restoration'.[168] With this goal in mind, several tasks forces have been created, among which the UN Decade Task Force on Best Practices (hereafter 'the Best Practice Task Force') led by the Food and Agriculture Organization (FAO). The Best Practice Task Force aims at supporting the implementation of the Decade goals and focusses on framing the knowledge component of the UN Decade Strategy by creating a shared vision of ecosystem restoration.[169] In order to do so, it published in 2021 the Principles for Ecosystem Restoration to Guide the United Nations Decade 2021–2030 (hereafter 'the UN Decade Principles'). These best-practice principles 'underpin all of the restorative activities that are part of the continuum of ecosystem restoration defined by the UN Decade'[170] and are thus wider than the SER Principles which focus on ecological restoration.

The Best Practice Task Force identified ten principles to guide any restoration activity which, in many ways, concur with the SER Standards. They are as follow: ecosystem restoration contributes to the UN Sustainable Development Goals and the goals of the Rio Convention

[165] ibid S17.

[166] Cliquet and Decleer (n 161) 124.

[167] Higgs and others (n 152) 401.

[168] UNGA Resolution A/RES/73/284 on the United Nations Decade on Ecosystem Restoration (2021-2030) (n 2) para 1.

[169] IUCN/CEM FAO, *Principles for Ecosystem Restoration to Guide the United Nations Decade 2021–2030* (FAO, 2021) <https://www.fao.org/documents/card/en/c/cb6591en>.

[170] ibid.

(Principle 1); ecosystem restoration promotes inclusive and participatory governance, social fairness and equity from the start and throughout the process and outcomes (Principle 2); ecosystem restoration includes a continuum of restorative activities (Principle 3); ecosystem restoration aims to achieve the highest level of recovery for biodiversity, ecosystem health and integrity, and human well-being (Principle 4); ecosystem restoration addresses the direct and indirect causes of ecosystem degradation (Principle 5); ecosystem restoration incorporates all types of knowledge and promotes their exchange and integration throughout the process (Principle 6); ecosystem restoration is based on well-defined short-, medium- and long-term ecological, cultural and socio-economic objectives and goals (Principle 7); ecosystem restoration is tailored to the local ecological, cultural and socio-economic contexts, while considering the larger landscape or seascape (Principle 8); ecosystem restoration includes monitoring, evaluation and adaptative management throughout and beyond the lifetime of the project or programme (Principle 9) and; ecosystem restoration is enabled by policies and measures that promote its long-term progress, fostering replication and scaling-up (Principle 10).[171]

As it can be observed, these principles are particularly broad and, as the SER Standards, they are barely guiding precepts aimed at informing restoration activities and are not legally binding. Both the SER Standards and the UN Decade Principles confirm one another with, for example, Principle 4 of the UN Decade replicating Principle 6 of the SER Standards and Principle 6 of the UN Decade mirroring Principle 2 of the SER Standards. However, the UN Decade Principles are less operational than those of the SER in that they do not include any performance rating system.

3.2.1.3 General principles of international environmental law applicable to ecological restoration

While both the SER Standards and the UN Decade Principles are directly addressing ecological restoration, some principles existing in the broader field of international environmental law, although not directly targeting ecological restoration still can be applied to ecological restoration.

[171] ibid.

3.2.1.3.1 The Stockholm Declaration: Principle 3 and Stockholm+50

The 1972 Declaration of the UN Conference on the Human Environment (the Stockholm Declaration)[172] is the first UN Declaration on the global environment. The Conference was described as one of the most successful of its time[173] and as a 'first step towards the development of international environmental law' by the UN Representative of Canada.[174] The resulting Declaration was at the state-of-the-art on several matters, including the notion of a fundamental and basic human right in relation to the environment.[175]

The Stockholm Declaration is built around a set of 'common principles to inspire and guide the peoples of the world in the preservation and enhancement of the human environment'[176] but its provisions are, however, not legally binding.[177] As it was adopted by a consensus of a hundred and fourteen States[178], the Stockholm Declaration has a strong soft law influence.

Amongst its twenty-six principles, one of them is of relevance regarding restoration. Principle 3 of the Stockholm Declaration reads that '[t]he capacity of the earth to produce vital renewable resources *must be* maintained and, *wherever practicable, restored* or improved' (emphasis added).[179] This principle serves as one of the earliest direct references to restoration that can be found in international law.[180] While this thesis will not go in details on the subject, it is noteworthy that the Declaration made a distinction between 'restore' and 'improve'.[181]

As noted above, principles contained in the Declaration are not binding. Nonetheless, statements made during the negotiation phase of the Conference buttress a desire of States to pursue restoration as a priority remedial action.[182] Discussions conducted prior to the adoption

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[172] Stockholm Declaration on the Human Environment 1972 (UN Doc A/CONF 48/14, at 2 and Corr 1).

[173] Louis B Sohn, 'The Stockholm Declaration on the Human Environment' (1973) 14 Harvard International Law Journal 423, 423.

[174] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 63.

[175] Jonas Ebbesson, 'Getting It Right: Advances of Human Rights and the Environment from Stockholm 1972 to Stockholm 2022' (2022) 52 Environmental Policy and Law 79, 80.

[176] Stockholm Declaration.

[177] Sohn (n 173) 427.

[178] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 63.

[179] Stockholm Declaration v Principle 3.

[180] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 63.

[181] ibid 66.

[182] See for e.g. Report of the Preparatory Committee for the United Nations Conference on the Human Environment, First Session, UN Doc. A.CONF.48/PC/6 1970 para 36 The daft Declaration 'would serve

of the Declaration thus show a will of States to use restoration, where practicable, as a tool to maintain certain resources.

When looking at the text of Principle 3 indeed, one can see that restoration activities under its auspices are limited to the ones targeting 'renewable resources'. While the term 'natural resources' is defined in the Stockholm Declaration as to include 'air, water, land, flora and fauna and especially representative samples of natural ecosystems'[183], the Declaration does not incorporate a definition of what pertains to 'renewable resources'. As it was drafted in the early 1970s, it is not ill-advised to assume 'renewable resources' referred to those natural elements having an intrinsic economic value.[184] This interpretation also finds support in the preparatory work of Principle 3. In fact, the Swedish proposal read that '[t]he *productive basis* of renewable resources of the earth, such as *farmland, forests, crops and fish*, which in many cases and places have been threatened or destroyed, must be maintained or enhanced' (emphasis added)[185] while a joint proposal by Brazil, Egypt and Yugoslavia stressed the need to 'restore, wherever possible, the *productive capacity* of those renewable resources that have been unnecessarily depleted' (emphasis added). [186] Both of these wordings suggest that restoration under Principle 3 of the Stockholm Declaration was aimed to primarily serve human production needs and enhance the human environment.[187]

Another phrasing of Principle 3 deserves some attention: 'wherever practicable'. Based on this language, it appears that the commitment made under this principle to participate in restoration activities is limited to 'such efforts [that] are financially and technically practical'.[188]

One question remains: who is responsible of achieving the goals found in Principle 3? For this matter, paragraph 2 of the Preamble of the Stockholm Declaration establishes a duty upon all

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to stimulate public opinion and community participation for the protection and betterment of the human environment and, where appropriate, for the restoration of its primitive harmony etc. in the interest of present and future generations. It would also provide guiding principles for Governments in their formulation of policy and set objectives for future international cooperation.'

[183] Stockholm Declaration v Principle 2.

[184] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 65.

[185] U.N. Doc. A/CONF.48/PC/WG.i(II)/CRP.2 1971.

[186] U.N. Doc. A/CONF.48/WG.I (II)/CRP.3/Rev. 3 1972.

[187] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 65.

[188] ibid 66.

Governments to protect and improve the environment.[189] Paragraph 7 notes that these goals can be achieved, however, only with 'the acceptance of responsibility by citizens and communities and by enterprises and institutions at every level, all sharing equitably in common efforts'.[190] These two paragraphs thus create a role and a responsibility upon both States and non-State actors to implement the principles found in the Stockholm Declaration, including Principle 3.

2022 marks the 50 years anniversary of the Stockholm Declaration. To celebrate this half a century, the Stockholm+50 International Meeting took place in June of this year, which led to the drafting of a civil society Declaration for Stockholm+50 titled *Restoring Our Common Home*.[191] This Declaration calls upon 'the United Nations, its agencies, and all Member States to act upon a four-step pathway towards the critical paradigm shift we all need'.[192] Restoration is a central aspect of this civil Declaration, as can be shown in its title, and in the second item of this pathway labelled 'Recognize, Restore and Safeguard the Global Commons'.[193] While this Declaration has no legal power, it can be seen as a step towards a better recognition of restoration as an important aspect of international environmental law.

3.2.1.3.2 The World Charter for Nature: Article 11(e)

The World Charter for Nature (WCN) was adopted by the UN ten years after the Stockholm Declaration, in 1982, and proclaimed 'principles of conservation by which all human conduct affecting nature is to be guided and judged'.[194] The term 'restoration' is never used in the Charter. Rather, the WCN employs the term 'rehabilitation' in one of its principles. Article 11(e) reads as follow: 'Areas degraded by human activities shall be rehabilitated for purposes in accord with their natural potential and compatible with the well-being of affected populations'.[195]

'Rehabilitation' means 'the process of returning something to a good condition'.[196] The notion of a 'return' to a previous state concords with the several definitions given to restoration

[189] Stockholm Declaration v Preamble, para 2.

[190] ibid Preamble, para 7.

[191] Restoring Our Common Home: Declaration for Stockholm+50 2022.

[192] ibid.

[193] ibid.

[194] UNGA, Resolution A/RES/37/7, World Charter for Nature 1982.

[195] ibid 11(e).

[196] 'Rehabilitation' (n 82).

activities (cf. 3.1.1). This is even more true when article 11(e) calls for rehabilitation of areas 'in accord with their natural potential' – rehabilitation is supposed to bring back an ecosystem to a historical reference and should be done taking the current environment into account.

Just like the Stockholm Declaration, the WCN is not legally binding and is thus solely a political statement. Non-compliance with its principles does not engage the responsibility of its signatories. Nevertheless, the WCN assigns a duty to 'each person' to 'act in accordance with the provisions of the […] Charter'.[197]

3.2.1.3.3 The Rio Declaration: Principle 7 and Agenda 21

The 1992 Rio Declaration on Environment and Development (the Rio Declaration)[198] was adopted following the United Nations Conference on Environment and Development (UNCED), most known as the Earth Summit. In the immediate aftermath of the UNCED it was said that

> The Rio Conference can be considered in different ways, like a bottle which is seen half full or half empty, according to the optimism or the pessimism of the person who contemplates it. The Declaration itself has disappointed some […]. However, this instrument […] confirms several international environmental law rules and reinforces emerging ones, some of which are particularly important.[199]

Contrary to the Stockholm Declaration, the Rio Declaration is the result of a conference that brought together the entirety of the UN Member States.[200] Just like its predecessor, however, the Rio Declaration is built around a set of principles, twenty-seven, which aim at 'protect[ing] the integrity of the global environment and developmental system'[201] but are not legally binding.

Principle 7 of the Rio Declaration reads as follow:

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[197] UNGA, Resolution A/RES/37/7, World Charter for Nature (n 194) para 24.

[198] Rio Declaration.

[199] Alexandre Kiss, 'The Rio Declaration on Environment and Development' in Luigi Campiglio (Graham & Trotman 1994) 63–64.

[200] Jorge E Viñuales (ed), *The Rio Declaration on Environment and Development: A Commentary* (First edition, Oxford University Press 2015) 66.

[201] Rio Declaration v Preamble.

> States shall cooperate in a spirit of global partnership to conserve, protect *and restore* the health and integrity of the *Earth's ecosystem*. In a view of the different contributions to global environmental degradation, States have *common but differentiated responsibilities*. The developed countries acknowledge the responsibility that they bear in the international pursuit of sustainable development in view of the pressures their societies place on the global environment and of the technologies and financial resources they command.[202] (emphasis added)

Principle 7 is mostly known for establishing the 'common but differentiated responsibilities' principle which explicitly recognizes that different standards or less stringent commitments for different groups of countries may be appropriate. Through this principle, developed countries acknowledge their greater responsibility because of the extra stress they put on the environment and their larger financial resources.[203]

More relevant to our discussion, however, is that this principle also mentions restoration and urges States to cooperate in restoring the global ecosystem. For this matter, it appears that Principle 7 of the Rio Declaration is divided in two different parts, the first one dealing with the conservation, protection and restoration of the ecosystem, the second one dealing with common but differentiated responsibilities. The combination of those two parts in one single principle suggests that developed countries may have a differentiated responsibility to support restoration efforts.[204] Moreover, the use of the wording 'conserve, protect *and* restore' (emphasis added) indicates conservation and restoration strategies should be implemented concurrently by States.[205] This is supported by the fact that different areas have different needs, and while some might need conservation attention, others might have already endured degradation calling for restoration activities.

It can be noted, however, that while the second half of Principle 7 received a lot of attention in the last three decades, the same cannot be said concerning its first half, whether it be relating to cooperation in terms of conservation, protection or restoration.[206] It is argued that, to a certain

[202] ibid Principle 7.

[203] Viñuales (n 200) 237.

[204] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 70–71.

[205] ibid 72.

[206] ibid.

extent, the 'common but differentiated responsibilities' principle found in Principle 7 covered up the question of restoration found in the same Principle.

The 1992 Earth Summit held in Rio de Janeiro also led to the adoption of Agenda 21, an internationally agreed upon non-legally binding action plan with regard to sustainable development.[207] Agenda 21 is built upon action items and several of them are closely related to ecological restoration,[208] with for example item 15.5.h calling for the promotion of the 'rehabilitation and restoration of damaged ecosystems and the recovery of threatened and endangered species'.[209]

When it comes to the ocean, Chapter 17 of Agenda 21 calls for the 'protection of the oceans, all kinds of seas, including enclosed and semi-enclosed seas, and coastal areas and the protection, rationale use and development of their living resources'.[210] More specifically, pursuant to objectives 17.46.b (high seas) and 17.74.c (national jurisdiction) States commit themselves to 'maintain or *restore* populations of marine species at levels that can produce the *maximum sustainable yield* […]' (emphasis added).[211] It is noteworthy that restoration relating to marine species in Agenda 21 is only envisioned in relation to the quantitative and economic criteria of the 'maximum sustainable yield'. It comes back to the above discussion on anthropocentrism (cf. 3.1.1) and shows that even environmental agendas justify restoration through an economic gain. This functional approach to restoration of the oceans has been later confirmed by the 2002 Johannesburg Plan of Implementation of the World Summit on Sustainable Development which reinforced Agenda 21 goals and mention restoration of marine stocks 'to levels that can produce the maximum sustainable yield'.[212]

As a result, the Rio Declaration read in conjunction with Agenda 21 suggests dual policy attitudes towards restoration.[213] As explained by Telesetsky and others, restoration is regarded

[207] Andrew Baldwin, 'Agenda 21', *Encyclopedia of environment and society* (SAGE 2007) 10.

[208] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 72.

[209] United Nations Agenda 21 ch 15, item 15.5.h.

[210] ibid 17.

[211] ibid 17, items 17.46.b and 17.74.c.

[212] Johannesburg Plan of Implementation of the World Summit on Sustainable Development, UN Doc. A/CONF/199/20 2002 para 31.a.

[213] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 74.

both as a 'utilitarian exercise to recover vital human commodities' and 'as a therapeutic exercise for purposes of recovering global "health and integrity"'.[214]

3.2.1.3.4 The Sustainable Development Goals

The Sustainable Development Goals (SDGs), agreed upon by the UN General Assembly in 2015 through the 2030 Agenda for Sustainable Development, follow the Millennium Development Goals, which were operational between 2001 and 2015.[215] They gather a collection of 17 goals subdivided in 169 targets and have been described as 'the blueprint to achieve a better and more sustainable future for all'.[216] Even though they do not constitute the first attempt to guide sustainable development policies, the SDGs are considered as being 'by far the most comprehensive and most detailed attempt by the United Nations to guide sustainable development policies'.[217]

Among its 17 goals, one explicitly mentions restoration. Goal 15 is titled 'Protect, *restore* and promote sustainable use of terrestrial ecosystems […]' (emphasis added).[218] Restoration is also explicitly mentioned in six of the 169 targets. Relevant to the topic of this thesis, goal 14 on the conservation and sustainable use of the oceans, seas and marine resources for sustainable development includes two targets calling for the restoration of marine and coastal ecosystems[219] and of fish stocks 'at least to levels that can produce maximum sustainable yield as determined by their biological characteristics'.[220]

However, as it has been mentioned, all of those principles, are non-legally binding.

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[214] ibid.

[215] Frank Biermann, Thomas Hickmann and Carole-Anne Sénit, 'Assessing the Impact of Global Goals: Setting the Stage' in Frank Biermann, Thomas Hickmann and Carole-Anne Sénit (eds), *The Political Impact of the Sustainable Development Goals: Transforming Governance Through Global Goals?* (Cambridge University Press 2022) 1.

[216] 'Take Action for the Sustainable Development Goals' (*United Nations Sustainable Development*) <https://www.un.org/sustainabledevelopment/sustainable-development-goals/> accessed 6 October 2022.

[217] Biermann, Hickmann and Sénit (n 215) 2.

[218] UNGA Resolution A/RES/70/1 on Transforming our world: the 2030 Agenda for Sustainable Development 2015 v Goal 15.

[219] ibid Target 14.2.

[220] ibid Target 14.4.

3.2.2 The Convention on Biological Diversity

This section will first examine the context in which the CBD has been adopted (3.2.2.1), before looking at how restoration is addressed in the text of the Convention (3.2.2.2). It will then analyse the targets adopted by its Conference of the Parties (COP) for 2020 (3.2.2.3) and for 2030-2050 (3.2.2.4). Finally, a partial conclusion will summarize the key takeaways of the CBD (3.2.2.5).

3.2.2.1 Background on the Convention on Biological Diversity

In the second half of the 20th century, the interest of the international community in using law as an approach to the conservation of biodiversity grew stronger.[221] In this context, the UN Environment Programme (UNEP) Governing Council called upon UNEP, through its decision 14/26, to convene an Ad Hoc Working Group of Expert on Biological Diversity to harmonize the existing conventions relating to biological diversity.[222] This would further lead to the adoption of the CBD.

The CBD was negotiated over the course of ten intergovernmental meetings held between November 1988 and May 1992.[223] Meanwhile, preparatory meetings for UNCED were held, which resulted in the adoption of the Rio Convention. It has been said that

> [t]he concurrence of preparatory meetings for UNCED and the negotiations leading to the UNFCCC was both a burden and a blessing for the biodiversity negotiations. On the one hand, the proliferation of meetings meant that the international environmental policy community was overextended. On the other hand, the momentum created by a multiplicity of meetings, the completion of the climate change negotiations, and the pending and highly public Rio Earth Summit served as incentives for concluding a biodiversity convention.[224]

The CBD was opened for signature at the UNCED in June 1992 and entered into force on 29 December 1993. While it was initially conceived as a means of gathering existing and disparate

[221] Philippe G Le Prestre (ed), *Governing Global Biodiversity: The Evolution and Implementation of the Convention on Biological Diversity* (1st edn, Routledge 2017).

[222] Secretariat of the Convention on Biological Diversity (ed), *Handbook of the Convention on Biological Diversity* (Earthscan Publications 2001) xvii.

[223] Le Prestre (n 221).

[224] ibid.

agreements regarding the protection of wildlife, the CBD moved beyond this narrow concern and addresses issues ranging 'from ecosystem protection to the exploitation of genetic resources, from conservation to justice, from commerce to scientific knowledge, from the allocation of rights to the imposition of responsibilities'.[225] Intended as a holistic convention, it addresses comprehensively both conservation and the sustainable use of biodiversity.[226] It rejected both the strictly scientific and strictly legalistic approaches to biodiversity in favour of an approach recognizing the social, economic and political dimensions of biodiversity.[227]

The CBD is a framework convention. Hence 'it sets the tone, establishes certain principles and even enunciates certain commitments […]. As a rule, it does not contain specific obligations […] nor does it contain detailed prescriptions of certain activities'.[228] Its three guiding objectives are the ones of conservation, sustainable use and equitable sharing of benefits. These objectives are translated into binding commitments through articles 6 to 20 of the Convention[229], with two of them explicitly mentioning restoration.

3.2.2.2 Restoration under the Convention on Biological Diversity

Restoration is explicitly mentioned in the text of the CBD at two occasions, both in article 8(f) and in article 14(2). Article 8(f) of the CBD, dealing with in situ conservation, reads as follow:

> Each Contracting Parties shall, *as far as possible and as appropriate*: […]
> (f) Rehabilitate *and restore* degraded ecosystems and promote the recovery of threatened species, *inter alia*, through the development and implementation of plans or other management strategies.[230] (emphasis added)

While the Ad Hoc Working Group had noted during the drafting of the convention that the wording 'restore' would need to be defined in the final text,[231] the final text of the CBD includes no definition of 'restoration'. Such a lack of definition renders the implementation of article 8(f) confusing at best, as what the drafters meant by the phrase 'rehabilitate and restore' is

[225] ibid.

[226] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 110.

[227] Le Prestre (n 221).

[228] ibid.

[229] Secretariat of the Convention on Biological Diversity (n 222) xvii.

[230] CBD art 8(f).

[231] Elements for Possible Inclusion in a Global Framework Legal Instrument on Biological Diversity 1990 [UNEP/Bio.DIV/WG2/1/3] 6.

uncertain.[232] Moreover, the choice of the word 'and' could mean that an approach favouring rehabilitation over restoration could be chosen by States. However, having a look at the drafting history, it appears that achieving article 8(f) through *de minimis* action cannot be judged satisfactory.[233] Rather, when restoration is achievable, a State must 'as far as possible and as appropriate' undertake restoration activities to satisfy its in-situ conservation obligations. An interpretation of the wording 'as far as possible and as appropriate' would mean that it is only where financial constraints or technical unfeasibility render it impossible that States can meet the obligations of article 8(f) with acts of rehabilitation rather than restoration.[234] While both words are sometimes used interchangeably, rehabilitation tends to acknowledge an ecosystem has been permanently degraded and cannot be returned to its original state, thus calling for less ambitious actions than restoration.

The other explicit mention of restoration in the CBD is found in article 14(2) on impact assessment and adverse impacts which instructs the COP to:

> examine, on the basis of studies to be carried out, the issue of liability and redress, *including restoration* and compensation, for damage to biological diversity, except where such liability is a purely internal matter.[235] (emphasis added)

The same comments as above apply here and not much can be said as the COP has not yet rendered any decision on what restoration activities would satisfy redress for biodiversity loss.[236]

In addition to these two explicit mentions of restoration, two other articles of the CBD suggest that States should conduct restoration activities. Article 8(h) of the CBD calls States, 'as far as possible and as appropriate, [to] prevent the introduction of, control or eradicate those alien species which threaten ecosystems, habitats or species'.[237] Alien species, which are not native to a certain habitat, can have adverse impacts on native species and ecosystems. By preventing

[232] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 113.

[233] ibid.

[234] ibid.

[235] CBD art 14(2).

[236] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 115.

[237] CBD art 8(h).

their introduction, controlling or eradicating those foreign species which threaten the balance of an ecosystem, States would thus engage in a form of restoration.

Article 9(c) on ex-situ conservation, on the other hand, calls States, 'as far as possible and as appropriate, [to] adopt measures for the recovery and rehabilitation of threatened species and for their reintroduction into their natural habitats under appropriate conditions'.[238] While non explicit, the reference to restoration is, however, self-evident through the wording 'recovery', 'rehabilitation' and 'reintroduction'.

It can be derived from these articles that the CBD adopts an approach to restoration as being an obligation of conduct.[239] As opposed to an obligation of result, this means *efforts* towards restoration are sufficient to fulfil this obligation. Moreover, the duty to restore is not absolute – restoration is only expected when feasible or appropriate.[240] But what exactly does it mean to restore degraded ecosystems 'as appropriate'? To answer this question, which is left unanswered in the text of the CBD, as well as to give States more guidance on the general obligations contained in the Convention, the Aichi Biodiversity Targets (the Aichi targets) were adopted by the COP at its 10th meeting, under the Strategic Plan for Biodiversity 2011–2020.[241]

3.2.2.3 The Aichi Biodiversity Targets

The Aichi targets, adopted by the COP of the CBD in 2010, followed the targets adopted in 2002 'to achieve by 2010 a significant reduction of the current rate of biodiversity loss'.[242] Parties failed to meet these targets and it was decided to adopt new and more sophisticated targets for the following decade, taking notably into account pressures put on biodiversity and

[238] ibid 9(c).

[239] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 110.

[240] ibid 141.

[241] Decision X/2 The Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets 2010 [UNEP/CBD/COP/DEC/X/2].

[242] Decision VI/26 Strategic Plan for the Convention on Biological Diversity 2002 [UNEP/CBD/COP/DEC/VI/26].

cross-sectoral issues.[243] These "SMART" (specific, measurable, ambitious, realistic and time-bound) targets are known as the Aichi targets.[244]

Divided under five strategic goals, the twenty Aichi targets aim at haltering the loss of biodiversity in order to ensure the resilience of ecosystems and their capacity to continue to provide essential services.[245] Out of these twenty targets, two refer directly to restoration and, contrary to the text of the CBD, operates as obligations of result, even though non-legally binding, by enunciating anticipated outcomes.[246]

Target 14 provides that

> By 2020, *ecosystems that provide essential services*, including services related to water, and contribute to health, livelihoods and well-being, *are restored* and safeguarded, taking into account the needs of women, indigenous and local communities, and the poor and vulnerable.[247] (emphasis added)

Target 15 reads as follow

> By 2020, ecosystem resilience and the contribution of biodiversity to carbon stocks has been enhanced, *through conservation and restoration*, including *restoration of at least 15 per cent of degraded ecosystems*, thereby contributing to climate change mitigation and adaptation and to combating desertification.[248] (emphasis added)

Some other targets support restoration even though they do not name it. For example, target 11 required the conservation of

> at least 17 per cent of terrestrial and inland water, and 10 per cent of coastal and marine areas […] through effectively and equitably managed, ecologically

[243] Stuart HM Butchart, Moreno Di Marco and James EM Watson, 'Formulating Smart Commitments on Biodiversity: Lessons from the Aichi Targets' (2016) 9 Conservation Letters 457, 457–58.

[244] D Jørgensen, 'Ecological Restoration in the Convention on Biological Diversity Targets' (2013) 22 Biodiversity and Conservation 2977, 2978.

[245] Decision X/2 The Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets (n 241) Annex, 8.

[246] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 116.

[247] Decision X/2 The Strategic Plan for Biodiversity 2011-2020 and the Aichi Biodiversity Targets (n 241) Target 14.

[248] ibid Target 15.

> representative and well connected systems of protected areas and other effective area-based conservation measures […].[249]

These targets have many shortcomings. First of all and once again (cf. 3.1), restoration is considered by the Aichi targets as an activity that must be conducted for the benefits of humankind. Target 14 value ecosystems based on their ability to provide 'essential services' – moreover without defining them further than noting they include services related to water and contribute to broad concepts such as 'health, livelihoods and well-being'.[250]

Secondly, these targets are ambiguously written. Once again, the targets do not define 'restoration' and, even though Decision XI/16 adopted following the 2012 Hyderabad Conference requested to 'develop clear terms and definitions of ecosystem rehabilitation and restoration and clarify the desired outcomes of implementation of restoration activities',[251] such lexical work has not been done. The absence of definition also concerns target 15 and the wording 'degraded ecosystems'. When can an ecosystem be considered 'degraded'? Because target 15 mentions the contribution of ecosystems to climate change mitigation and adaptation, is a degraded ecosystem one that is so deteriorated that it fails to provide those services? No answer is to be found in the text of Decision X/2, nor in any further decision of the COP, but this thesis supports the view that slight degradations should not be overlooked. Indeed, it is argued that restoration activities have better chances of success if undertaken early, almost precautionarily.

This lack of definition of key terms, however, has another detrimental effect. Even though target 15 sets a numeric goal for restoration, it is impossible to assess when 15% of degraded ecosystems will be restored[252] as it is impossible to (i) assess what 15% represent without characterizing 'degraded ecosystems' and having an overview of what they actually encompass, and (ii) assess when they are restored without determining what it would factually entail. Thus,

[249] ibid Target 11.

[250] ibid Target 14.

[251] Decision XI/16 Ecosystem Restoration 2012 [UNEP/CBD/COP/DEC/XI/16] para 5(i).

[252] Jørgensen (n 244) 2981.

as noted by Jørgensen, 'the adoption of SMART goals is only smart if the goals are possible to achieve'[253], which is not exactly the case with the Aichi targets.

With these weaknesses, it could have been easily expected that those targets would not be achieved. In 2014 already, the COP had noted that 'not enough progress [had] been made' towards targets 14 and 15.[254] Decision XII/19 encouraged States to cooperate across boundaries to reach those targets, but being non-legally binding it did not managed to create a momentum.

3.2.2.4 The Post-2020 Global Biodiversity Framework

Despite conservation efforts, none of the Aichi targets were fully achieved by 2020.[255] The CBD thus started working on a new document, the Post-2020 Global Biodiversity Framework (GBF), whose first draft was adopted in July 2021.[256] The framework is built around four long-term goals for 2050 with 2030 milestones, and 21 action-oriented targets for urgent action over the decade to 2030.

Restoration appears three times in the first draft. First, it is included in the 2050 vision according to which 'by 2050, biodiversity is valued, conserved, *restored* and wisely used, maintaining ecosystem services, sustaining a healthy planet and delivering benefits essential for all people' (emphasis added).[257] It is then incorporated into Milestone B.2 following which 'the long-term sustainability of all categories of nature's contributions to people is ensured, with those currently in decline restored'.[258] Finally, a quantitative restoration goal is included in Target 2 which aims at 'ensur[ing] that at least 20 per cent of degraded freshwater, *marine* and terrestrial ecosystems are *under restoration* […]' (emphasis added).[259]

It is noteworthy for this thesis that Target 2 directly refers to marine ecosystems. Moreover, and contrary to the Aichi targets, it does not seem to value restoration with regards to ecosystem services. Indeed, while they are mentioned in the 2050 vision and in the 2030 Milestones, the

[253] ibid.

[254] Decision XII/19 Ecosystem conservation and restoration 2014 [UNEP/CBD/COP/DEC/XII/19] para 3.

[255] Haigen Xu and others, 'Ensuring Effective Implementation of the Post-2020 Global Biodiversity Targets' (2021) 5 Nature Ecology & Evolution 411, 411.

[256] First Draft of the Post-2020 Global Biodiversity Framework (n 23).

[257] ibid E.9.

[258] ibid Milestone B.2.

[259] ibid Target 2.

quantitative goal of Target 2 does not refer to ecosystem services as a way of assessing restoration.

Contrary to the Aichi targets, the GBF does not call for restoration to be completed by a certain timeframe. Target 2 only calls for those ecosystems to be 'under restoration' by 2030, making the target more flexible to attain, with no obligation of result either. However, as it was the case with the Aichi targets, assessing the progress towards this goal is going to be difficult as no further definitional work has been done and little guidance is given regarding how to measure compliance with Target 2.

3.2.2.5 Key takeaways from the Convention on Biological Diversity

The CBD and the further decisions from its COP reveal a current trend to legalize restoration as a strategy for attaining sustainability.[260] While restoration has become a priority, however, it was never intended to supersede conservation efforts. The parties to the CBD made it clear during the Hyderabad conference when they noted that 'ecosystem restoration is not a substitute for conservation, nor is it a conduit for allowing intentional destruction or unsustainable use'.[261]

Some authors advance that, taken all together, the CBD and the decisions from its COP suggest that restoration 'has matured into a customary obligation'.[262] For this matter, it is noteworthy that customary international law is 'a general practice accepted as law'[263] and is formed through the meeting of a State practice and an *opinio juris*, the latest being the belief that this practice is obligatory by law.[264] The author of this thesis supports that, indeed, the growing body of soft law regarding restoration and the efforts of States to work towards international goals and targets show a crystallisation of restoration as a rule of customary international law.

[260] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 133.

[261] Decision XI/16 Ecosystem Restoration (n 251).

[262] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 141.

[263] Statute of the International Court of Justice art 38.1(b).

[264] *North Sea Continental Shelf (Federal Republic of Germany v Denmark; Federal Republic of Germany v Netherlands), Judgment* (1969) Reports 1969 3 (ICJ) [77].

3.2.3 The United Nations Framework Convention on Climate Change and the climate change regime

As mentioned earlier in this thesis, ecological restoration and climate change are interlinked. This section, after looking at the context in which the UNFCCC was adopted (3.2.3.1), aims at analysing the framework for restoration under the climate change regime (3.2.3.2).

3.2.3.1 Background on the United Nations Framework Convention on Climate Change and its subsequent agreements

Just like the CBD, the UNFCCC was opened for signatures at the 1992 Earth Summit in Rio de Janeiro.[265] In entered into force on March 21st, 1994, and, as of today, has 198 parties, including all UN Member States and the European Union (EU).

Because the role of ecosystems as carbon sinks had been gradually recognized in international law,[266] the objectives of the UNFCCC as stated in its article 2 are to 'achieve […] stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interreference with the climate system'.[267] Moreover and notably, 'such level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally'.[268] Progress towards this goal is monitored through GHG inventories that must be submitted by all parties.

As a framework convention, the UNFCCC was meant to be completed and specified by further agreements. For this matter, it was completed in 1997 by the Kyoto Protocol[269] and in 2015 by the Paris Agreement.[270] All together, these three agreements form the international climate change regime. The Kyoto Protocol provides for flexible mechanisms and a market-based approach and call States to reduce their overall GHG emissions 'by at least 5 per cent below 1990 levels'.[271] The Paris Agreement is a legally binding international treaty of which the object

[265] Jonathan Kuyper, Heike Schroeder and Björn-Ola Linnér, 'The Evolution of the UNFCCC' (2018) 43 Annual Review of Environment and Resources 342, 345.

[266] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 264.

[267] UNFCCC art 2.

[268] ibid.

[269] Kyoto Protocol to the United Nations Framework Convention on Climate Change 1997 (2303 UNTS 162).

[270] Paris Agreement to the United Nations Framework Convention on Climate Change.

[271] Kyoto Protocol art 3.

and purpose is to 'enhance the implementation of the Convention with the aim to strengthen the global response to the threat of climate change'.[272] It provides three main goals relating to temperature ('holding the increase in the global average temperature to well below 2°C above pre-industrial levels'),[273] adaptation[274] and finance.[275]

It is mainly in its approach towards carbon sink and adaptation mechanisms that the climate change regime can be linked to restoration ecology.

3.2.3.2 Restoration under the climate change framework

Many ecosystems are large carbon sinks meaning that restoration of degraded ecosystems can strengthen their capacity to sequester carbon.[276] Thus, restoration of ecosystems can help mitigate emissions of GHG and, more largely, help mitigate climate change. Yet, restoration is not mentioned *stricto sensu* in the text of the UNFCC, nor in the Paris Agreement. Interpreting the text of the Convention, however, can lead to integrate restoration activities in the scope of the climate change framework.

For this matter, and pursuant to article 4 of the UNFCCC, all Parties shall

> promote and cooperate in the conservation and *enhancement*, as appropriate, *of sinks and reservoirs* of all greenhouse gases […] including biomass, forests and *oceans* as well as other terrestrial, coastal and *marine ecosystems*.[277] (emphasis added)

Although not mentioned explicitly, it is argued that the wording 'enhancement', which in its normal use is 'the process of improving the quality, amount, or strength of something',[278] could include restoration.[279] Because one of the main goals of ecological restoration is the recovery of the characteristic of an ecosystem that were prevalent before degradation,[280] this thesis

[272] Paris Agreement to the United Nations Framework Convention on Climate Change art 2.1.
[273] ibid 2.1(a).
[274] ibid 2.1(b).
[275] ibid 2.1(c).
[276] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 264.
[277] UNFCCC art 4.1(d).
[278] Colin McIntosh (ed), 'Enhancement'.
[279] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 265.
[280] Benayas and others (n 119) 1122.

supports the view that improving the quality of a degraded ecosystem, *i.e.* enhancing it, would amount to restoration.

It has been argued that marine geoengineering techniques enhancing the storage of atmospheric CO_2 into the ocean was encouraged by article 4.1(d) of the UNFCCC.[281] While some authors have read this article as 'inadvertently allowing for the exacerbation of ocean acidification',[282] this negative effect could be avoided if article 4.1(d) was to allow for whale restoration to achieve its goal. This is a view supported by this thesis and that will be explained further below (cf. 3.3.2.1).

Moreover, while the UNFCCC is not legally binding, it is not the case of the Paris Agreement which recaptures the essence of article 4.1(d) of the UNFCCC and call States to 'take action' towards its ambition.[283]

3.3 Ecological restoration under the United Nations Convention for the Law of the Sea

This section aims at demonstrating that, while ecological restoration is mentioned in the text of UNCLOS, it is so in a limited way (3.3.1). Moreover, most of the mentions of ecological restoration found in international law is directed towards restoration of lands, making it harder to implement in the context of the law of the sea (3.3.2).

3.3.1 Rules and principles found in UNCLOS

The duty to restore appears twice in the text of UNCLOS, both in article 61 on the conservation of the living resources and in article 119 on the conservation of the living resources of the high seas. Taken together, these articles create an obligation for parties to undertake restoration activities in all ocean waters[284] as they both call States to take measures designed 'to maintain or restore populations of harvested species at levels which can produce the *maximum*

[281] Ellycia R Harrould-Kolieb, '(Re)Framing Ocean Acidification in the Context of the United Nations Framework Convention on Climate Change (UNFCCC) and Paris Agreement' (2019) 19 Climate Policy 1225, 1228.

[282] ibid.

[283] Paris Agreement to the United Nations Framework Convention on Climate Change art 5.1'Parties should take action to conserve and enhance, as appropriate, sinks and reservoirs of greenhouse gases as referred to in Article 4.paragraph 1(d), of the Convention, including forests' .

[284] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 86.

sustainable yield' (emphasis added).[285] As noted by Telesetsky, Cliquet and Akhtar-Khavari, this language indicates one of the rare instances where States agreed to an obligation of result related to restoration.[286] As positive as this is, it is noteworthy, however, that this obligation is driven by a 'functional restoration scheme designed to ensure adequate commodity levels for commercial harvest'.[287] Indeed, the notion of 'maximum sustainable yield', used as a reference for the level to which harvested species should be restored, corresponds to the largest average catch a resource can sustain without impairing its renewability. Thus, even though it includes the notion of sustainability, it is only in light of a commercial use and does not align with restoration activities undergone to rebuild a historic ecosystem.

This thesis also supports the view that restoration can be read through article 192 of UNCLOS. It has indeed been argued that the observations made by the Permanent Court of Arbitration (PCA) in the South China Sea Arbitration[288] allow to interpret UNCLOS in a manner to require the restoration of degraded ecosystems.[289] In this case, the Tribunal held that the general duty found in article 192 of protection and preservation of the marine environment had to be read 'in the sense of maintaining or improving its present condition'.[290] While the Tribunal did not go further as to clarify what this obligation would entail, this thesis argues it could encompass a duty to rehabilitate or restore degraded marine ecosystems.[291] As noted above indeed, the existence of a duty to restore, even though limited to the notion of maximum sustainable yield, is not impervious to UNCLOS.[292] A similar obligation also applies to associated or dependent species whose populations must be maintained or restored 'above levels at which their reproduction may become seriously threatened'.[293] Taken all together, it is contended that these

[285] UNCLOS art 61(3) and 119(1)(a).

[286] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 86.

[287] ibid.

[288] *South China Sea Arbitration (Philippines v China)* [2016] PCA 2013-19.

[289] James Harrison, 'The Protection of Species, Ecosystems and Biodiversity Under UNCLOS in Light of the South China Sea Arbitration: An Emergent Duty of Marine Ecosystem Restoration?' [2019] Edinburgh School of Law Research Paper 4.

[290] *South China Sea Arbitration* (n 288) para 941.

[291] Harrison (n 289) 10.

[292] UNCLOS arts 61 and 119.

[293] ibid 61(4).

provisions call States to take positive steps to restore marine ecosystems affected by fishing, at least so that fish stocks can recover.[294]

Article 192 of UNCLOS imposes on States an obligation of due diligence[295], meaning an obligation 'to deploy adequate means, to exercise best possible efforts, to do the utmost'[296] to reach this result. Therefore, it cannot be expected from States to restore all degraded marine ecosystems regardless of the cost and feasibility of doing so.[297] Rather, States must undertake all reasonable efforts to this end.

It must also be noted that, pursuant to article 31(3)(c) of the VCLT, relevant rules of international law applicable between the parties must be taken into account when interpreting an agreement.[298] Having this in mind, it is noteworthy that the CBD is binding upon all parties to UNCLOS and, in this sense, contribute to the argument that article 192 of UNCLOS 'can, and should be, interpreted to include an obligation of ecosystem rehabilitation and restoration'.[299] Moreover, the qualification of the obligation to restore under article 192 of UNCLOS as an obligation of due diligence is also supported by the wording 'as far as possible and as appropriate' found in the CBD.[300]

3.3.2 The use of international principles of ecological restoration under UNCLOS

3.3.2.1 Very few principles are directed towards the ocean

Some of the principles mentioned earlier (cf. 3.2) refer directly to the ocean. It is the case, *inter alia*, of SDG n°14 which includes two targets calling for the restoration of marine and coastal ecosystems[301] and of fish stocks 'at least to levels that can produce maximum sustainable yield

[294] Harrison (n 289) 10.

[295] *South China Sea Arbitration* (n 288) para 944.

[296] *Responsibilities and obligations of States sponsoring persons and entities with respect to activities in the Area, Advisory Opinion* [2011] Rep 2011 (ITLOS) [110].

[297] Harrison (n 289) 12.

[298] Vienna Convention on the Law of Treaties 1969 (UNTS 1155) art 31(3)(c).

[299] Harrison (n 289) 11.

[300] CBD art 8.

[301] UNGA Resolution A/RES/70/1 on Transforming our world: the 2030 Agenda for Sustainable Development (n 218) v Target 14.2.

as determined by their biological characteristics'.[302] This goal which, besides, is not legally binding, aligns with the rules found in UNCLOS.

It is also the case of article 4 of the UNFCCC which calls for the 'enhancement of sinks and reservoirs of greenhouse gases, including biomass, forests and oceans as well as other terrestrial, coastal and marine ecosystems'.[303] As noted above, this thesis supports the view that 'enhancement' could amount to restoration (cf. 3.2.3.2). It also argues that this article, even though non-legally binding, opens the door to whale restoration. Indeed, article 4 of the UNFCCC directly recognizes that biomass can act as sinks and reservoirs of GHG, and it has been demonstrated that great whales act as carbon sinks (cf. 2.2). With those elements in mind, this thesis advocates that article 4 of the UNFCCC could be used to uphold whale restoration activities.

Apart from these few texts, the mention of the ocean and of marine ecosystems in legal rules and principles dealing with ecological restoration is very limited, as most of the agreements do not have the ocean as a target.

3.3.2.2 Challenges of transposing principles of ecological restoration to the ocean space

The majority of the rules and principles found in the various international agreements described above focus on land restoration and, even more, on forest restoration.[304] This can partly be explained by the facts knowledge of marine systems is lesser than that of terrestrial systems,[305] that oceans vastly constitute an 'empty' space beyond national jurisdiction,[306] and that the valuation of ecosystem services provided by marine ecosystems is under-represented in studies,[307] making restoration of oceanic systems appear as less beneficial.

All things considered, some principles and attributes of ecological restoration, even though directed firstly towards terrestrial ecosystems, can inform restoration activities in marine

[302] ibid Target 14.4.

[303] UNFCCC art 4.

[304] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 285.

[305] Roberto Danovaro and others, 'Marine Ecosystem Restoration in a Changing Ocean' (2021) 24 Restoration Ecology 3.

[306] Benjamin J Richardson, 'Timescapes of Ecological Restoration' in Afshin Akhtar-Khavari and Benjamin J Richardson (eds), *Ecological restoration law: concepts and case studies* (Routledge 2020) 51.

[307] Danovaro and others (n 305) 6.

systems. Under the current state of the art, restoration principles can influence marine restoration projects through the interpretation of articles 61, 119 and 192 of UNCLOS (cf. 3.3.1). Indeed, the VCLT is adamant that rules of international law applicable between the parties to a convention shall be taken into account in interpreting the said agreement.[308] As a result, the eight principles identified by the SER Standards which serve as guidelines for restoration activities (cf. 3.2.1.2.1) should be used to inform the conduct of such activities undergone through the application of UNCLOS.

The biggest challenge in transposing principles of ecological restoration to the ocean space lies in the complexity of its 'ownership'.[309] Garret Hardin's tale about the tragedy of the commons submits that a legally 'empty' space encourages its careless exploitation.[310] This thesis argues that those 'empty' spaces, in addition to being recklessly exploited, may also fail to be restored due to a lack of any legally responsible actor.[311]

When it comes to the ocean, UNCLOS sets detailed jurisdictional boundaries, with States exercising lesser and lesser sovereignty or sovereign rights as one goes further away from their coasts.[312] In the high seas, which extend beyond 200 nautical miles (nm), States enjoy various freedoms[313] and none of them are sovereign.[314] This renders restoration activities in the ocean even more complicated to conduct as, in addition to being broadly defined, to be obligations of means rather than result, and to rely on non-legally binding principles rather than compulsory goals, they are not the responsibility of an identifiable stakeholder or small group of stakeholders.

While restoration of coastal ecosystems could be more easily undergone as coastal waters up to 12 nm are under the sovereignty of the coastal State,[315] restoration of whales as advocated for by this thesis is faced by many challenges due to their geographical distribution. Indeed, a

[308] VCLT art 31(3)(c).
[309] Danovaro and others (n 305) 19.
[310] Richardson (n 306) 59.
[311] ibid 60.
[312] UNCLOS arts 2, 33, 56, 77.
[313] ibid 87.
[314] ibid 89.
[315] ibid 2, 3.

recent report by the World Wildlife Fund (WWF) titled Protecting Blue Corridors[316] visualizes whales' migrations across the world (cf. Figure 1 – Whale superhighwaysin Annexes) and noted, *inter alia*, that one humpback whale covered 18,942 kilometres across the Southern Ocean over 265 days, spending half of its time in the coastal waters of 28 States and the other half in the high seas.[317] The intrinsic nature of whales as a migratory specie, paired up with the complex jurisdictional framework of the ocean, renders the application of principles of ecological restoration found in international soft and hard law more difficult.

4 The need of a better framework – discussion and concluding remarks

Although the full extent of the benefits of conducting restoration might be unknown, it cannot be denied that restored ecosystems are likely to increase biodiversity and the provision of ecosystem services that could help improve resilience to climate change.[318] However, while the field of ecological restoration is gaining momentum in environmental law, and while principles meant to guide its conduct are multiplying, this thesis supports the view that the current existing framework for ecological restoration requires further development to be efficient as international obligations and targets on restoration are 'far from being met'. [319] This improvement in ecological restoration needs to occur at two levels, regarding both the already existing general framework (4.1), and the ocean in peculiar where such a framework still requires to be built (4.2). The last sub-section of this chapter will then be devoted to concluding remarks (4.3).

4.1 The need to improve the existing framework

In order to build a more effective framework, one has to look at the weaknesses of the existing one. As detailed throughout the previous chapter of this thesis, one of the main shortcomings

[316] Christopher M Johnson and others, 'Protecting Blue Corridors - Challenges and Solutions for Migratory Whales Navigating National and International Seas' (WWF 2022) <https://zenodo.org/record/6196131>.

[317] ibid 57.

[318] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 51; McCormack (n 144) 272.

[319] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 128.

of the restoration regime lies in its lack of clear definitions. Ecological restoration would benefit from being defined in an authoritative international instrument, whether be it in a COP decision, an additional protocol or a novel agreement. This definition could rely on the existing definition from the SER, yet, it should go further in better characterizing the outcomes expected from restoration activities. This thesis further supports that this definition should encompass not only restoration of whole ecosystems, but also restoration of single species[320], as some selected species might be endangered without their whole ecosystem needing restoration. This functional approach to restoration, as it would most likely focus on the recovery of species of interests to humankind, is, however, not far from current restoration projects which focus on ecosystems capable of providing greater ecosystem services if restored. Hence, while recovery of whole ecosystems might be favourable in the long term, projects meant to restore individual species should not be disregarded due to this reason. Definitional work should also be undertaken for peripherical wordings, such as 'degraded ecosystem', so that the achievement of targets and goals could be better assessed and measured.

This new framework should also take into account the fact that, while ecological restoration helps mitigate climate change, it is also influenced by it. This is due to the fact climate change fundamentally alters ecological conditions, making it more difficult to return to a historical state.[321] In order to adapt to this challenge, this thesis argues that flexibility with regards to a return to a historical state should be acceptable when existing conditions do not allow for a full restoration. Thus, the wording 'as far as possible and as appropriate' included in some of the principles and rules mentioned above (cf. 3.2.2.2), should be understood to include climate change as a variable. This leads to argue that ecological restoration goals should not necessarily be static, as such targets would most likely fail to deal with the dynamic changes caused by climate change.[322]

Finally, one of the other biggest deficiencies of the current restoration framework lies in the fact it is built around principles and goals which, in addition to being scattered in various documents, are not legally binding, and whose non-compliance with do not carry consequences for States. It is not denied that soft law instruments bear several advantages. Soft law is generally used as (i) it is easier to reach an agreement on detailed provisions as consequences

[320] Jørgensen (n 244) 2980.

[321] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 264.

[322] ibid 281.

of non-compliance are limited, (ii) it does not require to go through a ratification process, (iii) soft law instruments are more flexible and are thus more easily supplemented and amended than conventions and, (iv) they can show better evidence of international support as soft law is not subject to reservation.[323] However, when it comes to setting goals and targets, this thesis suggests that compliance should be a major condition of their existence, and that such goals and targets should not stay in the realm of soft law. This raises another issue, as measuring the implementation success of ecological restoration project is arduous. In fact,

> laws that require restoration rely on achieving a future outcome based on past conditions that are no longer present. This requires the law to function dynamically, with law-making, law-interpreting and law-enforcing institutions forecasting future restoration outcomes that may or may not be technically achievable and then measuring the incremental progress towards the anticipated outcomes.[324]

4.2 The need to build a framework for the ocean

As previously stated, restoring ecosystems other than lands and forests has been largely overlooked by the international community.[325] What was said in the previous section on the need to enhance the existing global framework on ecological restoration applies *mutadis mutandis* to the ocean. However, this thesis supports the view that a specific framework for the restoration of ocean space should be adopted by the international community.

While the existing rules and principles on ecological restoration can be used to interpret Conventions, [326] there is an end in how far UNCLOS can be interpreted in an evolutionary way as to include restoration obligations. Indeed, although 'subtle evolutionary changes in existing treaties may come about through the process of interpretation under the influence of soft law',[327] restoration is very sparingly and precisely mentioned in the text of UNCLOS, meaning that bringing about full restoration obligations under the Convention is very limited.

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[323] Alan Boyle, 'Soft Law in International Law Making' in Malcom D Evans (ed), *International law* (4th edn, Oxford University Press 2014) 121.

[324] Telesetsky, Cliquet and Akhtar-Khavari (n 85) 294.

[325] ibid 285.

[326] VCLT art 31(3).

[327] Alan Boyle, 'Further Development Of The Law Of The Sea Convention: Mechanisms For Change' (2005) 54 International and Comparative Law Quarterly 563, 574.

Furthermore, a framework for restoration in the ocean would need to address the specific jurisdictional challenges tied to this area. Indeed, unlike forests or lands which are always within State boundaries, whether be it those of one or several States, and thus under the sovereignty of an identifiable set of actors, UNCLOS divides the ocean into various zones where States enjoy more or less rights, up to the high seas where all States enjoy the same freedoms.[328] As a result, and as written by Danovaro and others, '[n]owhere is the need for true, and sustained, international cooperation needed more clearly than in the global ocean, most of which lies outside of any individual nation's sovereign territory'.[329] This challenge is amplified when it comes to the case study of this thesis, as whales are a migratory specie that live both within and outside States' jurisdictional borders.

Ultimately, one might wonder why the International Convention for the Regulation of Whaling (ICRW)[330] has not been mentioned throughout this thesis. Even though it can be said that the moratorium on commercial whaling imposed by the ICRW[331] participates in the passive restoration of whales' populations, restoration is never mentioned in this Convention. Besides, while whaling has historically been the main reason of the decline in whales' populations, new factors are nowadays participating in this decline. Indeed, a recent report of the Climate Change Workshop of the International Whaling Commission (IWC) showed that climate change is negatively affecting cetaceans' populations.[332] The same conclusion is reached regarding the impact of noise pollution on whales.[333] Hence, the text of the ICRW does not actively advocates for the restoration of whales nor for their protection from various threat. Rather, it is an instrument focussed primarily on commercial whaling, and while this is a positive first step, it is too little to suffice.

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[328] UNCLOS art 87.

[329] Danovaro and others (n 305) 1.

[330] International Convention for the Regulation of Whaling 1946.

[331] ibid Schedule para. 10(e).

[332] 'Report of the IWC Climate Change Workshop' (IWC 2022) <https://archive.iwc.int/pages/view.php?ref=19418&k=&search=&offset=0&order_by=resourcetype&sort=DESC&archive=0>.

[333] Andrew J Wright, Mark P Simmonds and Barbara Galletti Vernazzani, 'The International Whaling Commission—Beyond Whaling' (2016) 3 Frontiers in Marine Science <http://journal.frontiersin.org/Article/10.3389/fmars.2016.00158/abstract>.

4.3 Concluding remarks

The latest report from the IPCC, as quoted in the introduction of this thesis, is adamant that human-induced climate change has caused widespread adverse impacts to nature and people and additional severe risks are to be expected.[334] While reducing GHG emissions is a necessity, mitigation strategies are a tool that needs to be further delved into. For this matter, it is established that marine ecosystem aid climate change mitigation,[335] and whales play an important part in this process.

Despite this knowledge, both of the risks and of the tools at our disposition, this thesis supports that environmental law, and even more restoration law, is currently incapable of anticipating and responding to the challenges posed by climate change.[336] Such an argumentation relies mainly on the fact restoration is, as of today, mainly to be found in non-binding principles, and focusses mainly on land while the potential of ecosystems such as oceans are overlooked. Indeed, while various geo-engineering projects are trying to replicate services naturally provided by thriving ecosystems, restoration of those ecosystems does not appear as a priority.

Therefore, this thesis advocates for a better framework for ecological restoration, especially in relation to marine ecosystem, as a climate change mitigation tool. Such a work would echo the words of Arthur Campeau who once observed that

> 'Instinctively, intuitively; perhaps the loudening whisper of a survival instinct within many of us is a deepening, more or less articulate sense that our own survival as a species depends on the co-existence of others.'[337]

[334] 'IPCC, 2022: Climate Change 2022: Mitigation of Climate Change. Contribution of Working Group III to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change' (n 4).

[335] Lutz and Martin (n 41) 9.

[336] McCormack (n 144) 265.

[337] Arthur Campeau, as reported in Le Prestre (n 221).

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Annexes

Table 1 *– Comparison of ecosystem restoration, ecological restoration and rewilding*

		Scope	
		Whole ecosystem	Smaller than an ecosystem
Goal	Return to a former state	Ecosystem restoration	Ecological restoration
	Wildness	Rewilding	Rewilding

Table 2 *– Pre-whaling and modern (2001) abundance and biomass of 8 species or species groups of baleen whales*[338]

	Abundance		Biomass (tons)		Gross Flux (tons C ind^{-1}yr^{-1})	Export (tons C/yr)	
Species	**Pre-whaling**	**2001**	**Pre-whaling**	**2001**		**Pre-whaling**	**2001**
Blue	340,280	4,727	35,730,693	496,353	0.424	72,172	1,003
Fin	762,400	109,600	43,339,848	6,230,387	0.223	85,180	12,245
Humpback	231,700	42,070	6,151,172	1,116,874	0.103	11,890	2,159
Sei/Bryde's	392,300	181,490	6,566,730	3,017,572	0.424	12,037	5,540
Minke	637,000	506,900	5,060,496	4,099,570	0.018	8,525	6,906
Gray	24,600	15,936	674,466	436,922	0.105	1,287	834
Right	84,100	9,239	3,074,915	337,802	0.137	1,156	127
Bowhead	89,000	9,450	2,420,141	256,970	0.051	455	48
Total	2,561,380	879,412	103,018,460	15,992,451		192,702	28,862
Change	−1,681,968		−87,026,010			−163,840	

An age-structured model was built for each species group and was used to estimate the stable age distribution and then the average mass of a whale in the populations. The average mass was multiplied by the abundances to estimate the pre-whaling and modern biomass. The age-structured models were then used to estimate the biomass (expressed as tons of carbon yr^{-1} ind^{-1}) of carcasses of each species produced per individual in the species, termed the gross flux. Multiplying by the abundance values by the gross flux and dividing by 2 gives an estimate of the flux (tons carbon yr^{-1}) exported from the euphotic zone by each species.

[338] Pershing and others (n 36) 2.

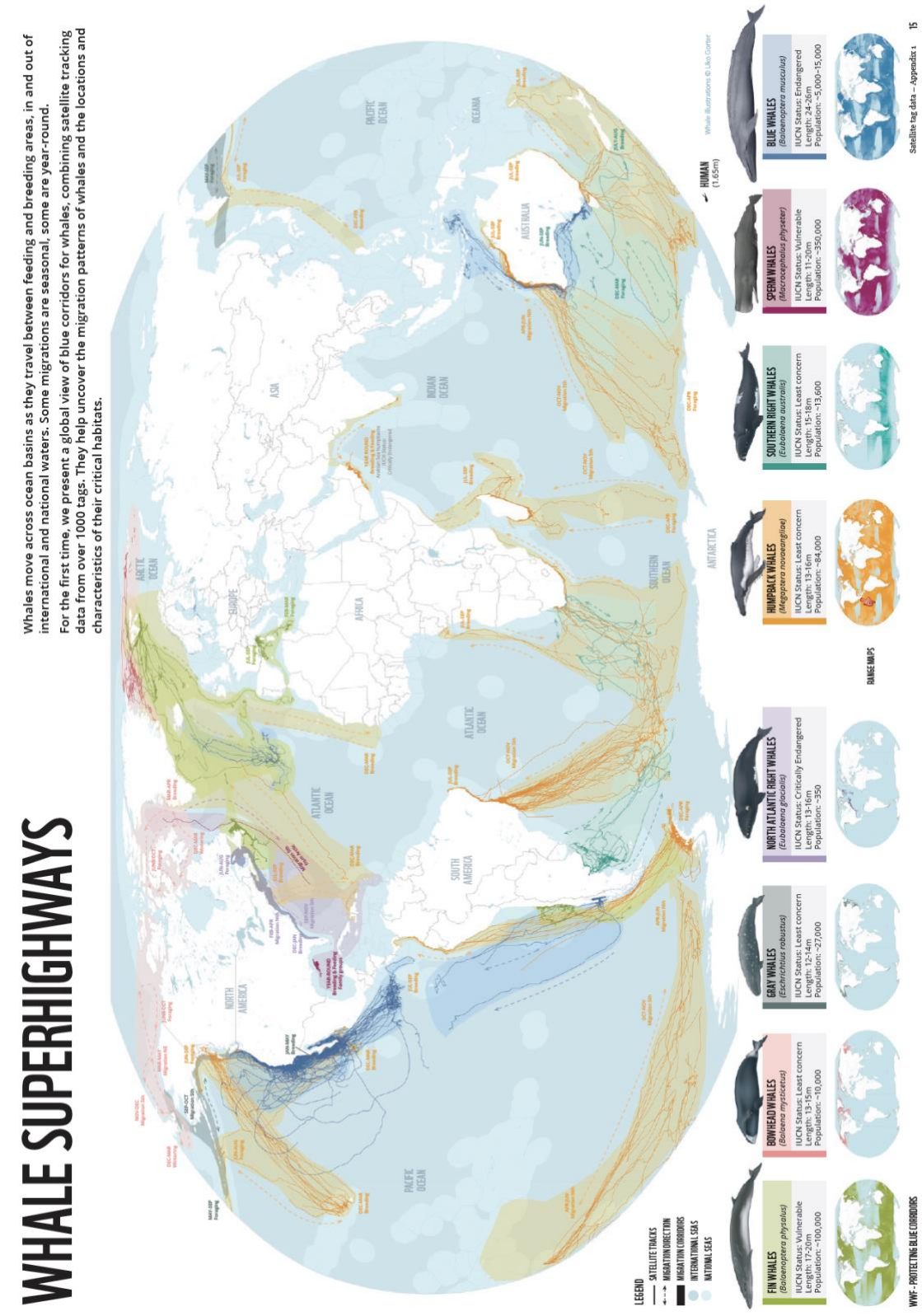
Table 3 *– Key ecosystem attributes and Five-Star System*[339]

Table 4. Sample one to five star recovery scale interpreted in the context of the six key ecosystem attributes used to measure progress along a trajectory of recovery. This five-star scale represents a gradient from very low to very high similarity to the reference model. As a generic framework, users must develop indicators and monitoring metrics specific to the ecosystem and sub-attributes they identify.

Attribute	★	★★	★★★	★★★★	★★★★★
Absence of threats	Further deterioration discontinued, and site has tenure and management secured	Threats from adjacent areas beginning to be managed or mitigated	All adjacent threats managed or mitigated to a low extent	All adjacent threats managed or mitigated to an intermediate extent	All threats managed or mitigated to high extent
Physical conditions	Gross physical and chemical problems remediated (e.g. excess nitrogen, altered pH, high salinity, contamination or other damage to soil or water)	Substrate chemical and physical properties on track to stabilize within range of reference ecosystem	Substrate stabilized within range of reference ecosystem and supporting growth of characteristic native biota	Substrate securely maintaining conditions suitable for ongoing growth and recruitment of characteristic native biota	Substrate exhibiting physical and chemical characteristics highly similar to that of the reference ecosystem with evidence they can indefinitely sustain species and processes
Species composition	Some colonizing native species present (e.g. ~2% of species in the reference ecosystem). Moderate onsite threat from nonnative invasive or undesirable species. Regeneration niches available	A small subset of characteristic native species establishing (e.g. ~10% of reference). Low to moderate onsite threat from nonnative invasive or undesirable species	A subset of key native species (e.g. ~25% of reference) establishing over substantial proportions of the site. Very low onsite threat from nonnative invasive or undesirable species	Substantial diversity of characteristic native biota (e.g. ~60% of reference) present across the site and representing a wide diversity of species groups. Very low onsite threat from nonnative invasive or undesirable species	High diversity of characteristic native species present (e.g. >80% of reference), with high similarity to the reference ecosystem; improved potential for colonization of more native species over time. No known onsite threat from undesirable species
Structural diversity	One or fewer biological strata present and no spatial patterning or community trophic complexity relative to reference ecosystem	More strata present but low spatial patterning and trophic complexity, relative to reference ecosystem	Most strata present and some spatial patterning and trophic complexity relative to reference site	All strata present. Spatial patterning evident and substantial trophic complexity developing relative to the reference ecosystem	All strata present and spatial patterning and trophic complexity high. Further complexity and spatial patterning able to self-organize to highly resemble reference ecosystem
Ecosystem function	Substrates and hydrology are at a foundational stage only, capable of future development of functions similar to the reference	Substrates and hydrology show increased potential for a wider range of functions including nutrient cycling, and provision of habitats and resources for other species	Evidence of functions commencing (e.g. nutrient cycling, water filtration, and provision of habitat and resources for a range of species)	Substantial evidence of key functions and processes commencing including reproduction, dispersal, and recruitment of native species	Considerable evidence of functions and processes on a secure trajectory toward that of the reference and evidence of ecosystem resilience, tested by reinstatement of appropriate disturbance regimes
External exchanges	Potential for exchanges (e.g. of species, genes, water, fire) with surrounding landscape or aquatic environment identified	Connectivity for enhanced positive (and minimized negative) exchanges arranged through cooperation with stakeholders. Linkages being reinstated	Positive exchanges between site and external environment becoming evident (e.g. more species, gene flows, etc.)	High level of positive exchanges with other native ecosystems established; control of undesirable species and disturbances	Evidence that external exchanges are highly similar to reference, and long-term integrated management arrangements with broader landscape in place and operative

339 Gann and others (n 10) S19 Table 4.

Figure 1 *– Whale superhighways*[340]



[340] Johnson and others (n 316) 15.