# Marine Geoengineering Amendments under the London Protocol

In 2013, parties to the London Protocol negotiated amendment LP.4(8) to enable this agreement to specifically govern marine geoengineering activities.[369] The LP.4(8) amendment prohibits OIF, except for activities that qualify as legitimate scientific research. It also establishes a framework to enable the London Protocol to govern other marine geoengineering activities in future. The amendment has yet to enter into force, but it is the first attempt by states to negotiate a set of legally binding rules for geoengineering governance within the international law system. It is therefore recognized as a very significant development, and a potential model for future geoengineering governance.[370] The process by which this amendment was negotiated within the ocean dumping regime has been extensively analyzed elsewhere.[371] This report considers instead the related issue of whether the LP.4(8) amendment, when it comes into force, can provide a comprehensive governance framework for marine geoengineering research, field testing and deployment.First, the rules that the LP.4(8) amendment establishes for ocean fertilization are analyzed, followed by the framework it establishes for future governance of other marine geoengineering activities.

369 Res LP.4(8), *supra* note 39.

370 Ginzky, *supra* note 305.

371 See e.g. McGee, Brent & Burns, *supra* note 82 at 67; Kemi Fuentes-George, "Consensus, Certainty, and Catastrophe: Discourse, Governance, and Ocean Iron Fertilization" (2017) 17:2 Global Environmental Politics 125; Harald Ginzky & Robyn Frost, "Marine Geo-Engineering: Legally Binding Regulation under the London Protocol" (2014) 8:2 Carbon & Climate L Rev 82.

## Ocean Fertilization

The LP.4(8) amendment operates through a positive list governance approach. New article 6*bis* prohibits geoengineering activities that are specifically listed under Annex 4, which currently lists only ocean fertilization activities. Ocean fertilization is defined as "any activity undertaken by humans with the principal intention of stimulating primary productivity in the oceans," except for "conventional aquaculture, or mariculture, or the creation of artificial reefs."[372] This is a broad definition that includes ocean fertilization for the purpose of addressing climate change, as well as activities that primarily intend to enhance marine productivity, such as the Haida Gwaii experiment, which involved a salmon fishery off the coast of Canada.[373] The LP.4(8) amendment effectively prohibits all ocean fertilization activities, except those carried out for legitimate scientific research.[374] Until other marine geoengineering activities are listed under Annex 4, they are permitted, so long as they do not otherwise constitute dumping under the London Protocol,[375] or are contrary to the objectives of the Protocol to protect and preserve the marine environment.[376]

Whether a proposed ocean fertilization activity constitutes legitimate scientific research will be determined by the 2010 OFAF.[377] This framework requires the state responsible for a proposed marine geoengineering activity[378] to conduct an initial assessment of the activity's scientific attributes, including whether the activity will lead to direct economic gains[379] and whether it will be subject to scientific peer review.[380] If the activity passes the initial assessment, the state must then conduct an EIA, which includes considering the site of the proposed activity, likely environmental effects and risk management procedures. An OIF activity will only be considered legitimate scientific research if all steps of the framework have been satisfied to minimize the impact on the environment and maximize the scientific benefits from the activity, and if consent has been sought from any other countries likely to be affected by the activity.[381] LP.4(8) and the 2010 OFAF therefore provide a very cautious and restrictive framework for ocean fertilization governance.

The LP.4(8) amendment to the London Protocol is therefore a significant development in international law. It may not yet be in force, but still provides the most detailed provisions for the governance of ocean fertilization activities agreed upon to date. Moreover, it is the first attempt of the international law system to develop binding rules for any type of geoengineering proposal.

## Framework for Marine Geoengineering Governance

In addition to establishing specific rules for OIF, the LP.4(8) amendment establishes a set of rules for the governance of other types of marine geoengineering technologies. The rationale for developing this framework is that other marine geoengineering technologies may be developed that will present risks of harm to the marine environment and fall within the scope of the ocean dumping regime.[382] Other marine geoengineering activities can be governed if parties agree to list them under Annex 4. This annex system provides for greater flexibility in governing future marine geoengineering proposals. Under article 22 of the London Protocol, any party can propose an addition to Annex 4 to prohibit other marine geoengineering activities and provide for any exceptions to the prohibition (i.e., carrying out legitimate scientific research).[383] Any additions to Annex 4 must be accepted by a two-thirds majority of the London Protocol parties and will enter into force after 100 days.[384] Unlike the process for amending the text of the Protocol,[385] parties do not need to formally adopt amendments to Annex 4 before it

372 Res LP.4(8), *supra* note 39 at Annex 4, 1.1.

373 For an overview of this experiment, see Abate, *supra* note 205 at 52–57.

374 Res LP.4(8), *supra* note 39 at Annex 4, 1.3.

375 *London Protocol*, *supra* note 264, art 1.4.1–3.

376 Reynolds, *supra* note 201 at 90.

377 UNEP, 2010 OFAF, *supra* note 352; Res LP.4(8), *supra* note 39, at Preamble, para 3.

378 A state will be responsible for an ocean fertilization activity if it is to be conducted within their jurisdiction, if the nutrients to be placed into the ocean were loaded from their territory or if it is the flagship state of the vessel being used in the activity. See *London Protocol*, *supra* note 264, arts 9–10.

379 UNEP, 2010 OFAF, *supra* note 352 at 2.2.2; see also Brent et al, "International law poses problems", *supra* note 352.

380 UNEP, 2010 OFAF, *supra* note 352 at 2.2.3.

381 UNEP, 2010 OFAF, *supra* note 352 at 4.1–4.2.

382 See McGee, Brent & Burns, *supra* note 81 at 71.

383 *London Protocol*, *supra* note 264, art 22(1).

384 *Ibid*, art 22(2)–(4).

385 *Ibid*, art 21(3).

can enter into force.[386] This means that new marine geoengineering technologies can be more readily governed.[387] Although the London Protocol parties have the option of adding new activities to Annex 4 at the present time, it is important to bear in mind that any additions will not actually take effect until the LP.4(8) gains enough ratifications to enter into force.[388]

If a new marine geoengineering activity is listed under Annex 4 of the LP.4(8) amendment, the London Protocol parties can decide to prohibit it outright, or create exceptions where the activity might be allowed, but subject to the issue of a permit to ensure that any risks of harm to the marine environment are minimized.[389] Annex 5 of the LP.4(8) amendment establishes a general assessment framework, which is similar to the 2010 OFAF, which sets out decision-making rules for states to apply to marine geoengineering activities when considering whether a permit should be granted. It includes criteria for determining whether a proposed marine geoengineering research activity is legitimate, rules for consulting with potentially affected states, and detailed provisions for carrying out EIAs and ongoing monitoring of activities that are authorized.[390] Moreover, London Protocol parties are only allowed to authorize marine geoengineering activities if marine environmental pollution can be minimized, so that the activity is not thereby contrary to the aims of the London Protocol.[391] The general assessment framework in Annex 5 of the LP.4(8) therefore requires states to adopt a highly precautionary approach when deciding whether to issue a permit for marine geoengineering activities, in keeping with their existing obligations under the London Protocol.[392]

The general assessment framework for marine geoengineering in Annex 5 has two broad purposes. States can use the general assessment framework to determine whether a marine geoengineering activity listed in Annex 4 should take place. The framework can also be used to develop additional assessment frameworks that are tailored to specific marine geoengineering proposals, just as the OFAF has been tailored to the features of OIF research. Either way, states must develop domestic laws or regulations to ensure any permits they issue meet the requirements of Annex 5.[393] Annex 5 thus creates a minimum standard that new specific assessment frameworks must meet.[394] This approach provides some degree of flexibility in governing future marine geoengineering activities by ensuring that parties are not stuck with the same assessment framework for all new marine geoengineering activities.[395]

The LP.4(8) amendment provides a detailed framework for marine geoengineering governance that has capacity to adapt to future scientific and technological developments. It is a highly precautionary framework,[396] significantly informed by expert scientific advice as well as the advice of environmental policy makers and international lawyers.[397] It not only provides a model for future geoengineering governance, but also provides an example of the processes through which new governance mechanisms for marine geoengineering might be developed within existing international organizations and treaty bodies.[398] However, it is important to keep in mind that LP.4(8) is an amendment to protect the marine environment *from* geoengineering technologies, not to govern research or development of geoengineering technologies per se. LP.4(8) is an amendment to an existing environmental protection treaty and its capacity to provide a comprehensive governance framework for marine geoengineering activities will therefore be limited by the aims, scope and membership of the London Protocol itself. These limitations of the London Protocol are set out further below.

386 Parties will be automatically bound by the amendment, unless they make a declaration that they are unable to accept it. *London Protocol*, *supra* note 264, art 22(4).

387 See Chiara Armeni & Catherine Redgwell, "International legal and regulatory issues of climate geoengineering governance: rethinking the approach" (2015) Climate Geoengineering Governance Working Paper Series 021 at 26–27, online: <http://geoengineering-governance-research.org/perch/resources/workingpaper21armeniredgwelltheinternationalcontext-3.pdf>.

388 *London Protocol*, *supra* note 264, art 22(6).

389 Res LP.4(8), *supra* note 39 at Annex 5, para 26, establishes conditions for a permit.

390 See also Karen Scott, "Geoengineering and the Marine Environment" in Rosemary Rayfuse, ed, *Research Handbook on International Marine Environmental Law* (Cheltenham, UK: Edward Elgar, 2015) 451 [Scott, "Geoengineering and the Marine Environment"] at 460.

391 Res LP.4(8), *supra* note 39 at Annex 5.26.7.

392 See also Scott, "Mind the Gap", *supra* note 307 at 50.

393 Res LP.4(8), *supra* note 39, art 6*bis*(2).

394 *Ibid* at Annex 5(2). See also Ginzky, *supra* note 305 at 1006.

395 See also Anna-Maria Hubert, "Marine Scientific Research" in Salomon & Markus, *supra* note 305, 933. Hubert describes the amendment overall as flexible and adaptive in its design (at 944).

396 Scott, "Geoengineering and the Marine Environment", *supra* note 390 at 460.

397 Ginzky & Frost, *supra* note 371 at 94.

398 See *ibid*, 94–96. See also Fuentes-George, *supra* note 371, who analyzes the institutional behaviour that led to this amendment.

### *The LP.4(8) amendment may not be able to govern all marine geoengineering activities*

The LP.4(8) amendment defines "marine geoengineering" as follows: "a deliberate intervention in the marine environment to manipulate natural processes, including to counteract anthropogenic climate change and/or its impacts, and that has the potential to result in deleterious effects, especially where those effects may be widespread, long lasting or severe."[399]

Any activities that might be considered for listing under Annex 4, and hence be governed by the LP.4(8) amendment, must, as a threshold issue, fall within this definition. The definition is wide enough to include activities to address climate change, but also other activities for other purposes, such as enhancing marine productivity, or addressing ocean acidification.[400] However, the definition excludes activities that are not deliberately intended to manipulate natural processes but may nevertheless manipulate natural processes as a side effect. According to Ginzky, examples of such activities include the laying of submarine cables and the creation of artificial reefs.[401] Moreover, the definition applies only to activities that have the potential to have "deleterious effects," presumably on the marine environment. This is in keeping with the objectives of the London Protocol to protect and preserve the marine environment.[402] The threshold for harm is, however, very low, in that an activity need show only the potential of risk of harm, and thus, harm does not actually need to eventuate.[403]

The main provision of the LP.4(8) amendment, article 6*bis*, further limits the capacity of the amendment to govern marine geoengineering activities. Article 6*bis* prohibits "the placement of matter into the sea from vessels, aircraft, platforms or other man-made structures at sea for marine geoengineering activities listed in annex 4." This has led several international environmental law experts to conclude that the amendment can govern only those marine geoengineering activities that involve the placement of matter into the oceans.[404] According to Harald Ginzky and Robyn Frost, "activities which do not place matter into the marine environment would not come within the scope of the amendments. For example, the extraction of sea water for the purpose of cloud seeding in order to increase the albedo effect would not fall within the scope of the new regulation. Nor would a geoengineering technique be regulated that, for example, involved the introduction of energy into the ocean."[405]

The amendment has the capacity to govern AOA activities, as they would involve the placement of calcium carbonate or other matter into the ocean.[406] The amendment could also apply to blue carbon initiatives, such as enhanced kelp farming, if they involve the placement of matter (i.e., nutrients) into the ocean. The amendment will likely apply to microbubble techniques that involve placing matter into the ocean (i.e., glass microbeads). However, as noted by Karen Scott, "the creation of microbubbles through 'the expansion of air saturated water through vortex nozzles' is likely to be excluded from the remit of Article 6bis — since 'matter' is effectively not 'placed' into the sea. Furthermore, the regime does not cover schemes such as marine cloud brightening which utilize the oceans as a tool from which to effect geoengineering but which do not involve the placement of matter therein."[407]

The LP.4(8) amendment is also unlikely to apply to ocean upwelling/downwelling, as this involves the transfer of water/nutrients from one part of the ocean to another, rather than the introduction of new matter.[408] LP.4(8) therefore cannot provide a comprehensive governance framework for marine geoengineering activities, as key proposals are currently beyond its scope.[409]

### *The amendment does not consider the need to address climate change*

A further limitation of LP.4(8) is that it does not consider the growing need to develop geoengineering technologies to ameliorate climate change. Admittedly, this amendment was negotiated prior to the signing of the Paris Agreement, and the

399 Res LP.4(8), *supra* note 39, art 1 (5bis).

400 Ginzky & Frost, *supra* note 371 at 86.

401 Ginzky, *supra* note 305 at 1005.

402 Ginzky & Frost, *supra* note 371 at 86.

403 *Ibid*; Scott, "Mind the Gap", *supra* note 307 at 48.

404 Ginzky & Frost, *supra* note 371 at 86; Scott, "Geoengineering and the Marine Environment", *supra* note 390 at 461.

405 Ginzky & Frost, *supra* note 371 at 86.

406 Scott, "Geoengineering and the Marine Environment", *supra* note 390 at 459.

407 *Ibid* at 459. See also Ginzky & Frost, *supra* note 371 at 86.

408 Ginzky, *supra* note 305.

409 See Scott, "Geoengineering and the Marine Environment", *supra* note 390 at 461.

assumptions about negative emissions contained therein. The IPCC's 5th Assessment Working Group I Report was published in 2013, but the fact that CDR geoengineering had been incorporated into most pathway scenarios to limit global temperature increase to 2°C was not yet widely publicized.[410] At the time LP.4(8) was negotiated, geoengineering therefore did not have as prominent a role in international climate change policy as it does today.

It is possible that a closer linkage of the Paris Agreement and London Protocol may emerge in the future. However, although the London Convention parties have previously carried out some important work around $CO_2$ sequestration in geological structures,[411] the LP.4(8) amendment's failure to directly consider wider issues posed by climate change is conspicuous, especially as the LP.4(8) amendment draws links to other international treaties, organizations and broader environmental issues. The preamble to the LP.4(8) amendment highlights the need to conserve the marine environment and promote sustainable use of the world's oceans. It notes the COP decisions of the CBD discouraging states from engaging in geoengineering activities that might have an impact on biological diversity. The preamble also notes the IPCC's 5th Assessment report and the expert meeting it held in 2011 on geoengineering. It is therefore surprising that the amendment makes no reference to climate change as a significant environmental issue. It does not acknowledge the risks climate change poses to the marine environment, nor does it recognize the broader objectives of the UNFCCC to stabilize the levels of GHGs in the atmosphere.[412] It also does not require or encourage any cross-organizational cooperation with the UNFCCC. Annex 5 requires permits for marine geoengineering activities to, as far as practicable, minimize environmental impacts and "maximize benefits."[413] However, LP.4(8) also does not provide governance mechanisms that allow for any sort of risk-risk trade-off between the marine pollution risks posed by marine geoengineering activities and the wider risk of not engaging in such activities (i.e., climate change continuing unabated).

In short, the LP.4(8) amendment focuses only on the risks marine geoengineering activities might pose to the marine environment, with a particular emphasis on the placement of matter, without considering the bigger picture of geoengineering or climate change governance.[414] Given the extent to which CDR geoengineering is now incorporated into international climate change policy, this is a significant omission that further detracts from the amendment's capacity to comprehensively govern marine geoengineering technologies.

### *The amendment has slow uptake with limited potential parties*

The LP.4(8) amendment needs to enter into force before it can form a part of the London Protocol and become legally binding on state parties. Under article 21, to enter into force, two-thirds of state parties to the London Protocol must accept the amendment.[415] As of October 22, 2019, 53 states are party to the London Protocol,[416] meaning that a minimum of 35 states must accept the LP.4(8) amendment for it to enter into force. On face value, this does not appear to be a prohibitively large number. However, uptake of LP.4(8) has been slow. In the five years since the LP.4(8) amendment was negotiated, only five parties have accepted it (Estonia, Finland, the Netherlands, Norway and the United Kingdom).[417] The amendment is therefore unlikely to enter into force and become an operative part of the London Protocol anytime soon.

Even if the amendment enters into force, its capacity to govern marine geoengineering activities will not extend to the activities of all states. The LP.4(8) amendment can only bind states that are party to the London Protocol.[418] As noted above, this is currently only 53 states. This number is significantly less than the

410 See e.g. Sabine Fuss et al, "Betting on negative emissions" (2014) 4 Nature Climate Change 850; Kevin Anderson & Glen Peters, "The trouble with negative emissions" (2016) 354:6309 Science 182.

411 *Resolution LP.1(1) on the Amendment to Include $CO_2$ Sequestration in Sub-Seabed Geological Formations in Annex 1 to the London Protocol* (adopted 2 November 2006) (LC-LP.1/Circ.5), online: <www.imo.org/en/KnowledgeCentre/IndexofIMOResolutions/London-Convention-London-Protocol-(LDC-LC-LP)/Documents/LP.1(1).pdf>; *Resolution LP.3(4) on the Amendment to Article 6 of the London Protocol* (adopted 30 October 2009).

412 *UNFCCC*, *supra* note 2, art 2.

413 Res LP.4(8), *supra* note 39 at Annex 5, para 28.

414 See also Karen N Scott, "Regulating Ocean Fertilization under International Law: The Risks" (2013) 2 Carbon Climate L Rev 108 at 116.

415 See also Scott, "Geoengineering and the Marine Environment", *supra* note 390 at 461.

416 IMO, "Status of IMO Treaties", online: <www.imo.org/en/About/Conventions/StatusOfConventions/Documents/Status%20-%202019.pdf>.

417 *Ibid* at 558.

418 See also Scott, "Geoengineering and the Marine Environment", *supra* note 390 at 461.

87 states in the London Convention,[419] and represents only one-quarter of the world's states. As illustrated in Figure 3 above, several key states (i.e., those with likely capacity to engage in marine geoengineering activities) are not bound by the London Protocol, including India, Indonesia, Malaysia, Russia and the United States. Furthermore, of those states in the London Protocol, the LP.4(8) amendment will only bind those states that accept it.[420] The only key state to accept the LP.4(8) amendment so far is the United Kingdom. As things stand, the LP.4(8) amendment is therefore unlikely to bind all key states that may engage in marine geoengineering.[421] This detracts from the amendment's capacity to govern marine geoengineering activities.

The capacity of LP.4(8) to bolster the capacity of international law to govern marine geoengineering technologies is significantly limited. The amendment has some capacity to adapt to new technologies and changes in scientific understandings. However, this feature cannot help the LP.4(8) amendment to overcome the shortcomings discussed above. For the above reasons, international policy makers will likely find it difficult to rely on this amendment alone to comprehensively govern marine geoengineering activities. It is therefore important to look beyond the London Protocol and to consider how other rules and regimes in international law might be developed to contribute to the governance of marine geoengineering activities. Current efforts to negotiate a new international agreement to protect biodiversity in areas beyond national jurisdiction (i.e., the high seas) may provide an important opportunity to do this.

419 As of October 16, 2019, 87 states are contracting parties to the London Convention. IMO, "Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter", online: <www.imo.org/en/OurWork/Environment/LCLP/Pages/default.aspx>.

420 *London Protocol*, *supra* note 264, art 21.

421 See also Ginzky & Frost, *supra* note 371 at 92.