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Restoration Activities in the Marine Environment

Balancing Diverging Perceptions of 'Risk'

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7.1 INTRODUCTION

The idea that, in addition to mitigation and adaptation action, we might also need to look at actively restoring some of the damage that has already been done is a relatively novel notion in the context of the marine environment.[1] It is prompted by a growing awareness of the unprecedented scale of cumulative human impacts on the oceans.[2] The Intergovernmental Panel on Climate Change (IPCC) Special Report on Oceans and the Cryosphere identifies marine habitat restoration as a means of enhancing ecosystem-based adaptation to changing conditions.[3] The UN General Assembly recently declared 2021–2030 the 'UN Decade on Ecosystem Restoration' in order to address climate change, enhance water and food security, and protect biodiversity.[4] Restoration also plays a role under various multilateral environmental agreements, including the Convention on Biological Diversity (CBD).[5] Often, restoration is mentioned in the same breath as the need to build ecosystem resilience. For example, the draft negotiating text of the Agreement under the UN Convention on the Law of the Sea (UNCLOS) on the conservation and sustainable use of marine biological diversity of areas beyond national jurisdiction

[1] This chapter is based on R. J. Roland Holst, *Change in the Law of the Sea: Context, Mechanisms and Practice* (Leiden: Brill 2022) ch. 6 section 4. Emerging scholarship on restoration and the law has predominantly been terrestrial in focus. See for an overview e.g., B. J. Richardson, 'The Emerging Age of Ecological Restoration Law' (2016) 25 *Review of European, Comparative & International Environmental Law* 277; A. Akhtar-Khavari and B. J. Richardson (eds.), *Ecological Restoration Law: Concepts and Case Studies* (New York: Routledge 2019).

[2] See extensively United Nations, 'The Second World Ocean Assessment' (2021).

[3] H. O. Pörtner and others, 'IPCC Special Report on the Ocean and Cryosphere in a Changing Climate' (2019) <www.ipcc.ch/srocc/download-report-2/>. Summary for Policymakers, para. C.2.2.

[4] UNGA Resolution A/RES/73/248 (6 March 2019).

[5] CBD Arts. 8(f) and 9(c) and Aichi Targets 14 and 15, CBD COP Decision X/2, Strategic Plan for Biodiversity 2011–2020 (2010).

(ABNJ) includes references to 'restoration of ecosystem integrity' as a general principle or approach,[6] to 'rehabilitating and restoring biodiversity and ecosystems' as an objective of area-based management tools,[7] as well as to a potential trust fund to finance 'rehabilitation and ecological restoration' of marine biodiversity in ABNJ.[8]

Does this suggest that we may be seeing a surge in restoration activities in the marine environment over the coming decades? It should be emphasised that restoring marine ecosystems and ecosystem services remains a highly complicated task, and a subject of ongoing scientific research.[9] Most restoration efforts are furthermore extremely expensive, and feasibility is often questionable. However, this does not seem to deter the most avid proponents. Interestingly, private actors are leading recent developments. A noteworthy example is The Ocean Cleanup (TOC): a private actor taking to the high seas with a new technology to systematically clean up plastic pollution. While the objective of both proponents and opponents of such technological 'solutions' is ultimately the same – protection of the marine environment – the underlying conceptions of 'risk' or 'harm' to the marine environment seem to diverge. When seeking guidance from the rule of law on how to assess or balance these different approaches, challenges may arise in issue-areas where the law in turn relies on extra-legal knowledge, such as scientific data, to give content to legal standards.

This chapter will explore this interaction by taking emerging state practice in relation to TOC as a case-study. It will briefly position the notion of restoration within the context of the law of the sea more broadly before zooming in on the example of TOC to illustrate how state practice deals with interpretative questions under UNCLOS in the absence of dedicated legislation. The focus will be on several key outstanding questions regarding the standard of due diligence required from States exercising jurisdiction over such restoration activities, and the difficulties involved in balancing the risks inherent in technological interventions in the absence of knowledge of both the environmental benefits and potential risks. Finally, some conclusions will be drawn as to what guidance, if any, is provided by existing rules and principles of (environmental) law in this context.

7.2 RESTORATION ACTIVITIES UNDER UNCLOS

The term 'restoration' means slightly different things in different contexts.[10] A general distinction is often drawn between restoration in the sense of positive

[6] Revised Draft Text, UN Doc A/CONF.232/2020/3 (18 November 2019), draft Art. 5(h).
[7] Ibid., draft Art. 14(e).
[8] Ibid., draft Art. 52(5)(d).
[9] See e.g., the EU-funded MERCES Project on the restoration of degraded marine habitats <www.merces-project.eu/>.
[10] A distinction has been drawn between 'environmental restoration' in discrete contexts of a more limited scope (such as a spill site) and the broader notion of structural 'ecological restoration'. See for a discussion, e.g., Richardson (n 1).

measures to improve the degraded condition of the environment affected by past activities and 'remediation' or 're-instalment' action to repair damage for which there is legal liability.[11] Yet, in the *Costa Rica/Nicaragua compensation* case the International Court of Justice (ICJ) used the term 'restoration' in its finding that when natural recovery cannot return an environment to the state it was in before the damage occurred, then 'active restoration measures' may be required in order to return the environment to its prior condition, in so far as that is possible.[12] To avoid confusion, and leaving aside questions of liability and compensation for environmental damage attributable to a particular actor, restoration activities of the kind discussed here do not depend on questions of legal attribution or a causal link.[13] The focus is on restoration activities that consist of deliberate intervention aiming to (partly) restore damage or degradation of the marine environment for the purpose of improving the condition of the environment *per se*.

That the common objective of enhanced marine environmental protection is inherently linked to strengthening the rule of law is evidenced by the very existence of Part XII of UNCLOS, which provides a central framework for protection of the marine environment.[14] It has been observed that one of the most significant contributions of UNCLOS to strengthening the rule of law lies in the *process* rather than the substance of many of its provisions.[15] Again, Part XII is a case in point. By setting out a general obligation to protect the marine environment, which has been interpreted and applied as an obligation of 'due diligence',[16] it enables an ever-evolving balance of interests to be struck, as well as incorporation of more detailed environmental (procedural) duties and standards that respond to developments in law and in fact. This obligation of due diligence to protect and preserve the marine

[11] This distinction is drawn, e.g., under EU Directive 2004/35/CE on Environmental liability with regard to the prevention and remedying of environmental damage (2004). See also R. Long, 'Restoring Marine Environmental Damage: Can the "*Costa Rica* v *Nicaragua*" Compensation Case Influence the BBNJ Negotiations?' (2019) 28 *Review of European, Comparative & International Environmental Law* 244, 9.

[12] *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica* v. *Nicaragua)* Compensation, Judgement, ICJ Reports 2018, 15, para. 43.

[13] See for a discussion of these issues, e.g., Long (n 11).

[14] See also B. H. Oxman, 'The Rule of Law and the United Nations Convention on the Law of the Sea' (1996) 7 *European Journal of International Law* 353, 364; and more generally J. Harrison, *Saving the Oceans through Law: The International Legal Framework for the Protection of the Marine Environment* (Oxford: Oxford University Press 2017).

[15] Oxman (n 14) 356; P. Allott, 'Mare Nostrum: A New International Law of the Sea' (1992) 86 *The American Journal of International Law* 764, 785.

[16] See UNCLOS Art. 192 et seq. See also *South China Sea Arbitration (Philippines* v. *China)*, Award on the Merits, 12 July 2016, para. 944; *Request for an Advisory Opinion Submitted by the Sub-Regional Fisheries Commission*, Advisory Opinion, 2 April 2015, ITLOS Reports 2015, 4, para. 131; *Pulp Mills on the River Uruguay (Argentina* v. *Uruguay)* Judgment, ICJ Reports 2010 (I), 14, para. 197.

environment does not impose an explicit duty to proactively restore parts of the marine environment that are damaged or degraded in the absence of legal liability for such damage.[17] However, the general obligation has been interpreted to include both protection from future damage and 'preservation in the sense of maintaining *or improving* its present condition'.[18] While this does not quite amount to an obligation of result to restore or improve the condition of the marine environment in order to comply with the general obligation of due diligence, restoration activities are in principle clearly consistent with the object and purpose of Part XII.

Various kinds of restoration activities are already taking place in the marine environment, primarily on a local scale in areas within national jurisdiction, for example, revegetation of seagrass meadows or coral farming for the purposes of re-planting and restoring natural reefs.[19] These are relatively small-scale and non-invasive activities that, when successful, can reap multi-user benefits by increasing species abundance, thereby supporting local livelihoods. Proactive restoration measures are also being explored on the regional level. In the Baltic Sea, a serious environmental threat is posed by eutrophication and the resultant oxygen depletion caused by excessive nutrient runoff from land.[20] As a result, large parts of the seabed can no longer sustain any plant or animal life.[21] Among the measures proposed to address this issue is sea-based engineering that purposefully targets the pollution that is already out there; either by dredging phosphorus-rich sediments, or by chemically treating those sediments.[22] These proposals have proven controversial; both due to concerns about the environmental risks involved in the technologies themselves, as well as concerns about the implications of sea-based measures for the overall governance approach to eutrophication in the region.[23] Furthermore, while the Baltic Sea is one of the most densely regulated seas on the planet, the absence of a specific legal framework for the proposed engineering techniques and the resultant questions of legal qualification under the various layers of law, make it a significantly more complex activity from a regulatory point of view, compared to the non-invasive

[17] UNCLOS only contains an obligation to 'maintain or restore' populations of harvested species for the specific purpose of maintaining the maximum sustainable yield, see Arts. 61 for the EEZ and 119 for the high seas.

[18] *South China Sea* (n 16), para. 941. Emphasis added.

[19] See e.g. <www.coralrestoration.org/>.

[20] Eutrophication and oxygen depletion concentrate at the seabed, where a chemical process occurs through which additional phosphorus is released from sediments. As the Baltic is a semi-enclosed sea, this means that limited amounts of oxygen-rich waters can reach its central parts. See next chapter and H. Ringbom, B. Bohman and S. Ilvessalo, *Combatting Eutrophication in the Baltic Sea: Legal Aspects of Sea-Based Engineering Measures* (Leiden: Brill 2019) 2–3.

[21] Ibid.

[22] For an extensive legal study of these proposals, see Ringbom, Bohman and Ilvessalo (n 20).

[23] Most Baltic countries strongly emphasise the potential of (enhanced) land-based measures. Only Sweden and Finland are openly positive towards exploring sea-based measures further. Ibid., 3–4.

small-scale restoration projects under a single jurisdiction mentioned above.[24] Yet another type of applicable law questions is raised by restoration activities that take place entirely in areas beyond national jurisdiction. The latter will be the focus of the remainder of this chapter, for which TOC serves as an example.

7.3 THE OCEAN CLEANUP: A NOVEL USE OF THE HIGH SEAS

TOC is a private entity with a unique agenda: a Dutch non-profit organisation on a mission to rid the oceans of plastic. In October 2018, TOC towed the first cleanup system (System 001) into the Great Pacific Garbage Patch (GPGP) for an operational trial. The GPGP is an oceanic gyre situated on the high seas off the coast of North America where ocean currents naturally accumulate plastic debris and other matter, and it is the largest plastic accumulation zone on the planet according to research conducted by TOC.[25] System 001 consisted of a 600-metre-long U-shaped passively floating boom with a three-metre underwater curtain to retain plastics within the system.[26] The latest iteration of the system (System 002) uses a similar contraption, but with a closed retention net, while the system will now be actively towed by two vessels.[27] TOC's ambition is to eventually scale up to a fleet of such devices, to be operated in all five subtropical gyres where currents concentrate ocean-borne plastic waste.[28]

As TOC is a legal entity incorporated under Dutch law, the Dutch Government not only has an obligation of due diligence under UNCLOS and general international law to ensure that activities under its jurisdiction and control do not cause harm to other States or the marine environment,[29] but it has also expressed a willingness to actively 'facilitate and support' TOC's activities.[30] However, owing to the unique nature of the activity, it is not self-evident which international legal

[24] Applicable are national laws, regional rules under the Helsinki Convention and EU law, as well as international law under UNCLOS, the London Convention/London Protocol and CBD. See for an extensive and comprehensive legal analysis of all these aspects Ringbom, Bohman and Ilvessalo (n 20).

[25] It is estimated to contain over 79 thousand tonnes of plastic, which does not form a solid floating 'trash island', as is sometimes suggested, but is rather widely dispersed, see L. Lebreton and others, 'Evidence That the Great Pacific Garbage Patch Is Rapidly Accumulating Plastic' (2018) 8 *Scientific Reports* 4666.

[26] See <https://theoceancleanup.com/oceans/>.

[27] Ibid.

[28] i.e., the North Pacific Gyre, South Pacific Gyre, Indian Ocean Gyre, North Atlantic Gyre and South Atlantic Gyre. See for detailed cleanup projections <www.theoceancleanup.com/technology/>

[29] UNCLOS Art. 194(2) and customary international law as confirmed in e.g., *Pulp Mills* (n 16) para. 101; *Certain Activities Carried Out by Nicaragua in the Border Area (Costa Rica v. Nicaragua) and Construction of a Road in Costa Rica Along the San Juan River (Nicaragua v. Costa Rica)* Judgment ICJ Reports 2015, 665, para. 104.

[30] See Explanatory Notes to the *Agreement between the State of the Netherlands and The Ocean Cleanup concerning the deployment of systems designed to clean up plastic floating in the upper*

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frameworks are directly applicable, nor is dedicated domestic legislation in place. In order to ensure that TOC's activities are at least conducted in accordance with general international law on maritime safety, protection of the marine environment and other legitimate uses of the high seas, the Dutch government entered into an agreement with TOC on 8 June 2018 (the Agreement).[31] In this Agreement the parties chose to draw 'by analogy' on the provisions of Part XIII of UNCLOS on marine scientific research (MSR).[32] The next sections will consider how the Agreement interprets and applies UNCLOS to TOC's activities, and what legal questions remain outstanding.

7.3.1 *The 2018 Agreement between the Netherlands and The Ocean Cleanup*

The legal qualification of the cleanup system is not immediately obvious.[33] The Agreement does not specify its status as a 'vessel', 'installation' or otherwise. The system does carry identification markings to indicate its connection to the Netherlands;[34] however, these depictions of the flag are based on UNCLOS Article 262 and are not intended to identify the Netherlands as the flag State within the meaning of Article 94.[35] It is interesting to note that the Agreement uses the term 'system' in the singular, and defines it as 'one *or more* floating systems developed by [TOC] and designed to capture plastic floating in the upper surface layer of the high seas'.[36] Yet, as will be considered in more detail later, none of the Agreement's provisions substantively differentiate between the operation of a single system or the envisaged fleet.

UNCLOS Article 87 provides a non-exhaustive list of high seas freedoms, including the freedom to construct 'installations permitted under international law', which would logically entail the right to deploy such installations. There is no apparent reason why the system could not be regarded an 'installation'.[37] A further point of

surface layer of the high seas (The Hague, 8 June 2018) Staatscourant 2018 nr. 31907, 6 July 2018, at paras. A1–2.

[31] Agreement between the State of the Netherlands and The Ocean Cleanup concerning the deployment of systems designed to clean up plastic floating in the upper surface layer of the high seas (The Hague, 8 June 2018) Staatscourant 2018 nr. 31907, 6 July 2018. Full text of the Agreement in English reproduced in R. Roland Holst, 'The 2018 Agreement between The Ocean Cleanup and the Netherlands' (2019) 34 *The International Journal of Marine and Coastal Law* 351. The next section draws partly on this earlier work by the author.

[32] Explanatory Notes (n 30), at para. A1.

[33] See more extensively Roland Holst (n 31) 353–354.

[34] Agreement (n 31), Art. 1.5

[35] See Explanatory Notes (n 30) to Art. 1.5. The system is not registered in the Dutch flag registry at the time of writing, but the Agreement leaves this option open for the future. See also the Agreement, Art. 6.4.

[36] Agreement (n 31), Art. 1.1(c). Emphasis added.

[37] UNCLOS Art. 87(1)(d), the Convention does not define either of the terms. Note that the terminology for 'installations' is not consistent throughout the various parts of UNCLOS: Arts. 56, 60 and 80 of the EEZ and Continental Shelf regimes refer to 'installations and

reference for the deployment and use of installations on the high seas can then be found in Part XIII of UNCLOS on MSR, which contains provisions relating to the legal status of installations (and equipment) and maritime safety-related aspects of their deployment in general. Without using the term 'MSR' in the text of the Agreement, the parties chose to apply UNCLOS provisions on MSR 'by analogy', which, according to the Explanatory Notes, allows the Dutch government to 'sufficiently fulfil its duty of care and provide for a recognisable context in the international arena'.[38] Yet, the Agreement not only transposes those obligations from Part XIII that relate to the deployment of installations but also more MSR-related ones, such as the obligation on the TOC to publish scientifically relevant findings.[39] This may give the impression that the Agreement in effect treats TOC's activities as MSR (which is another recognised high seas freedom); however, the reluctance to explicitly qualify it as such bears witness to the fact that this is not an obvious fit.[40] The choice to model the Agreement on Part XIII appears to be a pragmatic one. As the Agreement was concluded shortly before the scheduled trial of System 001, it enabled compliance by TOC without requiring major changes to the setup of its activities, while providing the Dutch government with a sufficiently recognisable legal basis to take responsibility for TOC's activities in international fora.[41]

The Agreement's provisions remain of a very general character and focus on the system's interaction with other uses of the high seas and maritime safety,[42] as well as protection of the marine environment.[43] The provisions on maritime safety and other uses of the high seas require TOC to take the necessary precautionary measures to prevent hindrance caused by the system,[44] and to consult with affected parties to seek a joint solution, in line with UNCLOS Article 87.[45] As for the safety of the system at sea, the Agreement is drafted, where applicable, in accordance with legislation applicable to ships flying the Dutch flag.[46] The system thus needs to be equipped with traceability and visibility instruments that are standard on sea-going vessels; a requirement that is furthermore analogous to Article 262 of UNCLOS and the general requirement that MSR is conducted in compliance with other relevant

structures'; Art. 87(1)(d) refers to 'other installations permitted under international law' and Arts. 258–262 on MSR refer to 'installations or equipment'. There is no indication, however, that installations need to be 'fixed'.

[38] Explanatory Notes (n 30), para. A3.

[39] See Agreement (n 31), Art. 6.1 and Explanatory Notes (n 30) to Art. 6.1, referring to UNCLOS Art. 244.

[40] See more extensively Roland Holst (n 31) 355–357.

[41] Explanatory Notes (n 30), para. A3 and Arts. 1.1–1.2.

[42] In accordance with UNCLOS Art. 240(c).

[43] In accordance with UNCLOS Art. 240(d).

[44] Agreement (n 31), Art. 4.1. See more extensively Roland Holst (n 31) 357–358.

[45] Agreement (n 31), Art. 4.2.

[46] Explanatory Notes (n 30), para. A3.

rules of international law.[47] Finally, and importantly for the Netherlands, the Agreement stipulates that any damage caused to third parties by the system, including damage resulting from pollution or maritime accidents for which the Netherlands is held liable under international law, can be recovered from TOC.[48]

The provisions on protection of the marine environment from any (accidental) damage caused by the cleanup itself recognise the Netherlands' general obligation to protect the marine environment under Part XII of UNCLOS.[49] TOC is required to take precautionary measures, and is bound to remove any parts of the system from the high seas when they are no longer used.[50] A second article requires precautionary measures to be taken specifically for the protection of species in the area of operation, including establishment of a monitoring plan, which is curiously limited to the first year of deployment on the high seas.[51] A final provision concerns the processing of captured plastic, and it requires TOC to ensure that this is done in accordance with applicable domestic and international legislation.[52] Other than 'best efforts' obligations in terms of precautionary measures, the Agreement does not set out any concrete environmental standards or obligations in addition to those TOC claims to have already incorporated in the system's basic design, nor does it deal with the process of collecting the plastic, or the support vessels' interaction with the system. Noteworthy in particular is the fact that the need for an environmental impact assessment (EIA) is not mentioned anywhere in the Agreement. The next section will consider the implications of some of these outstanding issues in more detail.[53]

7.3.2 *Outstanding Questions: What Standard of Due Diligence?*

The Agreement does not differentiate in any of its provisions between operating a single system and the envisaged scale-up. This is particularly remarkable considering the possible impacts of the system(s) on the marine environment, as the monitoring obligation is limited to one year, and there is no provision for a (renewed) EIA. TOC published an EIA on its own initiative in July 2018 before towing the first system to

[47] This applies to the exercise of all high seas freedoms, UNCLOS Art. 87(1), as well as to MSR in particular, Art. 240(d). Other relevant rules of international law, to the extent applicable to the system, include provisions of COLREGS, SOLAS and MARPOL.

[48] Agreement (n 31), Art. 2.5(2), analogous to UNCLOS Arts. 263(3) and 235.

[49] See UNCLOS Arts. 192; 194(2) and 240(d).

[50] Agreement (n 31), Art. 3.1.

[51] Ibid., Art. 3.2. Monitoring is to include the interaction between the system and species, and the impact of captured plastic on species.

[52] Agreement (n 31), Art. 3.3. It is interesting to note in this respect that TOC's zero-waste policy treats the captured plastic as raw material, rather than waste. Explanatory Notes (n 30), Art. 3.3.

[53] It should be noted that an annual meeting between the parties is provided for to evaluate the effectiveness of the Agreement, and to make any future amendments. Hence outstanding or emerging issues may have to be addressed in a responsive manner as TOC's activities progress. Agreement (n 31), Art. 6.3; and Explanatory Notes (n 30).

the high seas, and a second one in July 2021 for System 002.[54] Presumably for this reason and the fact that the initial EIA did not establish a risk of significant harm to the marine environment,[55] the Agreement does not mention the need for an EIA. Nevertheless, this is an apparent lacuna. While the first trial of a single system may not reasonably be expected to pose any significant risks, the proposed scale-up to a fleet of systems may significantly change potential (cumulative) environmental impacts in the future. Reasonable grounds to expect that significant harm may occur could well arise at a later stage of the project, in which case the Netherlands is required as part of its obligation of due diligence under Part XII and general international law to (re)assess these risks by means of a new EIA, take any necessary measures to reduce the risk and notify any potentially affected States.[56]

This notion of environmental risk is not just hypothetical. Experts have raised a number of concerns, including the cleanup's impacts on particular (endangered) species living in the surface layer of the gyre,[57] and the risk of 'by-catch', nor has an approach been developed to deal with biofouling in an effective and environmentally sound way.[58] A unique but little-known floating sea-surface ecosystem called 'the neuston' can be found in the GPGP, exactly because of the same currents that concentrate the plastic there.[59] Apart from being home to a range of specific surface-dwelling creatures, the neuston is intimately connected to the wider marine ecosystem as a nursery for species of larval fish, and a crucial hunting ground for a diverse range of predators.[60] This surface ecosystem has been compared in function to an 'upside-down coral reef'.[61] Owing to its unique area of operation, TOC is quite possibly the first actor and activity to come into direct interaction with this ecosystem. Whereas TOC's first EIA notably omitted potential impacts on the neuston from the assessment altogether, the second EIA established moderate to high impacts of routine operation of the system on the neuston due to entrapment

[54] CSA Ocean Sciences, 'The Ocean Cleanup Environmental Impact Assessment' (2018) <https://assets.theoceancleanup.com/app/uploads/2019/04/TOC_EIA_2018.pdf>; CSA Ocean Sciences, 'The Ocean Cleanup: Final Environmental Impact Assessment' (2021) <https://assets.theoceancleanup.com/app/uploads/2021/07/TOC_FL_21_3648_EIA_FINREV01_12July2021.pdf>.

[55] CSA Ocean Sciences, (n 54) ES-3.

[56] See UNCLOS Art. 206, and customary international law as confirmed in *Pulp Mills* (n 16) para. 204; *Construction of a Road in Costa Rica* (n 29) paras. 104, 106.

[57] R. Helm, 'How Plastic Cleanup Threatens the Ocean's Living Islands', *The Atlantic* (22 January 2019) <www.theatlantic.com/science/archive/2019/01/ocean-cleanup-project-could-destroy-neuston/580693/>. For a response by the Ocean Cleanup see B Slat, 'The Ocean Cleanup and the Neuston' (6 February 2019), available at <www.theoceancleanup.com/updates/the-ocean-cleanup-and-the-neuston/>.

[58] For a critical review of an earlier feasibility study see K. Martini and M. Goldstein, 'The Ocean Cleanup, Part 2: Technical Review of the Feasibility Study' (Deep Sea News, 14 July 2014) <www.deepseanews.com/2014/07/the-ocean-cleanup-part-2-technical-review-of-the-feasibility-study/>.

[59] See for a discussion Helm (n 57).

[60] Ibid.

[61] Ibid.

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resulting in injury or death.[62] The concern of scientists is thus that if TOC is going to be successful at catching the plastic, it is going to be equally successful at catching the neuston; potentially harming or destroying an important ecosystem before it was properly understood.

These considerations are relevant for the standard of care required from the Netherlands as part of its obligation of due diligence. If the neuston can indeed be considered an important 'rare and fragile ecosystem' or even the habitat of 'depleted, threated or endangered species' this would raise the standard of care and precautionary measures required *vis-à-vis* the neuston in accordance with UNCLOS,[63] but also, for example, the CBD,[64] and potentially the future Implementing Agreement on BBNJ.[65] Yet, similar to the Baltic eutrophication measures mentioned previously,[66] determining the standard of due diligence and the exact measures required involves a different balancing exercise than most traditional activities.

7.4 BALANCING UNKNOWN RISKS

A key function of the rule of law in general is to constrain the arbitrary use of power,[67] and for a broad legal framework like UNCLOS that governs a spatially shared realm this means that a multitude of different interests need to be accommodated and balanced.[68] Whereas many UNCLOS provisions – especially in an exploitation context – typically balance particular sovereign rights and interests, on the one hand, with (common) environmental interests on the other, restoration activities such as TOC involve balancing one environmental concern (the impacts of plastic debris on the marine environment) against another environmental concern (impacts of the cleanup system itself on the neuston and biodiversity). The objective is the same: protecting and conserving the marine environment, but the two types of 'harm' or 'risk' involved are weighed differently, depending on one's position. This involves a novel type of balancing exercise for which existing legal principles do not necessarily provide any concrete benchmarks or guidance.

[62] CSA Ocean Sciences, 'The Ocean Cleanup: Final Environmental Impact Assessment' (n 54) ES-7.

[63] See UNCLOS, Art. 194(5).

[64] See also *South China Sea* arbitration (n 16), paras. 945, 956.

[65] The future Implementing Agreement may well contain more specific obligations on environmental impact assessment vis-à-vis biodiversity beyond national jurisdiction, see e.g., Revised Draft Text (n 6), Part IV.

[66] See also Ringbom, Bohman and Ilvessalo (n 20) 54, 85.

[67] See e.g. J. H. H. Weiler, 'The Geology of International Law: Governance, Democracy and Legitimacy' (2004) 64 *Heidelberg Journal of International Law* 547.

[68] P. Allott, 'Power Sharing in the Law of the Sea' (1983) 77 *The American Journal of International Law* 1.

What technology-driven 'solutions' to environmental problems such as TOC or engineering measures to combat eutrophication have in common is that the regulator is confronted with complex 'risk/risk trade-offs'.[69] These 'trade-offs' occur when an intervention to reduce the target risk (knowingly or inadvertently) creates another new risk.[70] Complexity arises where scientific uncertainty remains as to both the potential *benefits* of the technology addressing the target risk and the potential *risks* involved in deploying the technology.[71] Owing to this uncertainty, environmental standards and principles can work both ways in providing guidance on how a balance should be struck. For example, the need to apply the precautionary approach is not controversial in cases where uncertainty persists, but its precise implications are undetermined. The precautionary principle can be used as a regulatory principle in the sense that it prompts regulatory action in the absence of concrete evidence or scientific certainty surrounding a technology, but – based on that same precautionary principle – the technology may still either be authorised or prohibited.[72] That said, even when a permissive approach is taken, the principle requires at the very least a thorough risk assessment before deployment, as well as continuous monitoring.

The general obligation to protect the marine environment under Part XII, and principles such as the no-harm principle or even the ecosystem approach can also work both ways, either to provide support for TOC's continuous cleanup efforts, or as an argument not to do so – depending on how the (short- and long-term) impacts of the activity on the ecosystem versus its benefits are understood and weighed. Application of the environmental rules and principles mentioned above presupposes at least some knowledge of a technology, its consequences, risks and possible alternatives. When this is not available, the rules and principles are effectively 'drained of their substantive content'.[73] Tools and principles such as 'best available technology', 'best available science' or 'best practices' that are commonly used to give content to, for example, the precautionary approach and general due diligence, are of little help when no comparison can be made because there is no relevant 'science' or 'practice' available in the first place.

[69] The dilemma is that 'whilst the seriousness of a given problem may call for immediate and targeted intervention, the ensuing uncertain impacts on other elements of inter-connected systems may be equally deleterious, necessitating a gradual, considered, and holistic approach'. F. M. Fleurke, 'Catastrophic Climate Change, Precaution, and the Risk/Risk Dilemma' in M. Ambrus, R. Rayfuse and W. Werner (eds.), *Risk and the Regulation of Uncertainty in International Law* (Oxford: Oxford University Press 2017) 197, 200.

[70] S. F. Hansen, M. K. von Krauss and J. A. Tickner, 'The Precautionary Principle and Risk-Risk Tradeoffs' (2008) 11 *Journal of Risk Research* 423, 424–426; J. D. Graham and J. B. Wiener, *Risk vs Risk Tradeoffs in Protecting Health and the Environment* (Cambridge: Harvard University Press 1997) 23.

[71] See also Fleurke (n 69) 203; Ringbom, Bohman and Ilvessalo (n 20) 54.

[72] Fleurke (n 69) 205–208.

[73] Also Ringbom, Bohman and Ilvessalo (n 20) 47–48, 86.

The current lack of knowledge and baseline data concerning the neuston is also precisely what makes a proper risk and impact assessment for TOC so difficult at this stage.[74] This is arguably as much a challenge as it is an opportunity, as novel types of activities such as TOC may also prompt the study and acquisition of data in relation to little-known ecosystems and thereby inform the governance of (future) activities in areas beyond national jurisdiction. That said, given the current uncertainty and knowledge gaps that remain, a restoration activity such as TOC with uncertain benefits, feasibility and (potentially) significant risks may well meet some resistance based on environmental rules and principles, despite their best intentions.[75] Particular weight should be attached to the precautionary principle, at least in the form of prioritising knowledge-enhancement before any significant scale-up of the activity takes place.

An adaptive approach would furthermore be warranted, through which newly acquired knowledge is continuously integrated into the management of the activity.[76] If the Netherlands is to be considered to have taken 'all necessary measures' required as part of its general obligation of due diligence, it would thus be advisable to at the very least spell out dedicated EIA and continuous monitoring requirements before TOC's activities move into the next phase. Any arguments and future decisions on how the various risks involved are to be balanced can only be developed (and challenged) on the basis of such extra-legal knowledge and data.

7.5 CONCLUSIONS

TOC is a new actor and user of the high seas for restoration purposes. Whether it ushers in a time of private actor-led cleanup efforts and technological interventions in the marine environment only time will tell. TOC's objective to restore the marine environment is in line with the object and purpose of the Convention, as well as with general international policy on plastic pollution,[77] yet its means could prove controversial. While the analogous application of Part XIII under the 2018 Agreement may provide a suitable model to establish core responsibilities and liabilities and to ensure that TOC's activities are conducted in line with relevant international law, several important legal questions remain outstanding, notably concerning the standard of due diligence required from the Netherlands – the

[74] Furthermore, its location far out on the high seas makes monitoring and studying the neuston technically challenging and very expensive. R. Helm, Keynote Lecture at Ocean Cleanup Symposium, University of Liverpool, 17 December 2019.

[75] See for similar considerations with regard to sea-based eutrophication measures, Ringbom, Bohman and Ilvessalo (n 20) 84.

[76] Similarly, Ringbom, Bohman and Ilvessalo (n 20), 56–57.

[77] See e.g. UNEP's 'war on plastics', www.unenvironment.org/news-and-stories/press-release/nations-commit-fight-plastic-pollution-together-during-un-general. Also UNGA Resl 74/19 (2019), paras. 216–227, and UNEP/EA Resl 4/6 (2019).

content of which depends on the availability and assessment of extra-legal knowledge that is currently lacking.

Perhaps the biggest challenge for the rule of law in governing restoration activities such as TOC lies in dealing with uncertainty and knowledge gaps regarding both the benefits and risks involved in employing a new technology in a complex environment, and how to approach environmental risk/risk trade-offs when perceptions of these risks diverge. In such instances, general rules and principles such as the precautionary approach do not provide concrete directions. This chapter has sought to uncover a particular challenge for the rule of law in terms of its relationship with scientific knowledge, or the absence thereof, in times defined by cumulative pressures on marine ecosystems, significant measures of uncertainty and diverging perceptions of 'risk'.