Further Legal Protection for the Stratospheric Ozone Layer: Focusing on the Global Use Exemptions of Methyl Bromide

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I. Introduction

The fundamental conceptual definition of the environment is surrounding. It covers from the top of the atmosphere down to the inner core of the earth. Genetic characteristics of the environment use the law of nature to compromise and balance the eco-system. Especially from the nineteenth-century, population growth and modern technology have adversely affected this natural system. Therefore, based on various social concerns, global intervention came forward to protect the environment by the black letter law.[1] Today almost all the parts of the environment are governed by man-made law and one of the legally protected environmental organs is the "Stratospheric ozone layer". This layer covers approximately ten to fifty kilometres from the earth's surface, with a high concentration of ozone (O_3) to absorb harmful ultraviolet radiation from the sun. In 1985, a British research group of scientists discovered the first huge ozone loss in the southern hemisphere[2] which is called the ozone hole, and from then onward, global attention was directed to the ozone depleting matter.

The Vienna Convention for the Protection of the Ozone Layer (1985) established a monitoring system on ozone depletion by creating a framework to develop protocols to establish global binding actions. Accordingly, scientists identified the main threat of ozone depletion as man-made chemicals, which mainly included chlorine and bromine. These synthetic chemicals are commonly known as "ozone-depleting substances" (ODSs), and they are destroying vast amounts of ozone molecules when they reach to the stratosphere.[3] Based on these scientific findings, the need for global accountability was established by enacting international legal instruments to combat ozone depletion. The 1987 Montreal Protocol was designed under the Vienna Conventional framework to phase out the production and consumption of certain ODSs with specific deadlines. Both these treaties are universally ratified and adopted by the most domestic legal systems, including New Zealand. Statistics show 98 per cent reduction of ODSs usage of the world due to this legal involvement.[4] However, long life ODSs still stay within the atmosphere, and some forms of ODSs are still being used in industries, under the legal exemptions. One of the major exemptions of

1 Alexander Gillespie *The Long Road to Sustainability* (Oxford University Press, 2018) at 23–44.

2 David Caron "Protection of the Stratospheric Ozone Layer and the Structure of International Environmental Law-making" 14 Hastings International and Comparative Law Review 755 (1991) at 759.

3 Alexander Gillespie *Climate Change, Ozone Depletion and Air Pollution: Legal Commentaries Within the Context of Science and Policy* (Koninklijkc Brill NV, Leiden, 2006) at 4.

4 Stats NZ "Global production of ozone-depleting substances" <www.stats.govt.nz>.

global ODS usage are the exemptions for the methyl bromide. Based on the usage, these legal exemptions allow state parties to produce and consume methyl bromide, which is a high potential ODS with a considerably long atmospheric lifetime. New Zealand is one of the highest Methyl Bromide users in the world due to the growing timber exportation industry. This methyl bromide consumption raises worldwide critical debates, including within the New Zealand society, to ban some exemptional practices.

II. Methyl Bromide (CH_3Br)

Methyl bromide is a colourless, odourless and non-flammable gas of a combination of Chlorine and Bromine (CH_3Br), which is produced industrially and biologically. It is an efficient pesticide, and used for fumigation purposes, fire extinguishing and upgrading soil. It controls pests and pathogens in agriculture and shipping including fungi, weeds, insects, nematodes (or roundworms), and rodents.[5] The pesticide value of methyl bromide was first disclosed by Le Group, France in 1932 and since then has been widely used in the agriculture and timber industries.[6]

III. Methyl Bromide as an Ozone Depleting Substance

Methyl bromide is a toxic gas with 0.8 to 2 years of life in the atmosphere.[7] This gas enters to the atmosphere by both natural and anthropogenic causes. In addition to ozone depletion, it harms human health by damaging the nervous system and respiratory system. Also, it has a detrimental effect on soil biodiversity and polluting surface and ground water. However, it has less greenhouse effect, and its Global Warming Potential (GWP) is eighty-five.[8] Among the other bromide compounds, methyl bromide is the primary carrier of bromide to the stratosphere. Within the stratospheric area, those molecules break down into the form bromide and involve in a series of ozone depleting chemical reactions. Moreover, bromide is 50 times more reactive on ozone depleting than chlorine, as it reacts with reservoir chlorine species and freezes them to react with additional ozone.[9] According to the United Nations Environment Programme (UNEP) calculations ozone depleting potential (ODP) of methyl bromide is 0.6 or 60 per cent of CFC-11's ozone-depleting potential.[10] However, this ODP can be increased based on the increments of abundant chlorine in the atmosphere.[11] Due to the above characteristics, methyl bromide is categorised under the group of Class I ozone depleting substances.

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5 The United States Environment Protection Agency *Methyl Bromide* <www.epa.gov/ods-phaseout/methyl-bromide>.

6 Ministry of Primary Industries *Methyl Bromide Information* <www.biosecurity.govt.nz/dmsdocument/14869/direct>.

7 Hanna Ritche and Max Roser "Ozone Layer" (2018) published online at OurWorldInData.org <www.ourworldindata.org/ozone-layer>.

8 Above n 7 "Ozone Layer".

9 Jean Ristaino and William Thomas "Agriculture, Methyl Bromide and the Ozone Hole – Can we fill the gaps" (1997) 81(9) Plant Disease at 965.

10 At 966.

11 At 966.

IV. Methyl Bromide on Montreal Protocol

Methyl bromide is one of the group of chemicals phased out by the Montreal protocol. It continued to receive production and consumption exemptions from the international and domestic levels until today. This anthropogenic chemical was included in the Protocol by the Copenhagen Amendment 1992 adding art 2H and Annex E. Nevertheless, in 1997 ninth meeting of the parties of Montreal Protocol established the phasing out procedure for methyl bromide use in industrial countries based on 1991 consumption as; 25 per cent reduction in 1999, 50 per cent in 2001, 70 per cent in 2003 and 100 per cent in 2005.[12] This reduction period extended another decade for the non-industrialised nations. However, this phasing out process of production and consumption was subjected to the exemptions that depicted in the specific provisions of the Protocol, according to the collective decisions made by the parties of the Montreal Protocol at the annual meetings.

V. Exemptions for Methyl Bromide under Montreal Protocol

The exemptions of methyl bromide usage are recognised by the Montreal Protocol under three categories: use as a chemical feedstock, the provisions of "critical-use exemption" and use for Quarantine and Pre-Shipment (QPS) purposes. Article 2H (5) of the Protocol depicts the "critical-use exemption" of methyl bromide, which executed under the Decision IX/6 concluded in the ninth meeting. According to this Decision, to determine the "critical use" the nominated party should clarify, the lack of availability of methyl bromide for that use would cause significant market disruption and unavailability of technically and economically feasible alternatives or substitutes for this use. Furthermore, art 2H(6) states exemptional use of methyl bromide for quarantine and pre-shipment purposes. This QPS purpose more fully clarifies by the Decision VI/11, contrasting art 5 (developing) and non-art 5 (developed) countries and more QPS related provisions were described by the several other later decisions. Besides, the Decision XX/6 of the 20th meeting (2009/2010) encouraged parties to take necessary actions to replace or reduce the use of methyl bromide for QPS purposes and related emissions.

According to the United Nations Environment programme, Methyl Bromide Technical Options Committee (MBTOC) report, in 2017 the amount of 13,553 tonnes of methyl bromide produced in the world for all the above uses. 97.5 per cent of it consumed for the quarantine and pre- shipment (QPS) purposes and the rest 2.5 per cent for the non-QPS purposes.[13] Some countries still using methyl bromide for soil fumigation, and 50 per cent to 95 per cent of it eventually enters the atmosphere in this process.

VI. Methyl Bromide and New Zealand

According to the Environment Protection Authority (EPA) "Staff report: a modified reassessment of Methyl Bromide" (2020), New Zealand is consuming methyl bromide for different purposes. It is used as fumigation to treat products before export to the selected countries, and for quarantine application in imported goods (border biosecurity requirement) under the exemption of QPS

12 United Nations Montreal Protocol on Substances that Deplete the Ozone Layer (16 September 1987), art 2 H (1)–(4).

13 United Nations Environment Programme Methyl Bromide Technical Options Committee - Assessment report (2018) at 16–17.

purposes, and it is permitted to quarantine treatment for potato wart as well.[14] The methyl bromide consumptions in the New Zealand industries commence from the mid-1990s with less than 50 tonnes in annual usage, and it increased to more than 500 tonnes from 2012 onwards.[15] According to the 2017 worldwide scale, New Zealand is the highest industrial user of methyl bromide in the world, and it contributes 7.7 per cent of global anthropogenic emission of this major ODS.[16] Around 94 per cent of methyl bromide uses in New Zealand contribute to the fumigation of the exporting forest products (largest markets are China and India).

Following the state obligations imposed by art 2(2) of the Vienna Convention, New Zealand enacted domestic legislation to adopt the provisions in the Montreal Protocol to combat against ozone depleting substances usage including methyl bromide. The New Zealand Ozone Layer Protection Act 1996 is the foremost law in this field and the purpose of this Act is depicted in s 4 as follows:

> (1) The purpose of this Act is:
>
> (a) help protect human health and the environment from adverse effects resulting or likely to result from human activities which modify or are likely to modify the ozone layer:
>
> (b) phase out ozone depleting substances as soon as possible except for essential uses:
>
> (c) give effect to New Zealand's obligations under the Convention and the Protocol …

This Act includes the provisions to control and regulate the ODS use in New Zealand collaborates with the Ozone Layer Protection Regulations 1996, which implement under pt 3 of the Act. The Regulations include specific detailed provisions to rule ozone depleting substances and sch 1 of the regulations depicts a full list of ODS including Methyl bromide that need to be controlled. It further mentions the prohibitions on importation, exportations, manufacture and sale, along with the exemptional circumstances. Section 7 of the regulations specifically describes the provisions of quarantine and pre-shipment permits on importing methyl bromide, and those permits need to be approved by the Environment Protection Authority (EPA).

According to the QPS purposes clarification of Montreal Protocol sixth meeting Decision VI/11, New Zealand obliged to:[17]

> … refrain from use of methyl bromide and to use non-ozone-depleting technologies wherever possible. Where methyl bromide is used, Parties are urged to minimise emissions and use of methyl bromide through containment and recovery and recycling methodologies to the extent possible;

This obligation further emphasised by the XX/6 Decision to replace and reduce this anthropogenic chemical for the QPS purpose and related emissions. Based on these obligations, in 2010, the New Zealand methyl bromide uses were reassessed under s 63 of the Hazardous Substances and New Organisms Act 1996. This reassessment was concluded by Environment Risk Management Authority Decision HRC 08002, as follows:[18]

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14 Environmental Protection Authority *Staff report: a modified reassessment of Methyl Bromide* (2020) at 8.

15 *Envirofume Ltd v Bay of Plenty Regional Council* [2017] NZEnvC 12 at [88].

16 At [90].

17 United Nations Environment Programme *Montreal Protocol* Sixth Meeting of the Parties Decision VI/11: *Clarification of "quarantine" and "pre-shipment" applications for the control of methyl bromide* (1994), s 1(C).

18 Environment Risk Management Authority Decision HRC 08002 (28 October 2010 as amended on 17 June 2011), at 2.5.2.

> Accordingly, the committee has given particular consideration to the possibility of minimising emissions by requiring applications of methyl bromide to be subject to recapture technology.

This decision defines recapture technologies as "a system that mitigates methyl bromide emissions from fumigation enclosures such that the residual level of methyl bromide in the enclosed space is less than the worker-exposed standard".[19] Other than the requirement of recapture technologies, this decision imposed regulations on tolerable exposures limits (TELs), workplace exposure standards (WES) and minimum buffer zones. The above decision on 'the deadline for methyl bromide users to adopt recapture technologies' applies from ten years after the approval, and it was namely due from 28 October 2020. However, in July 2020, the decision-making committee (DMC) for modified reassessment received an application to extend this date for another six months and, controversially, it was approved by waiving the deadline unto 28 April 2021. However, according to the most recent decision dated 11 November 2020 DMC extended that deadline to another four months based on the 21st memorandum of Council.[20] Therefore, the new deadline for methyl bromide users to adopt recapture technologies is 28 August 2021 and it is raising intense discussions amongst the New Zealand community groups based on environment, health, and law.

VII. Methyl Bromide Ban in Council of Europe

Due to the low temperatures at the northern hemisphere, there is a trend of appearing ozone loss in the arctic range of atmosphere based on seasonal changes. It grants an inherent duty to the Europe region to work on ozone depletion. Therefore, under the European Council involvements, the ozone depleting substances ODSs were regulated by Regulation (EC) No 1005/2009 on Substances that Deplete the Ozone Layer (ODS Regulation). These regulations are stronger than the obligations of the Montreal Protocol and encompassing additional substances. Article 12 of this Regulation contains provisions about quarantine and pre-shipment applications and emergency uses of methyl bromide. It was designed to lower the use of methyl bromide in QPS purposes to ensure complete phase-out of methyl bromide from 18 March 2010.[21] Europe region has some top timber exporters in the world and those countries follow alternative methods for QPS purposes instead of using methyl bromide.[22] European Council "Staff Working Document, 2019" reveals, the use of methyl bromide for QPS within the European Union was zero in recent years as per the above prohibition from 2010 onwards. Showing the outcome of progressive steps taken by the European Council, in April 2020 Copernicus' Atmospheric Monitoring Service reported, "the largest hole ever observed in the ozone layer over the Arctic has closed."[23]

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19 At 16.11.

20 Environment Protection Authority "Direction and Minute WGT026 of the Decision-Making Committee (DMC)" (11 November 2020) at 5.

21 United Nations Environment Programme Ozone Secretariate *European Union Strategy to Reduce the Uses and Emissions of Methyl Bromide for Quarantine and Pre-Shipment Purposes* Ref Ares (2010)315100 - 08/06/2010 (June 2010) at 4.

22 At 15–16.

23 Copernicus' Atmospheric Monitoring Service "CAMS tracks a record-breaking Arctic ozone hole" <https://atmosphere.copernicus.eu/cams-tracks-record-breaking-arctic-ozone-hole>.

VIII. Alternatives, Replacements and Recommendations for Methyl Bromide Usage

Evaluating the feasible chemical or non- chemical alternatives or replacements for the current methyl bromide use is an essential discussion of this content. Montreal Protocol 11th meeting Decision XI/13 emphasises this requirement regarding the QPS exemptions. Before that, Decision IX/6 showed the methyl bromide "critical use exemption" applications need to prove unavailability of feasible alternatives. The Methyl Bromide Technical Options Committee (MBTOC) is working on to identify feasible alternatives, and it is funded by the Montreal Protocol Multilateral Fund. According to the European Council Regulation (EC) No 1005/2009 member states of the EU are required to report their annual efforts to develop non-methyl bromide alternatives for QPS purposes. Besides, these alternatives need to agree with the provisions of International Plant Protection Convention 1997 (IPPC).

Accordingly, ISPM -15 treatments 2017 (International Standards of Phytosanitary Measures Publication No. 15 – Guidelines for regulating wood packaging in international trade) Appendix I depicts effective methyl bromide alternatives as follows:[24]

- Fumigants: Methyl Iodide, Phosphine, Sulfuryl Fluoride (SF).
- Controlled Atmosphere (CA).
- Heat/ Cold treatment.
- Controlled Pressure Impregnation (CPI).
- Radiations (Gamma radiation, microwave energy).

Methyl bromide is considered as the most suitable method in quarantine disinfestation. Thus, there are some efficient alternatives exist with physical methods, including heat treatment.[25] The New Zealand timber industry considered phosphine for alternative fumigation as major timber export markets (including China, Malaysia) were agreed to use it. However, phosphine is a toxic gas, and it is not suitable for the deck transporting logs. The most recently approved phytosanitary alternative in New Zealand is ethanenitrile (EDN), and the Ministry of Primary Industries already submitted the research result to the key trading partners to assess and negotiate. However, New Zealand is still considering adopting recapture technologies for methyl bromide use which suggest a decade ago. Nevertheless, the New Zealand law is not yet binding the stakeholders to use alternative or replacements for methyl bromide on the QPS purposes.

IX. Conclusion

Methyl bromide uses are exempt for the quarantine and pre-shipment purposes under art 2H(6) of the Montreal Protocol. Although there are no legal provisions in the Protocol to control the amount of this usage. When considering global factors, it is obvious there are sufficient and efficient alternatives to methyl bromide uses, especially quarantine and pre-shipment applications. Accordingly, within the timber industry, there is a possibility to export or import processed timber instead of raw timber to avoid phytosanitary treatments. Therefore, this is the possible time for a further phasing out of the global use of methyl bromide by banning the exemption for quarantine

24 FAO *Recommendation on replacement or reduction of the use of methyl bromide as a phytosanitary measure* (2017).

25 Paul G Field and Noel D G White "Alternatives to Methyl Bromide Treatments for Stored-Product and Quarantine Insects" (2002) 47 Ann Rev Entomol 331 at 345.

and pre-shipment applications. Within this suggestion, if any specific circumstance occurred to consume methyl bromide for a QPS purpose, it would probably be considered under the critical use exemption for limited usage. The above-mentioned phasing out mechanism can be contrasted with art 5 and non-art 5 countries, both international and domestic levels.

New Zealand ozone protection law is flowing parallel with the Montreal Protocol on methyl bromide usage which grants the same exceptional practices. Countries have more power and practical ability to work on feasible alternatives and replacements to reduce the amount of methyl bromide usage in domestic corpus. Hence, New Zealand law needs to contemplate beyond "recapture technologies", which are still socially and legally argued in this field. The Country requires to work towards a ban of methyl bromide for QPS purposes, as it is a hazardous and ozone depleting substance. However, the limited exemptional uses need to be subject to the limited permits grant by the EPA after a reasonable examination. This is a possible process for New Zealand to contribute to the further protection for the ozone layer. This mechanism may adversely affect economic aspects, but it would be a long-term profit for the environment and the life on earth.

The countries of the world have a talent of collectively working to achieve global success. This talent needs to be expanded to prevent the current ozone depleting trends while strengthening the legal bindings. Accordingly, the global use of methyl bromide needs to minimise by further legal provisions in domestic and international levels to provide further protection for the stratospheric ozone layer.