Transnational Environmental Law, 7:2 (2018), pp. 201–227 © 2018 Cambridge University Press
doi:10.1017/S2047102517000401

ARTICLE

Keeping the Arctic White: The Legal and Governance Landscape for Reducing Short-Lived Climate Pollutants in the Arctic Region

Yulia Yamineva* and Kati Kulovesi**

First published online 14 March 2018

Abstract
Reducing emissions of short-lived climate pollutants (SLCPs) – in particular, black carbon and methane – is a promising option for slowing global and regional warming in the short term, while at the same time reducing local air pollution. This mitigation opportunity seems to be particularly relevant in the Arctic context. The article provides a comprehensive overview and a critical assessment of the state of international law and governance relevant to the reduction of SLCP emissions in the Arctic. The article demonstrates that current legal and governance regimes for reducing SLCP emissions in the Arctic are complex and fragmented, which raises questions about the scope for this option for climate change and air pollution mitigation to reach its full potential. Nevertheless, the article concludes that fragmentation in this policy domain is of a cooperative or synergistic nature and therefore not problematic, provided that greater harmonization of legal instruments and enhanced cooperation between institutions are achieved. It also suggests options for strengthening international law and governance on SLCPs. Although the focus of the article is regional, many of its conclusions are relevant for the global regulation of SLCPs.

Keywords: Climate law, Short-lived climate pollutants, Fragmentation, Arctic

1. INTRODUCTION

Reducing emissions of short-lived climate pollutants (SLCPs) – particularly methane and black carbon – is an important way to mitigate global warming, while at the

* Centre for Climate, Energy and Environmental Law, Law School, University of Eastern Finland, Joensuu (Finland).
Email: yulia.yamineva@uef.fi.

** Centre for Climate, Energy and Environmental Law, Law School, University of Eastern Finland, Joensuu (Finland).
Email: kati.kulovesi@uef.fi.

We would like to thank Harro van Asselt and Sabaa Khan from the Centre for Climate, Energy and Environmental Law of the University of Eastern Finland, Sunday Leonard from the Climate and Clean Air Coalition, and two anonymous reviewers for *TEL* for their helpful comments on earlier drafts. This research is part of the research project 'Keeping the Arctic White: Regulatory Options for Reducing Short-Lived Climate Pollutants in the Arctic', funded by the Academy of Finland (Decision 285389).

same time reducing local air pollution and benefiting public health and agriculture. This opportunity to link global and local environmental agendas in a mutually beneficial way seems especially relevant for the Arctic region, which is warming more quickly than the global average and where climate change poses serious challenges to northern ecosystems, indigenous lifestyles and local livelihoods. However, as we demonstrate in this article, the current legal and governance landscape for reducing SLCP emissions in the Arctic is complex and fragmented, which raises the question of whether this interesting option for climate change and air pollution mitigation can live up to its full potential.

In addition to being subject to various national and European Union (EU) regulations, SLCP emissions in the Arctic region are regulated by a patchwork of international and regional legal instruments. The three key instruments are the multilateral regimes on air pollution, climate change and ozone protection. The main instrument to tackle air pollution in the northern hemisphere is the Convention on Long-Range Transboundary Air Pollution (CLRTAP)[1] and, in particular, the Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone (Gothenburg Protocol).[2] Climate change is addressed through the United Nations Framework Convention on Climate Change (UNFCCC),[3] its Kyoto Protocol,[4] and the Paris Agreement.[5] Hydrofluorocarbons (HFCs) fall within the recently amended Montreal Protocol on Substances that Deplete the Ozone Layer.[6] In addition to these multilateral environmental agreements (MEAs), the eight Arctic nations – Canada, Denmark, Finland, Iceland, Norway, Russia, Sweden and the United States (US) – have been seeking to strengthen action on SLCPs through cooperation within the Arctic Council.[7] Some of them also actively participate in the Climate and Clean Air Coalition to Reduce SLCPs (CCAC) which, although it does not engage in lawmaking activities, is of relevance. Furthermore, the prospect of reducing emissions from international shipping is being discussed within the International Maritime Organization (IMO).

---

1 Geneva (Switzerland), 16 Nov. 1979, in force 16 Mar. 1983, available at: http://www.unece.org/env/lrtap/lrtap_h1.htm.

2 Gothenburg (Sweden), 30 Nov. 1999, in force 15 May 2005, available at: http://www.unece.org/env/lrtap/multi_h1.html.

3 New York, NY (US), 9 May 1992, in force 21 Mar. 1994, available at: http://www.unfccc.int.

4 Kyoto (Japan), 11 Dec. 1997, in force 16 Feb. 2005, available at: http://unfccc.int/resource/docs/convkp/kpeng.pdf.

5 Paris (France), 12 Dec. 2015, in force 4 Nov. 2016, available at: http://unfccc.int/paris_agreement/items/9485.php.

6 Montreal (Canada), 16 Sept. 1987, in force 1 Jan. 1989, available at: http://ozone.unep.org/en/treaties-and-decisions/montreal-protocol-substances-deplete-ozone-layer.

7 Some of these countries also cooperate bilaterally on SLCPs; e.g., in 2016 the US and Canada announced joint efforts to reduce methane emissions from oil and gas systems. However, the future of this initiative is unclear under the current US president Donald Trump: see Sabin Center for Climate Change Law, 'Climate Deregulation Tracker' (2017), available at: http://columbiaclimatelaw.com/resources/climate-deregulation-tracker; R. Gasper & M. Frankel, 'With New Joint Announcement with Canada, US Gets Serious about Cutting Methane Emissions', *World Resources Institute*, 1 Mar. 2016, available at: http://www.wri.org/blog/2016/03/new-joint-announcement-canada-us-gets-serious-about-cutting-methane-emissions.

This legal and governance landscape on SLCPs in the Arctic is characterized by complexity and fragmentation. The various instruments and institutions vary in their focus and spatial scope, and there are clear overlaps in substantive coverage. The fragmentation of international law and governance is not a new phenomenon. Over the past decade, it has been discussed extensively in public international law and international relations scholarship, both in relation to international law in general[8] and in relation to international environmental law,[9] as well as climate law and governance.[10] Opinions vary regarding the impact of fragmentation on the effectiveness of international cooperation, with some scholars suggesting that fragmentation can further effectiveness.[11] In this article, we explore the challenges and opportunities presented by the complex and fragmented nature of the legal and governance landscape surrounding SLCPs in the Arctic.

The main objectives of this article are: (i) to map out the legal instruments and institutions relevant to reducing emissions of SLCPs in the Arctic (Section 3); (ii) to assess the legal and governance landscape in the context of its fragmentation, based on the analytical framework suggested by Biermann and co-authors[12] (Sections 4.1 and 4.2); and (iii) to identify options for strengthening the legal and governance response to SLCP emissions in the Arctic region and globally (Section 4.3). Section 2 gives a brief overview of climate change in the Arctic region and SLCPs, including their mitigation potential and mitigation benefits, while Section 5 summarises the article's conclusions. The article therefore amounts to the first comprehensive analysis of the legal and governance landscape on SLCPs in the Arctic.[13] Despite its regional focus, the article's conclusions are relevant to the global regulation of SLCPs, as many of the regimes and institutions discussed here have a global character. As an in-depth empirical study of fragmentation in a specific policy domain, it also contributes to academic scholarship on the fragmentation of international law and global governance.

---

8 For an overview of academic literature, see M.A. Young, 'Fragmentation', *University of Melbourne Legal Studies Research Paper No. 699*, 15 Dec. 2014, available at: http://papers.ssrn.com/abstract=2538247. The seminal study is International Law Commission (ILC), Study Group on the Fragmentation of International Law, *Fragmentation of International Law: Difficulties Arising from the Diversification and Expansion of International Law; Finalized by Martti Koskenniemi* (ILC, 2006).

9 See D.K. Anton, '"Treaty Congestion" in International Environmental Law', in S. Alam et al. (eds), *Routledge Handbook of International Environmental Law* (Routledge, 2012), pp. 651–65; H. van Asselt, 'Managing the Fragmentation of International Environmental Law: Forests at the Intersection of the Climate and Biodiversity Regimes' (2011) 44(4) *New York University Journal of International Law and Politics*, pp. 1205–78.

10 See H. van Asselt, *The Fragmentation of Global Climate Governance* (Edward Elgar, 2014); K. Kulovesi, *The WTO Dispute Settlement System. Challenges of the Environment, Legitimacy and Fragmentation* (Wolters Kluwer Law & Business, 2010).

11 F. Biermann et al., 'The Fragmentation of Global Governance Architectures: A Framework for Analysis' (2009) 9(4) *Global Environmental Politics*, pp. 14–40.

12 Ibid.

13 Khan analyses the work of the Arctic Council on SLCPs but does not cover other instruments and initiatives: S.A. Khan, 'The Global Commons through a Regional Lens: The Arctic Council on Short-Lived Climate Pollutants' (2017) 6(1) *Transnational Environmental Law*, pp. 131–52. Others have reflected on specific pollutants: e.g. C. Cavazos-Guerra, A. Lauer & E. Rosenthal, 'Clean Air and White Ice: Governing Black Carbon Emissions Affecting the Arctic', in K. Keil & S. Knecht (eds), *Governing Arctic Change* (Palgrave Macmillan, 2017), pp. 231–56.

2. THE ARCTIC AND SLCPs

2.1. *The Arctic Region and Climate Change*

The Arctic is the polar region covering the Earth's northernmost surface. It consists of the Arctic Ocean and parts of the US (Alaska), Canada, Denmark (Greenland and the Faroe Islands), Finland, Iceland, Norway, Sweden, and Russia.

All climate models predict that with the continuing growth of global greenhouse gas (GHG) emissions, the Arctic will continue to warm more quickly than the global average and experience losses in ice and snow cover.[14] Between 1980 and 2012, the Arctic summer sea ice lost approximately 75% of its volume and Greenland experienced melting in over 97% of its ice sheet surface.[15] This goes to show that climate change poses remarkable challenges to the region's vulnerable ecosystems.

Climate change is also affecting the living conditions of about four million people living in the Arctic. Approximately 10% of the population consists of indigenous peoples whose hunting, fishing and herding activities are threatened by the changing weather conditions. Conversely, as a result of climate change new natural resources and economic opportunities will become available[16] – for example, the exploitation of minerals and fisheries, as well as tourism, could increase as a result of the warming climate. The disappearance of Arctic sea ice could open areas to year-round navigation. Certain oil and gas reserves in the Arctic region are projected to become more attractive for exploration and exploitation with the changing climate.

2.2. *Benefits of SLCP Mitigation*

SLCPs include black carbon, methane, tropospheric ozone and some HFCs. Human activity has produced increases in air concentration of these substances, with impacts on both the global and the Arctic climate.[17] Methane and black carbon (soot), in particular, have a significant short-term warming effect. SLCPs also warm the Arctic by increasing overall global warming, which obviously also affects the Arctic region.[18]

International climate policy efforts have focused on carbon dioxide (CO_2) as the most important GHG. Indeed, climate science shows that anthropogenic climate change cannot be effectively prevented without reducing CO_2 emissions to close to zero by the end of this century.[19] However, reducing CO_2 emissions requires a radical

[14] US National Research Council, *The Arctic in the Anthropocene: Emerging Research Questions* (National Academies Press, 2014), available at: http://www.nap.edu/catalog/18726.

[15] Ibid., p. 15.

[16] T. Koivurova, 'Arctic Resources: Exploitation of Natural Resources in the Arctic from the Perspective of International Law', in E. Morgera & K. Kulovesi (eds), *Research Handbook on International Law and Natural Resources* (Edward Elgar, 2016), pp. 349–66.

[17] Arctic Monitoring and Assessment Programme (AMAP), *Summary for Policy-Makers: Arctic Climate Issues 2015* (AMAP, 2015), p. 2.

[18] Ibid., p. 8.

[19] Core Writing Team, R.K. Pachauri & L.A. Meyer (eds), *Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change (IPCC)* (IPCC, 2014), p. 20.

economic and energy transformation, which is proving difficult and time-consuming to achieve. While the Paris Agreement establishes ambitious goals, including that of holding 'the increase in the global average temperature to well below 2°C [degrees Celsius] above pre-industrial levels' and pursue 'efforts to limit the temperature increase to 1.5°C above pre-industrial levels', the world is not on track to meet these goals.[20]

According to estimates by the United Nations Environment Programme (UNEP) and the World Meteorological Organization (WMO), reducing SLCP emissions, especially methane and black carbon, could slow the rate of climate change by 0.5°C by 2040.[21] In the Arctic, avoided warming is estimated at 0.7°C.[22]

In addition to their warming impact, SLCPs are, in many cases, harmful air pollutants: aggressive efforts to cut these emissions could avoid 2.4 million premature deaths globally by 2030.[23] SLCP emissions reductions would also have positive impacts on agriculture and ecosystems. Acting on SLCPs alone, the Arctic nations could make incremental progress towards reducing regional (and global) warming.[24] By showing leadership, they could pave the way for enhanced global action, with clear benefits for the Arctic region.

2.3. *SLCP Mitigation and the Arctic*

Black carbon and methane are particularly significant pollutants in the Arctic context. Methane accounted for 16% of anthropogenic GHG emissions in 2010[25] and is the second most important anthropogenic contributor to global warming after CO_2.[26] Furthermore, it has the potential to cause global warming to an extent 34 times higher than that of CO_2 over a 100-year period.[27] Climate models show that methane has warmed the Arctic climate by 0.5°C to date, which is approximately twice its impact on overall global warming.[28] Methane stays in the atmosphere for approximately nine years and distributes itself throughout the global atmosphere,[29] which means that reductions in its levels anywhere in the world can reduce Arctic warming.[30]

---

20 Paris Agreement, n. 5 above, Preamble. Note by the UNFCCC Secretariat, 'Synthesis Report on the Aggregate Effect of the Intended Nationally Determined Contributions', UN Doc. FCCC/CP/2015/7, 30 Oct. 2015, available at: http://unfccc.int/resource/docs/2015/cop21/eng/07.pdf.

21 UNEP/WMO, *Integrated Assessment of Black Carbon and Tropospheric Ozone: Summary for Decision Makers* (UNEP/WMO, 2011), p. 172.

22 Ibid., p. 262.

23 UNEP, *Near-Term Climate Protection and Clean Air Benefits: Actions for Controlling Short-Lived Climate Forcers* (UNEP, 2011), Executive Summary, p. xii.

24 AMAP, n. 17 above, p. 10.

25 O. Edenhofer et al., 'Technical Summary', in O. Edenhofer et al. (eds), *Climate Change 2014: Mitigation of Climate Change. Contribution of Working Group III to the Fifth Assessment Report of the IPCC* (Cambridge University Press, 2014), pp. 33–110, at 45.

26 AMAP, n. 17 above, p. 4.

27 G. Myhre et al., 'Anthropogenic and Natural Radiative Forcing', in T. Stocker et al. (eds), *Climate Change 2013: The Physical Science Basis. Contribution of Working Group I to the Fifth Assessment Report of the IPCC* (Cambridge University Press, 2013), pp. 659–740, at 714.

28 This is explained by the Arctic amplification of climate change: AMAP, n. 17 above, p. 8.

29 Ibid., p. 4.

30 Ibid., p. 8.

Oil and gas production accounts for approximately one third of global anthropogenic emissions of methane and is therefore the main contributor to this problem.[31] In terms of natural sources, wetlands are the main source of methane emissions globally.[32] They are particularly relevant for the Arctic region where melting of the permafrost may lead to a significant increase in methane emissions.

It has been estimated that half of global methane emissions that arise from human activity could be eliminated by 2030 through existing mitigation technologies.[33] In geographical terms, the Arctic region has the largest technical abatement potential and Arctic countries could achieve one quarter of these reductions.[34] Methane emissions could be reduced through changes in venting and flaring practices in oil and gas fields; reducing methane leakage during natural gas production, transport and distribution; separating or treating biodegradable waste instead of dumping it into landfills; and improving coal-mining practices.[35]

Black carbon is a component of fine particulate matter, formed through incomplete combustion of fossil fuels and biomass. Its lifetime in the atmosphere ranges from several days to weeks, which means that it is possible to achieve quick results through emissions reductions. Black carbon warms the Earth by absorbing both incoming and outgoing solar radiation.[36] When deposited on ice and snow, it warms the climate by reducing the albedo effect: that is, the ability to reflect sunlight. Black carbon therefore plays an important role in the melting of Arctic snow and glaciers.

Sources of black carbon emit a complex mix of substances, some of which, such as organic carbon and sulphates, may cool the climate.[37] This has led to some uncertainty concerning the climate change mitigation potential of black carbon. According to estimates by the AMAP for 2015, the warming impact of black carbon in the Arctic is comparable with that of methane, although the level of uncertainty is greater.[38] Arctic nations are responsible for approximately 30% of Arctic warming as a result of their black carbon emissions.[39] The remainder results from black carbon emissions outside the region, which impact on the Arctic through accelerated global warming.[40]

Key sources of black carbon emissions in Canada and Russia are forest, grassland and agricultural fires.[41] In the Nordic countries and the US, black carbon emissions originate mostly from the combustion of fossil fuels (the use of diesel engines).[42]

31 Ibid., p. 6.

32 Ibid.

33 Ibid., p. 10.

34 Ibid.

35 Ibid.

36 Arctic Council Task Force on SLCPs, 'An Assessment of Emissions and Mitigation Options for Black Carbon for Arctic Council: Technical Summary', Apr. 2011, available at: https://oaarchive.arctic-council.org/bitstream/handle/11374/1612/3_1_ACTF_Report_02May2011_v2.pdf?sequence=1&isAllowed=y.

37 Ibid.

38 AMAP, n. 17 above, p. 9.

39 Ibid., p. 12.

40 Ibid., p. 9.

41 AMAP, *AMAP Assessment 2015: Black Carbon and Ozone as Arctic Climate Forcers* (AMAP, 2015), p. 86.

42 Ibid.

https://doi.org/10.1017/S2047102517000401 Published online by Cambridge University Press

Domestic sources, such as wood stoves, are also relevant in the Nordic countries and Russia.[43] In addition, the energy sector plays a role, with three quarters of its black carbon emissions resulting from oil and gas flaring.[44]

It has been estimated that black carbon emissions could be reduced even more quickly than methane emissions: three quarters of global anthropogenic emissions could be eliminated by 2030.[45] Reductions in black carbon emissions have already been achieved through regulation of diesel engines and vehicles, as well as fuels.[46] Potential for mitigation remains in terms of reducing emissions from residential and commercial use of fossil fuels, especially diesel; reducing emissions from wood burning in residential heating, agricultural burning and wildfires; and changing flaring practices in oil and gas fields, especially in Russia.[47]

Our analysis of the relevant legal response to SLCPs also covers HFCs. Unlike most other GHGs, these gases have no natural sources and originate only from human activities. Many have very high potential for global warming, making them particularly harmful to the climate. The most common HFC (HFC-134a) has a global warming potential of 1,430 times higher than that of CO_2. While the share of HFCs in global GHG emissions is currently low, the increase in their use since 1990 has been significant and is projected to grow by as much as thirtyfold by 2050.[48] HFCs are used as refrigerants, aerosol propellants, solvents, and fire retardants. A range of mature and sustainable alternatives already exist for HFCs.[49]

3. MAPPING THE LEGAL AND GOVERNANCE LANDSCAPE FOR SLCPs IN THE ARCTIC

Over the past two decades, climate policy discussions have tended to focus on CO_2 emissions, while SLCPs have played a marginal role in global cooperation. This is reflected in the fragmented state of the current legal and governance landscape, which consists of several MEAs (the Gothenburg Protocol, the Montreal Protocol, and the three climate change agreements – the UNFCCC, the Kyoto Protocol, and the Paris Agreement), as well as the Arctic Council, the IMO, and the CCAC. The following section explains in detail the focus of each of these arrangements, their geographic coverage, the regulatory and governance approaches taken, and recent developments.[50]

3.1. *The CLRTAP and the Gothenburg Protocol*

As a framework convention, the CLRTAP defines general principles of cooperation for air pollution abatement in the northern hemisphere. Through eight protocols, the

43 Ibid.

44 Ibid.

45 AMAP, n. 17 above, p. 11.

46 Ibid.

47 Ibid.

48 S.O. Andersen, J. Depledge & D. Brack, *A Global Response to HFCs through Fair and Effective Ozone and Climate Policies* (Royal Institute for International Affairs, 2014), p. 2.

49 Ibid, p. 3.

50 Legal and policy developments are reflected as of 15 June 2017.

https://doi.org/10.1017/S2047102517000401 Published online by Cambridge University Press

Convention's regime sets legally binding national targets for parties to reduce emissions of such pollutants as nitrogen oxides, volatile organic compounds (VOCs), heavy metals, and persistent organic pollutants (POPs). All Arctic nations are parties to the CLRTAP, but not all have joined its individual protocols.

The key instrument for SLCPs within the CLRTAP regime is the Gothenburg Protocol to Abate Acidification, Eutrophication and Ground-Level Ozone.[51] Adopted in 1999, the Protocol originally sought to control and reduce anthropogenic emissions of sulphur, nitrogen oxides, ammonia and VOCs. Pursuant to a 2012 amendment, the Protocol also sets emissions reduction targets for fine particulate matter ($PM_{2.5}$), into which category black carbon falls. As of 15 June 2017, the amendment was yet to enter into force, pending ratification by two thirds of the parties to the Protocol. Concerns over cost-effectiveness, austerity and implications of emissions cuts for the economy, as well as the lack of clear champions for clean air action among states, have been cited as reasons for the low participation.[52] Of the Arctic nations, only Sweden and the US have ratified the amendment. The other EU Arctic nations party to the Protocol – Denmark and Finland – are expected to ratify amendments to the Protocol following revisions to the EU Directive on National Emission Ceilings.[53] Norway ratified the Protocol in its original form but has not yet ratified its amendments. Canada, Iceland and Russia are yet to sign or ratify the Protocol, and discussions to engage them are ongoing.

The Gothenburg Protocol defines emissions reduction commitments as a percentage of emissions between 2005 and 2020. These emissions reductions are to be achieved by 2020 and beyond. However, while parties to the Protocol accept quantitative emissions targets for fine particulate matter, the black carbon component of their emissions reductions has not been specified. Instead, the Protocol includes several caveats. Accordingly, parties 'should, in implementing measures to achieve their national targets for particulate matter, give priority, to the extent they consider appropriate, to emission reduction measures which also significantly reduce black carbon'.[54] In addition, 2014 saw the adoption of new Guidelines for Reporting Emissions and Projections, which require parties to submit emissions inventories for fine particulate matter on an annual basis and projection reports on a four-yearly basis from 2015.[55] Parties are also 'strongly encouraged' to report their emissions inventories for black carbon, and all Arctic nations have already provided such inventories.[56]

---

[51] N. 2 above.

[52] A. Byrne, 'Trouble in the Air: Recent Developments under the 1979 CLRTAP' (2017) 26(3) *Review of European, Comparative & International Environmental Law*, pp. 210–19.

[53] These revisions incorporate the Protocol's amendments into EU law: Directive (EU) 2016/2284 on the Reduction of National Emissions of Certain Atmospheric Pollutants, amending Directive 2003/35/EC and repealing Directive 2001/81/EC [2016] OJ L 344/1; Byrne, ibid.

[54] Gothenburg Protocol, n. 2 above, Art. 2.2; see also Art. 3.1.

[55] 'Guidelines for Reporting Emissions and Projections Data under the CLRTAP', UN Doc. ECE/EB.AIR/125, 13 Mar. 2014.

[56] Expert Group on Black Carbon and Methane, *Summary of Progress and Recommendations* (Arctic Council, 2017), p. 14, available at: https://oaarchive.arctic-council.org/handle/11374/1936.

The Protocol does not specify a timeline for its future development. However, it hints at the potential strengthening of control and the reduction of emissions in the future. For instance, in stating its objective, the Protocol refers to ensuring that 'in the long term and in a stepwise approach, taking into account advances in scientific knowledge' atmospheric concentrations do not exceed specified amounts.[57]

Overall, the Gothenburg Protocol is a good illustration of the CLRTAP's evolution and increased sophistication over time.[58] The early protocols under the CLRTAP addressed single pollutants and a single environmental problem, such as acid rain.[59] This was done through establishing a single emissions ceiling applicable to all parties. In contrast, the Gothenburg Protocol targets several substances and their broad-ranging effects[60] and is therefore described as a multi-pollutant, multi-effect legal instrument. Its emissions ceilings for fine particulate matter are based on the concept of critical levels, which focuses on the health and environmental effects of exposure to pollutant concentrations in the atmosphere. In addition, the Protocol encourages parties to use the best available techniques to abate emissions.[61]

For the regulation of SLCP emissions in the Arctic region, the Gothenburg Protocol is significant both as a regional agreement and as the only MEA to explicitly include black carbon in its scope.

3.2. *The UNFCCC, the Kyoto Protocol and the Paris Agreement*

The UNFCCC is the main international legal framework to tackle climate change and, to date, two agreements – the Kyoto Protocol of 1997 and the Paris Agreement of 2015 – have been adopted under its auspices.

The emissions reduction targets in the Kyoto Protocol apply to a basket of six GHGs, including methane and HFCs. While these two SLCPs have thus been subject to binding emissions reduction targets for developed countries since the Protocol's first commitment period in 2008–12, the limited coverage of the Protocol in terms of countries and global GHG emissions has constituted a key challenge to the successful mitigation of SLCPs. The Protocol does not set emissions reduction targets for developing countries, and its second commitment period[62] excludes three Arctic nations (the US, Canada and Russia).[63] In this sense, the Kyoto Protocol is not seen as

[57] Gothenburg Protocol, n. 2 above, Art. 2.1.

[58] P. Sands & J. Peel, *Principles of International Environmental Law* (Cambridge University Press, 2012), p. 257.

[59] Ibid.

[60] Ibid.

[61] Relevant guidance was adopted in 2015: 'Guidance Document on Control Techniques for Emissions of Sulphur, NOx, VOC, and Particulate Matter (including PM_{10}, $PM_{2.5}$ and Black Carbon) from Stationary Sources', UN Doc. ECE/EB.AIR/117, 23 Jan. 2015.

[62] The so-called Doha amendment of 2012, which introduced new emissions reduction targets for the second commitment period from 2013 to 2020, is yet to enter into force, pending ratification by three-quarters of the parties.

[63] The US has never ratified the Kyoto Protocol and Canada withdrew from it during the first commitment period in 2005. Russia is still party to the Protocol but does not participate in its second commitment period.

an effective instrument for reducing methane and HFC emissions in the Arctic, or indeed globally.

As for the Paris Agreement, as of December 2017, all Arctic countries except Russia and potentially the US participated in the Agreement: the US has indicated its future intention to withdraw,[64] and Russia – although a signatory to the Agreement – has not yet ratified it.[65]

A significant feature of the Paris Agreement in terms of its potential impact on SLCP emissions is its country-driven approach to mitigation, according to which parties define and regularly update their nationally determined contributions (NDCs). Each country enjoys broad discretion in defining the scope and contents of its NDC, including with respect to the types of emission covered by the NDC.[66] However, the Paris Agreement lays down several procedural obligations, including the requirement that each NDC must reflect progression beyond the existing pledge and reflect the highest possible ambition.[67] Obligations related to NDCs are complemented by international norms on reporting and transparency.

Arguably, the NDC approach to mitigation under the Paris Agreement leaves ample scope to accommodate diverse mitigation efforts[68] and could constitute an interesting opening for strengthening action on SLCPs under the UNFCCC. By June 2017, 142 countries had communicated their first NDCs. Most of these focus on CO_2, but many also include methane. All Arctic nations included methane in their first or intended NDCs. Globally, 27 countries (including India, Mexico, and Chile) specifically mentioned SLCPs in their intended NDCs.[69] Interestingly, some NDCs also include black carbon emissions for the first time in the history of the UN climate regime. This supports our argument that the Paris Agreement's mitigation framework is potentially conducive to strengthening global action on SLCPs.

The Paris Agreement also includes provisions for a periodic stocktake 'to assess the collective progress towards achieving the purpose of this Agreement and its long-term goals', covering mitigation, adaptation and support.[70] The stocktake is formally due to start in 2023 but a Facilitative Dialogue to test the format is scheduled for 2018. The sources of input for the stocktake will include combined information on

64 The White House, 'Statement by President Trump on the Paris Climate Accord', 1 June 2017, available at: https://www.whitehouse.gov/the-press-office/2017/06/01/statement-president-trump-paris-climate-accord.

65 The Russian government recently indicated that ratification is planned around 2019: P. Tarasenko, E. Chernenko & A. Davydova, 'Буря после дури' (transliteration 'Burya posle duri' ['Storm after Folly']), *Kommersant*, 6 Mar. 2017, available at: https://www.kommersant.ru/doc/3317347?query=%D1%82%D0%B0%D1%80%D0%B0%D1%81%D0%B5%D0%BD%D0%BA%D0%BE%20%D1%87%D0%B5%D1%80%D0%BD%D0%B5%D0%BD%D0%BA%D0%BE%20%D0%B4%D0%B0%D0%B2%D1%8B%D0%B4%D0%BE%D0%B2%D0%B0 (in Russian).

66 The rules for implementing the Paris Agreement are currently under negotiation.

67 Paris Agreement, n. 5 above, Art. 4.2.

68 We have made the same argument in the context of fossil fuel subsidies in H. van Asselt & K. Kulovesi, 'Seizing the Opportunity: Tackling Fossil Fuel Subsidies under the UNFCCC' (2017) 17(3) *International Environmental Agreements: Politics, Law and Economics*, pp. 357–70.

69 *INDC SLCP Summaries* (CCAC Secretariat and Institute for Governance and Sustainable Development, 2016), available at: http://www.ccacoalition.org/en/news/15-countries-address-slcps-and-air-pollution-part-their-indcs.

70 Paris Agreement, n. 5 above, Art. 14.

NDCs and assessments by the Intergovernmental Panel on Climate Change (IPCC).[71] This creates another opening to discuss the role of SLCP emissions reductions in achieving climate objectives.

The COP-21 decision accompanying the Paris Agreement is also significant. Apart from establishing procedures for putting the treaty into practice, it contains a section on enhanced pre-2020 action. This section, among other things, aims to strengthen the technical examination process of opportunities for action with high mitigation potential, which was set up by COP-19.[72] The process essentially consists of a series of expert meetings to share policies, practices and actions,[73] and represents an opportunity for technical discussion on SLCPs in the UNFCCC regime.

Overall, the Paris Agreement envisions a long-term response to climate change. It adopts a country-driven approach to mitigation and does not specify which emissions should be included in a country's NDC. Therefore, while it does not require mitigation of SLCP emissions, the Paris Agreement offers some interesting openings to strengthen action on these pollutants in ways that could be beneficial for the Arctic region.

3.3. *The Montreal Protocol on Substances that Deplete the Ozone Layer*

The Montreal Protocol has often been hailed as one of the most successful MEAs.[74] It includes legal obligations that restrict the production and consumption of 'controlled substances'. The Protocol also covers measures to regulate trade in controlled substances with non-parties, as well as trade in substances containing controlled substances and substances produced with controlled substances.[75] All Arctic nations are parties to the Montreal Protocol.

From the perspective of SLCPs, the Montreal Protocol is relevant because its decisions to phase out chlorofluorocarbons (CFCs) and hydrochlorofluorocarbons (HCFCs) have led to increases in the use of HFCs.[76] HFCs are used in many of the same appliances, such as refrigeration and air-conditioning equipment. Increasing the use of HFCs has, in fact, been actively encouraged through the Montreal Protocol's Multilateral Fund, which provided support for using HFCs as alternatives for HCFCs.[77] This obviously constituted a serious concern from the point of view of global climate change mitigation efforts given that HFCs are highly potent GHGs.

---

71 Decision 1/CP.21, 'Adoption of the Paris Agreement', UN Doc. FCCC/CP/2015/10/Add.1, 29 Jan. 2016, Art. 100.

72 Decision 1/CP.19, 'Further Advancing the Durban Platform', UN Doc. FCCC/CP/2013/10/Add.1, 31 Jan. 2014, Art. 5a.

73 One of the past meetings addressed non-CO_2 gases; see: http://unfccc.int/focus/mitigation/technical_expert_meetings/items/8179.php.

74 Sands & Peel, n. 58 above, p. 265.

75 Ibid., p. 271.

76 For a comprehensive overview of the topic, see R.E. Kim & H. van Asselt, 'Global Governance: Problem-Shifting in the Anthropocene and the Limits of International Law', in Morgera & Kulovesi n. 16 above, pp. 473–95.

77 Ibid.

https://doi.org/10.1017/S2047102517000401 Published online by Cambridge University Press

Against this background, the parties to the Montreal Protocol adopted an amendment to the Protocol in 2016 in Kigali (Rwanda) (the Kigali Amendment). The amendment adds HFCs to the list of substances controlled under the treaty and to be phased out,[78] and commits parties to the Protocol to reducing HFC use by 80% to 85% by the late 2040s. Developed and developing countries are subject to different phase-out schedules: the former are required to start reductions in 2019 and most of the latter have to freeze consumption of HFCs in 2024 and start reductions in 2029. Some developing countries are among the hottest in the world – such as India, Iran and Pakistan – and are accordingly on a more flexible schedule, with the freeze year in 2028 and the start of reductions in 2032. The amendment is yet to enter into force, pending ratification by at least 20 parties.

In sum, the ozone regime is a well-established and successful international legal framework, which has recently been amended to include an obligation to phase out HFCs. The relevant control measures are based on a top-down approach with more flexible phase-out schedules for developing countries. Once the Kigali Amendment enters into force, the Montreal Protocol will provide a strong global legal framework to mitigate certain types of SLCP emission, thereby also being of benefit to the Arctic region.

3.4. *The Arctic Council*

The Arctic Council was created in 1996 as an intergovernmental forum for cooperation between the eight Arctic states.[79] It has a long history of promoting collaboration on environmental matters. The Arctic Council can be described as a 'soft law body'[80] and mainly produces informal documentation such as guidelines, assessments and recommendations, which it 'does not and cannot implement or enforce'.[81] Recently, however, the Council has been engaged in traditional lawmaking by providing a forum for negotiating legally binding instruments – for example, the 2017 Agreement on Enhancing International Arctic Scientific Cooperation.[82]

The work of the Arctic Council on SLCPs began by marshalling scientific knowledge on black carbon and methane under the Task Force on SLCPs, which produced a first report in 2011[83] and a second in 2013.[84] To follow up on this

[78] UNEP, 'Frequently Asked Questions relating to the Kigali Amendment to the Montreal Protocol', 17 Feb. 2017, available at: http://ozone.unep.org/sites/ozone/files/pdfs/FAQs_Kigali_Amendment.pdf.

[79] Six indigenous peoples' organizations are considered 'permanent participants' and must be consulted before decisions are taken. Non-Arctic countries as well as intergovernmental organizations (IGOs) and non-governmental organizations (NGOs) can participate in the work of the Arctic Council as observers. For an overview of the history and work of the Arctic Council, see T. Koivurova & D. VanderZwaag, 'The Arctic Council at 10 Years: Retrospect and Prospects' (2007) 40(1) *University of British Columbia Law Review*, pp. 121–94, available at: http://papers.ssrn.com/abstract=1860308.

[80] T. Koivurova, P. Kankaanpää & A. Stępień, 'Innovative Environmental Protection: Lessons from the Arctic' (2015) 27(2) *Journal of Environmental Law*, pp. 285–311.

[81] 'The Arctic Council: A Backgrounder', 20 May 2015 (updated 3 Jan. 2018), available at: http://www.arctic-council.org/index.php/en/about-us.

[82] Fairbanks, AK (US), 11 May 2017, available at: https://oaarchive.arctic-council.org/handle/11374/1916.

[83] Arctic Council Task Force on SLCPs, 'Progress Report and Recommendations for Ministers', 2011, p. 1, available at: https://oaarchive.arctic-council.org/handle/11374/79.

[84] Arctic Council Task Force on SLCPs, 'Recommendations to Reduce Black Carbon and Methane Emissions to Slow Arctic Climate Change', 2013, available at: https://oaarchive.arctic-council.org/handle/11374/80.

scientific and technical work, the Arctic Council created a Task Force for Action on Black Carbon and Methane[85] in 2013. The Task Force was instructed to 'develop arrangements on actions to achieve enhanced black carbon and methane emission reductions in the Arctic'.

As a result, the 2015 Arctic Council Ministerial Meeting adopted its Framework for Action on Enhanced Black Carbon and Methane Emission Reductions.[86] The Framework seeks to accelerate the decline of black carbon emissions and significantly reduce methane emissions. Accordingly, the Arctic states commit to reducing these emissions through the development of national action, action plans and mitigation strategies.

The Framework creates a two-year iterative process, driven by an Expert Group to periodically assess progress made. As part of this periodic assessment, the Expert Group presents a Summary of Progress and Recommendations to the Arctic Council ministers. Following the first report of the Expert Group in 2017,[87] the Arctic Council Ministerial Meeting adopted an 'aspirational collective goal' of limiting black carbon emissions by between 25% and 33% below 2013 levels by 2025.[88] This is the first regional goal on black carbon. It should be noted that the target is based largely on the implementation of existing policies. Based on projections submitted by most of the Arctic states, their black carbon emissions are already estimated to decrease by 24% from 2013 by 2025.[89] Emissions reductions beyond current projections would require additional measures among Arctic states.

An important feature of the Framework is that it builds on enhanced emissions inventories and information. Under the Framework, the Arctic states commit to developing and improving black carbon emissions inventories and projections using, where possible, CLRTAP guidelines. They also agree to enhance expertise in the development of such inventories by working through the Arctic Council and other relevant bodies. In addition, the Arctic states agree to continue to improve emissions inventories and projections for methane as reported under the UNFCCC.

The Framework endorses a four-year cycle of scientific reporting, including the assessment of the status and trends of SLCPs in the Arctic, with a focus on the impact of anthropogenic emissions on Arctic climate and public health. The Framework outlines plans to raise awareness of the impact of black carbon and methane emissions locally and internationally, especially with Arctic Council observer states and other states whose emissions potentially impact upon the Arctic region.

---

85 Arctic Council, 'Kiruna Declaration', 15 May 2013, Kiruna (Sweden), available at: https://oaarchive.arctic-council.org/handle/11374/93.

86 Arctic Council, 'Enhanced Black Carbon and Methane Emission Reductions: An Arctic Council Framework for Action', 24–25 Apr. 2015, Iqaluit, Nunavut (Canada), available at: https://oaarchive.arctic-council.org/handle/11374/610.

87 Expert Group on Black Carbon and Methane, 'Summary of Progress and Recommendations', 11 May 2017, Fairbanks, AK (US), available at: https://oaarchive.arctic-council.org/handle/11374/1936.

88 Arctic Council, 'Fairbanks Declaration', 10–11 May 2017, Fairbanks, AK (US), available at: https://oaarchive.arctic-council.org/handle/11374/1910; Expert Group on Black Carbon and Methane, ibid.

89 Expert Group on Black Carbon and Methane, ibid., p. 4.

Through the Framework, the Arctic states expressly resolve to implement sector and project-based activities within the Arctic Council and nationally, which will focus on sectors identified as the most significant and emerging sources of black carbon and methane emissions. A particular sector or area may be selected for sustained attention over a two-year period.

Recognizing that black carbon and methane emitted outside the region have a substantial impact on the Arctic, the Framework notes that robust mitigation action by Arctic Council observer states is 'vital' for overall success. It thus welcomes the participation of those states in the implementation of the Framework. The Framework also highlights the role of the private sector, especially in areas such as transport and oil and gas, and invites it to participate in the Framework's implementation. The Arctic states have the intention of working with financial institutions to promote the financing of activities to reduce black carbon and methane emissions, and to bring such considerations into the mainstream in terms of decision making over funding.

By its nature, the Arctic Council Framework is a soft law instrument, and the 2017 collective goal for reducing black carbon emissions is merely aspirational. At the same time, the work to develop and improve emissions inventories – especially for black carbon – can be seen as an important and welcome first step in the process of reducing SLCP emissions with harmful impacts on the Arctic. Indeed, by late 2016, all the Arctic states and five observer states, including India, had submitted their inventories for black carbon.[90] Most Arctic states also provided black carbon projections.

By adopting an aspirational collective goal to limit black carbon emissions, the Arctic states seek to fill the gap in the legal and governance landscape on black carbon. Indeed, the Gothenburg Protocol does not address black carbon directly and its relevant amendments have not entered into force. Furthermore, the adoption of a regional target on black carbon under the Arctic Council reflects a political agreement that can raise the profile of the issue in both national and international policy. This contrasts favourably with the CLRTAP process, which is largely technical in nature and confined to ministries responsible for the environment.

The establishment of the process for periodic expert assessment of the progress made and scientific reporting is also significant. The Arctic Council has been successful in the past in influencing regional and national policy making through large-scale scientific assessments: for instance, its early work on POPs influenced negotiations on a POPs protocol under the CLRTAP and on the 2001 Stockholm Convention on Persistent Organic Pollutants.[91] In pushing for stronger action on SLCPs in other fora, the Arctic Council has the ability to highlight the impacts of SLCPs on Arctic communities, capitalizing on the role of its permanent participants, as it did in respect of POPs. In addition, in its ambition to reach a wider group of non-Arctic countries and stakeholders, the Arctic Council's approach may be more

[90] Expert Group on Black Carbon and Methane, ibid., p. 39.

[91] Stockholm (Sweden), 22 May 2001, in force 17 May 2004, available at: http://www.pops.int; Koivurova, Kankaanpää & Stępień, n. 80 above.

inclusive, and therefore potentially able to inspire action and promote responsibility among businesses, cities, local government, and citizens.[92]

Overall, the Framework can be characterized as a positive development, potentially paving the way for more ambitious future mitigation measures. However, more work is required to monitor its longer-term implementation and impact.

3.5. *The International Maritime Organization*

The International Maritime Organization (IMO) is a UN agency for intergovernmental cooperation in regulating shipping engaged in international trade. All Arctic nations are members of the IMO. The Organization addresses environmental issues through its Marine Environment Protection Committee and has adopted a number of conventions to address marine pollution and oil spills, of which the International Convention for the Prevention of Pollution from Ships of 1973 (MARPOL)[93] is the most significant.

With the exception of ozone-depleting substances, the IMO has thus far not addressed SLCPs directly. However, it has relevant regulatory experience in relation to air pollutants and GHGs. For example, Annex VI was added to MARPOL in 1997 to limit the main air pollutants emitted by ships, including sulphur oxides and nitrous oxides, and prohibit the deliberate emitting of ozone-depleting substances. In 2011 the IMO adopted a package of energy efficiency regulations for ships,[94] which are expected to significantly reduce GHG emissions.

During the last few years, discussion in the IMO has also focused on the issue of black carbon. Ships produce more particulate matter and black carbon per unit of fuel than other fossil fuel combustion sources because a different quality of fuel is used. Marine shipping activity is expected to increase worldwide, although the extent of the increase to be expected in the Arctic is unclear.[95] Black carbon has been discussed extensively in the IMO both separately and as part of particulate matter,[96] but progress has been slow. The Marine Environment Protection Committee adopted a definition of black carbon in 2015 after four years of deliberations, and some headway was made on the measurement of black carbon.[97] The focus of the discussions is now expected to shift to control measures.

---

92 It has been suggested that it is precisely the Council's informal nature that positions it as an example of 'global experimentalist governance' and an iterative, participatory and non-hierarchical form of global regulation: see Khan, n. 13 above, p. 145.

93 London (United Kingdom), 2 Nov. 1973, in force 2 Oct. 1983, available at: http://www.imo.org/en/About/conventions/listofconventions/pages/international-convention-for-the-prevention-of-pollution-from-ships-(marpol).aspx.

94 IMO, Marine Environment Protection Committee Resolution, 'Amendments to the Annex of the Protocol of 1997 to amend the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto (Inclusion of Regulations on Energy Efficiency for Ships in MARPOL Annex VI)', UN Doc. MEPC 62/24/Add.1, 15 July 2011.

95 Arctic Council Task Force on SLCPs, n. 84 above.

96 Litehauz et al., 'Investigation of Appropriate Control Measures (Abatement Technologies) to Reduce Black Carbon Emissions from International Shipping', 20 Nov. 2012, available at: http://www.imo.org/en/OurWork/Environment/PollutionPrevention/AirPollution/Documents/Air%20pollution/Report%20IMO%20Black%20Carbon%20Final%20Report%2020%20November%202012.pdf.

97 S. Kopela, 'Making Ships Cleaner: Reduction of Air Pollution from International Shipping' (2017) 26(3) *Review of European, Comparative & International Environmental Law*, pp. 231–42.

In parallel, the IMO in 2014 adopted the International Code for Ships Operating in Polar Waters (Polar Code),[98] which applies to both the Arctic and the Antarctic. However, although the Code contains a number of provisions on the prevention of environmental pollution, including pollution from oil and sewage and garbage from ships, they do not cover black carbon emissions.

Addressing climate change and reducing GHG emissions in the IMO context has been complicated by the uncertain and contentious relationship between the IMO and the UNFCCC.[99] For a long time, it was unclear whether the UNFCCC or the IMO was the appropriate arena for the international regulation of GHG emissions from shipping. The Paris Agreement is silent on the subject, which means that global action on GHG emissions from shipping is to be expected from the IMO. Discussions on regulating GHG emissions from shipping have been especially contentious as a result of a conflict of principles: while the principle of common but differentiated responsibilities underpins the global climate change regime, the IMO regime is based on non-discrimination and universality, which means that rules apply to all ships regardless of their ownership or flag.[100] The non-discrimination principle impedes discussion in the IMO of commitments to reduce emissions and of support mechanisms such as finance and technology transfer.

Hence, the IMO has ongoing discussions on how to address black carbon emissions in international shipping, but thus far no concrete measures have been developed.

3.6. *The Climate and Clean Air Coalition*

The CCAC is a government-led public–private partnership, which was launched in 2011. Its aims include raising awareness of SLCP impacts and mitigation approaches, as well as strengthening and developing national and regional actions. The CCAC also includes capacity building and seeks to mobilize support, promote best practices, and improve scientific understanding of SLCPs.[101] Its initial focus is on black carbon, methane and HFCs.[102]

Despite its recent establishment, the CCAC has been successful in mobilizing the participation of 53 state partners, including all the Arctic states except Iceland. More than 60 non-state partners – including IGOs and NGOs – have also joined. By joining the CCAC, states or other stakeholders sign up only for the generic responsibility to

98 Nov. 2014, in force 1 Jan. 2017, available at: http://www.imo.org/en/MediaCentre/HotTopics/polar/Pages/default.aspx.

99 S. Kopela, 'Climate Change, Regime Interaction, and the Principle of Common but Differentiated Responsibility: The Experience of the International Maritime Organization' (2014) 24(1) *Yearbook of International Environmental Law*, pp. 70–101.

100 Ibid.; Md S. Karim, *Prevention of Pollution of the Marine Environment from Vessels: The Potential and Limits of the IMO* (Springer, 2015), pp. 119–23. See also K. Kulovesi & J. Dafoe, 'International Civil Aviation Organization and IMO: International Sectoral Approaches to GHG Reductions in the Transport Sector', in D.A. Farber & M. Peeters (eds), *Climate Change Law* (Edward Elgar, 2016), pp. 274–85.

101 Framework for the CCAC to Reduce SLCPs, Doc. No. HLA/SEP2014/4A, 22 Sept. 2014.

102 Ibid.

take 'meaningful action to address SLCPs'.[103] Other than that, each partner 'determines the nature of its participation'.[104]

The CCAC has launched seven initiatives focusing on specific sectors or sources of SLCPs: agriculture, brick production, stoves used in household cooking and domestic heating, heavy-duty diesel vehicles and engines, HFCs, oil and natural gas production, and municipal solid waste. Thus far, the CCAC has shown itself to be innovative in tailoring its activities and strategies for specific sectors. It has not addressed the issue of SLCPs in the Arctic *per se*, but its work on emissions from diesel and the oil and gas industry, as well as waste and agriculture, is highly relevant for the Arctic. The CCAC has also undertaken four cross-cutting initiatives: (i) financing mitigation of SLCPs; (ii) regional assessments of SLCPs; (iii) supporting national planning; and (iv) health. Some initiatives have work streams on specific issues. Activities vary from initiative to initiative but commonly include high-level policy advocacy and building buy-in by private actors, the development of policies and regulations in developing countries, the mapping of knowledge and best practices, the development of toolkits, and the development of avenues for information exchange and mutual learning. The CCAC also facilitates financing, for example, for clean stoves.

Interestingly, the CCAC actively fosters links with formal international lawmaking processes. It frequently holds meetings on the sidelines of the official meetings under the climate and ozone regimes. Furthermore, UN Environment has been active in the establishment and current work of the CCAC, including the provision of secretariat services. It has been noted that 'the links to the UN system, and in particular the active participation of UNEP in the Coalition, lends greater political credence to the Coalition's activities'.[105]

The key role of the CCAC seems to be that of building an international arena for knowledge and information exchange on SLCPs. To what extent this function will lead to stronger action on SLCPs at the national or international levels is, however, difficult to predict. In principle, consolidation and the sharing of knowledge and best practice may lead to mutual learning that can advance action on SLCPs. This may be particularly relevant for developing countries where such knowledge is unavailable and technical expertise is scarce. A clearing house function can also be useful for highly fragmented sectors with multiple stakeholders and regulatory venues. On the other hand, for highly condensed sectors with fewer stakeholders, such as the oil and gas industry, such a function may be less useful, especially in the presence of parallel initiatives with similar goals.[106]

To sum up, the CCAC is the key global vehicle that focuses on SLCPs. Since its main activities are awareness raising, knowledge exchange and capacity building,

[103] Ibid.

[104] Ibid.

[105] H. van Asselt, *Alongside the UNFCCC: Complementary Venues for Climate Action* (Centre for Climate and Energy Solutions, 2015).

[106] E.g., the Global Methane Initiative (http://www.globalmethane.org) and the World Bank's Zero Routine Flaring by 2030 Initiative (http://www.worldbank.org/en/programs/zero-routine-flaring-by-2030).

it does not engage directly in lawmaking activities, but it has arguably played a role in raising awareness on SLCPs and identifying mitigation opportunities at the national and international levels.

4. ASSESSMENT OF THE LEGAL AND GOVERNANCE LANDSCAPE AND OPPORTUNITIES FOR ITS FUTURE DEVELOPMENT

The legal and governance landscape of SLCPs in the Arctic consists of a patchwork of various international instruments and organizations, and can thus be described as fragmented. Although some coordination between the various instruments and organizations takes place, there is no centralized interface and strategic oversight. The question arises whether the current state of regional and global cooperation is optimal for exploiting the mitigation potential of SLCPs in the Arctic. To draw some conclusions in this regard, we analyze the legal and governance landscape from a fragmentation perspective. We first explain the academic debate on the fragmentation of international law and global governance and set out a framework for assessing fragmentation as suggested by Biermann and his co-authors. We then apply this framework to analyze the type of fragmentation across legal instruments and institutions concerning SLCPs in the Arctic, in order to determine whether fragmentation is problematic in this context. Finally, we explore opportunities to strengthen the regulation and governance of SLCPs in the Arctic.

4.1. *The Fragmentation of International Law and Governance*

The debate on the fragmentation of public international law – in other words, 'uneven normative and institutional development and evolution in inter-state relations'[107] – drew impetus from a report of the International Law Commission (ILC) published a decade ago.[108] The ILC framed the issue of fragmentation by reference to the emergence under international law of such specialist systems as 'trade law', 'human rights law', 'environmental law', 'the law of the sea', and 'European law'.[109] The ILC report asserted that lawmaking in such specialized fields ignored developments in other fields as well as general principles and practices of international law. The ILC concluded that the fragmentation of law results in 'conflicts between rules or rule-systems, deviating institutional practices and, possibly, the loss of an overall perspective on law'.[110]

The concept of fragmentation has since been adopted by international relations scholars to analyze international and transnational institutions and public–private partnerships, especially in relation to the environment.[111] In this respect, this work is

[107] Young, n. 8 above.
[108] ILC Study Group on the Fragmentation of International Law, n. 8 above.
[109] Ibid., p. 11.
[110] Ibid., p. 11.
[111] E.g., Biermann et al., n. 11 above.

https://doi.org/10.1017/S2047102517000401 Published online by Cambridge University Press

closely linked to scholarship on institutional complexity[112] and, in particular, to studies on institutional interlinkages[113] and regime complexes.[114]

Some of the scholarship has been critical of the terminology of 'fragmentation', either because it is seen as having a negative bias, or (unrealistically) on the basis of the assumption that there has been, or should be, some kind of 'unity' in international law.[115] This article treats fragmentation as a neutral phenomenon, which can have both positive and negative impacts. Fragmentation here refers to 'the increased specialization and diversification in international institutions, including the overlap of the substantive rules and jurisdictions'.[116]

As we have shown, the legal and governance landscape of SLCPs in the Arctic is fragmented. The question of how to strengthen it is closely related to the consequences of this fragmentation. Here, Biermann and his co-authors usefully draw attention to different types of fragmentation. In this respect, they suggest analyzing the degree of institutional integration and the extent of overlaps between decision-making systems; the existence and degree of norm-conflicts; and the type of actor constellation.[117] Based on these criteria, they identify three types of fragmentation:

- synergistic fragmentation;
- cooperative fragmentation; and
- conflictive fragmentation.

This typology serves as a useful analytical tool, with the caveat that, in the real world, the boundaries between the three types of fragmentation may be blurred.

Synergistic fragmentation refers to situations in which one core institution exists and the institutional arrangements, although distinct from each other, are highly integrated (degree of institutional integration); there are effective and detailed general principles (existence and degree of norm conflicts); and nearly all countries are included (types of actor constellation).[118] An example of synergistic fragmentation is the ozone regime, for which the 1985 Vienna Convention for the Protection of the Ozone Layer[119] and the 1987 Montreal Protocol[120] serve as an overarching framework for all related institutions and amendments.[121]

---

[112] F. Zelli, 'Institutional Fragmentation', in P. Pattberg & F. Zelli (eds), *Encyclopedia of Global Environmental Governance and Politics* (Edward Elgar, 2015), pp. 469–70.

[113] O.S. Stokke & S. Oberthür (eds), *Managing Institutional Complexity: Regime Interplay and Global Environmental Change* (The MIT Press, 2011); H. Selin & S.D. VanDeveer, 'Mapping Institutional Linkages in European Air Pollution Politics' (2003) 3(3) *Global Environmental Politics*, pp. 14–46.

[114] R.O. Keohane & D.G. Victor, 'The Regime Complex for Climate Change' (2011) 9(1) *Perspectives on Politics*, pp. 7–23.

[115] Van Asselt, n. 10 above, p. 32.

[116] Ibid., p. 35.

[117] Biermann et al., n. 11 above, pp. 19–20.

[118] Ibid.

[119] Vienna (Austria), 22 Mar. 1985, in force 22 Sept. 1988, available at: http://ozone.unep.org.

[120] N. 6 above.

[121] Biermann et al., n. 11 above, pp. 19–20.

In situations of *cooperative fragmentation*, different institutions and decision-making processes are only loosely integrated; relations between their norms and principles are ambiguous; and the core institution does not cover all relevant countries.[122] However, the degree of cooperation is sufficient to avoid open conflicts between different institutions or norms.[123] In the view of Biermann and his co-authors, the relationship between the UNFCCC and the Kyoto Protocol offers an example of such cooperative fragmentation.

Finally, *conflictive fragmentation* occurs when different institutions are poorly connected and have different decision-making procedures; principles and norms are in conflict; and different sets of actors participate in different institutional arrangements.[124] Conflictive fragmentation takes place, for instance, in respect of access to and sharing the benefits of plant genetic resources, where two regimes – the Convention on Biological Diversity[125] and the Agreement on Trade-Related Aspects of Intellectual Property Rights[126] – seek to regulate the issue area at hand.[127]

Biermann and his co-authors conclude that different types of fragmentation indeed result in different types of performance. Cooperative fragmentation has both advantages and disadvantages, while conflictive fragmentation seems to bring about more costs than benefits and, in this sense, appears to be undesirable.[128] As for the synergistic type of fragmentation, Biermann and co-authors describe it as 'a realistic second-best option in a world of diversity and difference in which purely universal governance architectures are more a theoretical postulate than a real-life possibility'.[129] On this basis, it can be concluded that synergistic fragmentation is better than cooperative fragmentation, while conflicting fragmentation should be avoided. Another important conclusion to be drawn from the research is that fragmentation is not an evil *per se* and its consequences depend on how relationships between various overlapping agreements are managed.[130]

4.2. *Is Fragmentation a Problem for SLCPs in the Arctic?*

The overall legal and governance landscape for SLCP emissions in the Arctic can be described as fragmented. The various instruments and arrangements are different in character (regimes, international organizations, intergovernmental fora, voluntary initiatives), coverage of pollutants, constituencies (international, transnational),

[122] Ibid.

[123] Ibid.

[124] Ibid.

[125] Rio de Janeiro (Brazil), 5 June 1992, in force 29 Sept. 1993, available at: https://www.cbd.int/convention/text.

[126] Marrakesh (Morocco), 15 Apr. 1994, in force 1 Jan. 1995, available at: https://www.wto.org/english/docs_e/legal_e/31bis_trips_01_e.htm.

[127] Biermann et al., n. 11 above, pp. 19–20.

[128] Ibid., p. 31.

[129] Ibid.

[130] H. van Asselt, 'Managing the Fragmentation of International Climate Law', in E. Hollo, M. Mehling & K. Kulovesi (eds), *Climate Change and the Law* (Springer, 2013), pp. 329–57, at 339.

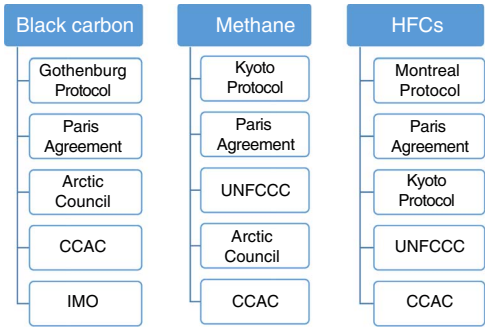

Figure 1 Regulation and Governance of SLCPs in the Arctic by Pollutant

spatial scope (regional, global), and subject matter (climate change, ozone layer, air pollution, international shipping). At the same time, there are clear overlaps in terms of their substantive coverage.

Utilizing the analytical framework proposed by Biermann and co-authors, this section assesses the fragmentation of law and governance for each relevant pollutant – black carbon, methane and HFCs. In addition, we examine regulatory and governance gaps. Each SLCP is covered by several instruments and institutions in parallel, as represented in Figure 1 above.

Black carbon

For black carbon, regional reductions among Arctic states are particularly important. With regard to actor constellations, not all countries participate in every instrument or initiative but all Arctic nations are engaged in the Arctic Council, the IMO, and (except Iceland) the CCAC. The Paris Agreement covers all but Russia and potentially the US,[131] while the amendment to the Gothenburg Protocol – which arguably provides the strongest regulation of black carbon emissions – has been ratified only by Sweden and the US and is yet to enter into force. As for institutional integration and the relationship between decision-making systems, there is evidence of some cooperation among these avenues. The CCAC is especially active in fostering linkages with other relevant international arenas. Also, there is collaboration with respect to national emissions inventories: the Arctic Council seeks to take advantage of the reporting infrastructure of the CLRTAP in advancing regional action on black carbon.[132] However, overall the linkages between the relevant avenues for regional action are loose and cooperation is conducted in an ad hoc manner. As to principles, the existing arrangements share some of the core principles of international environmental law,[133] including the principles of no harm, prevention,

[131] See Section 3.2.

[132] Arctic Council, n. 86 above.

[133] It is relevant to mention the ongoing work under the ILC on codifying the law on atmospheric protection, which addresses several of these principles: ILC, 'Analytical Guide to the Work of the ILC: Protection of the Atmosphere', available at: http://legal.un.org/ilc/guide/8_8.shtml.

https://doi.org/10.1017/S2047102517000401 Published online by Cambridge University Press

and cooperation.[134] One clear exception is the IMO, but at this point it is uncertain what shape its work on black carbon will take. While there are no obvious conflicts at the level of principles, the relationship between specific norms is less clear. For instance, there is a partial overlap between the emissions reduction targets for particulate matter under the Gothenburg Protocol and the regional goal for reducing black carbon emissions laid down under the auspices of the Arctic Council, but the extent to which they are mutually reinforcing is unclear. Overall, fragmentation in regional action on black carbon can be described as mostly of a cooperative nature.

Reducing global emissions of black carbon is also important for the Arctic.[135] Here, the mapping exercise in Section 3 points towards a regulatory gap rather than a fragmented landscape of partially overlapping instruments. There is no global treaty on air pollution[136] and the prospects of expanding the geographic scope of existing legal instruments such as the CLRTAP are remote.[137] While black carbon emissions can arguably be incorporated into the flexible and nationally driven mitigation framework laid down by the Paris Agreement, they have not traditionally been considered under the UNFCCC regime. The geographic scope of the CCAC is still narrow: for example, neither China nor India participate, which is relevant in respect of the effective mitigation of global black carbon emissions.[138] The Arctic Council can inspire action among its 13 observer states,[139] but their number is limited and the extent of such potential influence is unclear.

Methane

Our argument in respect of methane is that fragmentation is also mainly of a cooperative nature. Participating countries vary across treaties and initiatives, although there are overlaps. With respect to legally binding agreements, key emitters such as the US and Russia are covered by the UNFCCC but not by the Kyoto Protocol.[140] Furthermore, Russia has not ratified the Paris Agreement, while the US has indicated its intention to leave the treaty. All Arctic nations, however, participate in the Arctic Council and, with the exception of Iceland, in the CCAC.

Decision-making bodies of the three climate change treaties are highly integrated, as the Kyoto Protocol and Paris Agreement operate under the same framework convention. As for the relationship between the UN climate regime and the Arctic

[134] On principles of international environmental law see, e.g., P.-M. Dupuy & J.E. Viñuales, *International Environmental Law* (Cambridge University Press, 2015), Ch. 3.

[135] AMAP, n. 17 above, pp. 10–11.

[136] Y. Yamineva & S. Romppanen, 'Is Law Failing to Address Air Pollution? Reflections on International and EU Developments' (2017) 26(3) *Review of European, Comparative & International Environmental Law*, pp. 189–200.

[137] Byrne, n. 52 above; A. Byrne, 'The 1979 CLRTAP: Assessing Its Effectiveness as a Multilateral Environmental Regime after 35 Years' (2015) 4(1) *Transnational Environmental Law*, pp. 37–67.

[138] China has the highest share of global emissions of black carbon (20–24% between 1990 and 2007), while India has the second highest (about 10%): see, respectively, UNEP, *The Climate and Environmental Benefits of Controlling SLCPs in P.R. China* (UNEP, 2015), p. 11; L. Sloss, *Black Carbon Emissions in India* (International Energy Agency Clean Coal Centre, 2012), p. 10.

[139] Which include both China and India.

[140] See nn. 63, 64 and 65 above.

Council or the CCAC, some cooperation takes place, but there is no formal integration as such. To illustrate cooperation, the Arctic Council has endorsed its support for the Paris Agreement,[141] and senior officials from the UNFCCC Secretariat have taken part in meetings of the Council.[142] In addition, the Arctic Council Framework with respect to emissions inventories and national actions on methane explicitly builds on the reporting infrastructure under the UNFCCC.[143] The CCAC has also participated in UNFCCC-related events in the past[144] and its work has been endorsed by Christiana Figueres, former UNFCCC Executive Secretary.[145]

The question of the relationship between principles and norms is relevant to the climate change treaties and the soft law developed under the Arctic Council.[146] The work under the climate change regime and the Council (in respect of the environment) is arguably based on the same principles of international environmental law. For the climate change treaties, because of the high integration of decision-making bodies, the space for open conflict between specific norms is limited. As for the Arctic Council Framework, its approach to methane emissions is generic as specific actions are defined at the national level. However, the way in which national actions under the Framework complement the NDCs under the Paris Agreement and correlate with the norms of the Kyoto Protocol remains open to question.

HFCs

Fragmentation here is of a synergistic character: the recently adopted Kigali Amendment to the Montreal Protocol provides the main framework for action to reduce HFCs globally.[147] Other agreements and the CCAC play only a complementary role and do not compete with the ozone regime.

Fragmentation in respect of HFCs has not always had a synergistic character. Prior to the 2016 amendment of the Montreal Protocol, the situation could be characterized broadly as a norm conflict between the ozone and climate regimes. Measures to phase out HCFCs and protect the ozone layer under the Montreal Protocol led to increased production of HFCs. Since HFCs are highly potent GHGs, this obviously ran counter to the objectives of the UNFCCC and the Kyoto Protocol. A protracted debate followed among the parties to the respective regimes, the majority of which were members of both regimes, as to whether HFCs should be

[141] Arctic Council, n. 86 above.

[142] See, e.g., 'Arctic Council Support to Paris Agreement: Address by UNFCCC's Halldor Thorgeirsson', 2017, available at: http://newsroom.unfccc.int/unfccc-newsroom/arctic-council-contribution-to-the-impact-of-the-paris-agreement.

[143] Arctic Council, n. 86 above.

[144] E.g., in the technical expert meeting on non-CO_2 GHGs, available at: http://unfccc.int/bodies/awg/items/8420.php#Present.

[145] See CCAC Secretariat, 'UN Climate and Environment Heads say SLCP Reduction is Necessary to Protect Climate: A Joint Opinion Piece by C. Figueres (UNFCCC) and A. Steiner (UNEP)', 25 Mar. 2016, available at: http://www.ccacoalition.org/en/news/un-climate-and-environment-heads-say-slcp-reduction-necessary-protect-climate.

[146] As noted in Section 3.6, the CCAC does not engage in lawmaking activities.

[147] See also Biermann et al., n. 11 above.

https://doi.org/10.1017/S2047102517000401 Published online by Cambridge University Press

regulated under the Montreal Protocol or under the UNFCCC regime.[148] While some countries argued that HFCs should continue to be regulated primarily under the UNFCCC regime based on the principle of common but differentiated responsibilities,[149] others regarded the Montreal Protocol as a more appropriate legal framework. In the end, the Kigali Amendment differentiates among countries in terms of the commitments to phase out HFCs and the schedule to be followed.

To conclude, the fragmentation of law and governance in respect of SLCPs in the Arctic is mostly of a cooperative (black carbon, methane) and a synergistic nature (HFCs). This suggests that the fragmented state of law and governance in this area does not pose a significant problem *per se*, provided that better coordination and coherence is achieved among various instruments and arrangements. The analysis also shows that there is an important legal and governance gap concerning global emissions of black carbon.

4.3. *How to Strengthen International Law on SLCPs in the Arctic*

This section first explores whether a dedicated treaty on SLCPs is desirable and possible, and then continues to discuss how the regulation of each of the specific pollutants involved can be strengthened.

Should SLCPs, both in the Arctic and globally, be regulated through a new dedicated treaty? There are several arguments against such an approach. To start with, SLCPs have very different scientific characteristics, originate in different sectors, and have different impacts. In addition, as the examples in Section 3 demonstrate, negotiating a new legal instrument is a politically demanding process and the entry into force of the instrument or the participation of key countries cannot be taken for granted.

Furthermore, while the current legal and governance landscape concerning Arctic SLCPs is fragmented, this fragmentation has a cooperative or synergistic character and is therefore relatively unproblematic. Almost all of the extant specialized international legal regimes or arrangements are located in the sphere of international environmental law. This suggests that the risks associated with legal fragmentation – such as legal incoherence and the prioritization of one field of law over another[150] – may not materialize. At the same time, the instruments and initiatives involved are sufficiently different from each other to accommodate divergent state interests, the logic being that 'states perceive that their individual positions are better respected in these special regimes than in the global one' and hence are more likely to comply.[151] Thus, addressing SLCPs through specialized pollutant-specific venues is more

[148] A. Kumarankandath, 'Should HFCs Be Dealt under Montreal Protocol or Kyoto Protocol?', 31 Oct. 2014, available at: http://www.downtoearth.org.in/news/should-hfcs-be-dealt-under-montreal-protocol-or-kyoto-protocol-47171.

[149] Ibid.

[150] This can occur, e.g., if one legal regime is perceived as stronger than others – the issue which has been discussed in relation to the trade and environment debate: see van Asselt, n. 130 above, at 336–37.

[151] G. Hafner, 'Pros and Cons Ensuing from Fragmentation of International Law Diversity or Cacophony: New Sources of Norms in International Law Symposium' (2004) 25(4) *Michigan Journal of International Law*, pp. 849–63, at 859.

desirable and politically feasible than doing so through a new dedicated treaty which would cover them all comprehensively.[152]

At the same time, to avoid incoherence between the approaches taken and to ensure co-benefits, there is a clear need for strategic oversight and enhanced cooperation among the various arrangements. From a climate perspective, it is important to understand how individual efforts under specialized regimes add up with respect to the global 2°C and 1.5°C temperature goals referred to in Article 2 Paris Agreement. The UNFCCC can accommodate discussion on all SLCPs, including black carbon, through the pre-2020 technical examination process and the flexible mitigation structure of the Paris Agreement, relying on NDCs, the transparency framework and the periodic global stocktake. Indeed, some countries already include black carbon in their NDCs. The cyclical process of communicating and periodically updating NDCs could provide an interesting opportunity to step up SLCP mitigation under the auspices of the UNFCCC regime. In our view, this should be explored further to address both Arctic and global SLCP emissions.

In addition to the UNFCCC framework, other avenues of global and regional cooperation are relevant to strengthen SLCP mitigation in the Arctic. The CCAC has the potential to be instrumental in assembling scientific knowledge about the climate impacts of the reduction in SLCPs and in communicating it to policymakers. It also provides a useful forum for informal cooperation for countries interested in stepping up the SLCP agenda and coordinating their efforts, for example, under the UNFCCC regime. The Arctic Council already advances regional action on black carbon and methane under its Framework. Both the CCAC and the Arctic Council should explore opportunities for further inter-institutional cooperation with the UNFCCC. This is because close relationships among secretariats and decision-making bodies are important in ensuring cooperation between the various regimes.[153]

For reducing black carbon emissions among Arctic nations, the Gothenburg Protocol in principle provides a legal framework for a strengthened response. Although parties' existing obligations on black carbon are of a general nature, the provisions of the Protocol on the development of emissions inventories and trajectories could serve as the first step to more stringent obligations in the future. This would also reflect the history of the LRTAP regime, in which non-binding instruments proved to be effective in the early stages of creating the regime[154] and the Convention and the Protocols have evolved 'from vagueness to precision' over time.[155] The main challenges to be addressed for the future under the Gothenburg Protocol are increasing its level of participation, including among Arctic states, and adopting more specific and stringent emission limits for black carbon. In the

[152] This is also in line with suggestions by other scholars: see H. van Asselt, 'Interlinkages between Climate Change, Ozone Depletion, and Air Pollution: The International Legal Framework', in Farber & Peeters, n. 100 above, pp. 286–97, at 293.

[153] van Asselt, n. 130 above, p. 339.

[154] Byrne, n. 137 above, p. 43.

[155] Ibid., p. 44.

https://doi.org/10.1017/S2047102517000401 Published online by Cambridge University Press

meantime, the Arctic Council offers a means of catalyzing action among its members, including by encouraging countries to join the amended Protocol.

When it comes to global emissions of black carbon, which are also important in the Arctic context, there is a gap in international law and governance. Strengthening global action on air pollution through international fora such as UN Environment, the WMO and the World Health Organization (WHO), as well as via the framework of Sustainable Development Goals,[156] could create an opening to discuss the global impacts of black carbon emissions. These avenues already have global coverage, which eliminates the problem of inadequate geographic participation that plagues legal instruments on air pollution.[157] Such action is most likely to take a non-legally binding form: for instance, it may be pursued via soft law frameworks or some type of enhanced cooperation.[158] A bottom-up, facilitative approach to global action on black carbon could help to engage developing countries which might be averse to top-down restrictive measures. The Arctic Council could also be useful in encouraging its observer states to take action on their SLCP emissions.

With regard to methane, the picture is less clear. Methane is covered by the UNFCCC regime and is already reported on by countries under the Convention. However, it has not been the focus of mitigation action thus far. The Paris Agreement does not specify which GHGs it covers. Although many countries included plans to reduce methane emissions in their intended NDCs, the status of methane is still to be clarified in the negotiations on the Paris rulebook. In the absence of clear international legal rules, the Arctic Council can have more of an impact by strengthening regional action on methane. In the global context, there is also significant potential for transnational voluntary initiatives like the CCAC and others to stimulate action on methane emissions.

For HFCs, a global approach is a way forward, given that developing countries already account for an estimated 50% of global HFC emissions and their share is projected to grow.[159] The Arctic Council environment ministers also emphasize the importance of the Montreal Protocol in that respect.[160] The Kigali Amendment to the Protocol is a significant achievement in terms of multilateral action on environmental matters, and the challenge now is its full implementation.

5. CONCLUSIONS

Reducing SLCP emissions is important for slowing climate change and improving air quality and public health. This is relevant both for the Arctic region and at the

[156] Yamineva & Romppanen, n. 136 above.

[157] Ibid.

[158] Ibid.

[159] S.A. Montzka et al., 'Recent Trends in Global Emissions of HCFCs and HFCs: Reflecting on the 2007 Adjustments to the Montreal Protocol' (2015) 119(19) *The Journal of Physical Chemistry A*, pp. 4439–49.

[160] J. Parnell, 'Arctic Ministers Urge Swift Climate Action to Protect Region', *Climate Home – Climate Change News*, 7 Feb. 2013, available at: http://www.climatechangenews.com/2013/02/07/arctic-ministers-urge-swift-climate-action-to-protect-region.

global level. Although some action has already been taken at both levels, globally a clear need exists for strengthened cooperation and regulation.

To this end, this article has sought to provide a comprehensive overview of the state of international law and governance relevant to the reduction of SLCP emissions – including HFCs, black carbon and methane – in the Arctic. Although our focus is regional, many of the findings are relevant to the global regulation of SLCPs, including our conclusions on the climate change and ozone regimes, as well as on the gap in the global regulation of black carbon emissions.

The article maps out the main relevant instruments and institutions, and discusses the regimes on air pollution, climate change and ozone depletion: the CLRTAP and the Gothenburg Protocol; the UNFCCC, the Kyoto Protocol and the Paris Agreement; and the Montreal Protocol. We also outline the work carried out by the Arctic Council, the CCAC and the IMO, and conclude that despite significant differences in coverage and approach, overlaps exist between these instruments and institutions. The landscape of international law and governance on SLCPs can therefore be described as complex and fragmented.

We then assess this landscape in the context of its fragmentation based on the analytical framework set out by Biermann and his co-authors. Our conclusion is that fragmentation in this policy domain has a predominantly cooperative or synergistic nature and is therefore not problematic, provided that stronger coherence and cooperation among instruments and institutions can be achieved. The article also suggests options for strengthening international law and governance on SLCPs, concluding that many avenues can be pursued simultaneously to provide for ambitious mitigation action on black carbon and methane.