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The Role of the Montreal Protocol in Reducing Quarantine and Pre-shipment Uses of Methyl Bromide

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Abstract: Global production of methyl bromide for quarantine and pre-shipment (QPS) in 2006 was 10,275t which is about 34% of global methyl bromide production in 2006. It is now the single largest emissive use of any ozone-depleting substance that is not subject to reduction and phase out. Many countries have not reduced their consumption of QPS – MB in response to Protocol Decisions that encourage actions by governments to reduce use and emissions. Protocol decisions are not considered mandatory, unlike production and phase out schedules which are contained in Articles of the Montreal Protocol and compliance by countries is mandatory. Consequently, the global consumption of QPS – MB is declining very slowly and, at the current rate of reduction, we estimate it will approach zero by 2063. In order to create consistency between QPS – MB and the reduction in consumption of other ozone-depleting substances, the Montreal Protocol meetings are expected to discuss options for strengthening the controls on QPS – MB. Wood (including timber and whole logs, 49%), soil (mainly for strawberry runner production in two countries, 19%) and grain and cereals for consumption (15%) account for 83% of the QPS – MB use. Technical reports since 1994 have identified a wide range of alternative treatments. A worldwide survey in 2004 concluded that alternatives are available for 65% of QPS – MB uses. Several countries have unilaterally ceased consumption of QPS – MB, while others are now developing strategies to reduce use and emissions. Any future agreement on a global reduction in QPS – MB would likely result in financial support for the adoption of alternatives for QPS – MB in developing countries.

Introduction

The Montreal Protocol

The Montreal Protocol was originally agreed in 1987 to reduce the consumption of only eight ozone-depleting substances (ODSs), and at that time by only 24 countries and the European Economic Community. Today, 191 governments have signed the Protocol and production and consumption of all ODSs has been reduced significantly over the last 20 years. This achievement results in the Montreal Protocol being widely acknowledged as the most successful of all the environmental treaties.

The Protocol traditionally operates by agreement on control schedules which are timetables for the reduction and phase out of production and consumption of groups of ODS. These control schedules are sometimes weak initially, but they are strengthened over time on the basis of the most recent review of the scientific, environmental, technical and economic information on alternatives to ODS. Technical bodies such as TEAP and MBTOC provide annual updates on progress in the development and adoption of ODS alternatives, including information on alternatives for quarantine and pre – shipment uses of methyl bromide (QPS – MB).

This paper describes the current controls in the Montreal Protocol relating to QPS – MB, the quantities consumed according to use and provides examples of activities that have been undertaken to reduce its use.

QPS, non – QPS, Control Schedules and Definitions

QPS – MB is the only ODS consumed in significant volume that does not have a reduction and phase out schedule in the Montreal Protocol. In 1992 the Protocol adopted initial controls for most uses of methyl bromide. QPS was exempt control because governments at the time considered that few if any alternatives were available to disinfest where necessary imported and exported food and materials.

Fig 1. illustrates the differences between QPS and other (non – QPS) uses of methyl bromide, as defined by the Montreal Protocol. It shows the types of target pests, items treated, controls under the Protocol and percentage of total consumption in 2006. QPS is shown on the right side of Figure 1.

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1. The Methyl Bromide Technical Options Committee reports to the Technology and Economic Assessment Panel

Fig. 1 QPS uses and non – QPS uses of methyl bromide showing the types of pests targeted, examples of uses, and applicability to developed and developing countries.

Category		Non – QPS			QPS
Developed countries	% use	30%	2%	6%	34% Quarantine and Preshipment Exempted from reduction and phase out
	Controls	Only permitted for critical uses which must be phased out as soon as possible			
Developing countries	% use	22%	1%	5%	
	Controls	Phase out by 1 January 2015			

Descriptor	Soils	Stuctures	Durables	Durables	Perishables
Examples of treated items	Soil treatment prior to planting high value cropssuch as strawberries, tomatoes, sweet peppers, aubergine, melons, flowers, seedlings, nursery plants	Flour mills, food processing facilities, empty ship holds	Stored grains, cocoa beans, coffee, nuts, dried fruit, timber, wood products	Stored grains, cocoa beans, coffee, nuts dried fruit, timber, wood products	Fresh fruit vegetables and cut – and cut
Target pests	Soil pests, nematodes, fungi, weeds	Stored product pests and rodents	Stored Product pests	Stored and fresh product quarantine and officially regulated insects	
Exported or imported	No.	Some exports and imports		Yes	

Phase-out schedules for non – QPS uses were adopted in 1995. In 1997, stronger controls were agreed that resulted in MB consumption being banned in industrialised countries from 1 January 2005, except for QPS and specific circumstances where alternatives are considered not to be technically and economically feasible (so called 'critical uses'). Developing countries are permitted to consume non – QPS – MB until 2015. Economic assistance from the Protocol for alternatives has significantly reduced methyl bromide consumption in developing countries[3]. Non – QPS consumption globally continues to fall substantially each year.

MB is classified as a QPS use if it meets the criteria forquarantine' orpre-shipment'. *Quarantine applications* are MB treatments applied to prevent the introduction, establishment and/or spread of *quarantine* pests (including diseases), or to ensure their official control, where "official control" is that performed by, or authorised by, a national plant, animal, environmental protection or health authority; and "quarantine pests" are pests of potential importance to the areas endangered thereby and not yet present there, or present but not widely distributed and being officially controlled[4]. *Pre – shipment applications* are *non-quarantine* MB applications applied within 21 days prior to export to meet the official requirements of the importing country or existing official requirements of the exporting country[5]

Quantities of Methyl Bromide Consumed for QPS

Production for QPS

The Montreal Protocol requires governments to report data on QPS annually. The years 1999 and 2002 to 2006 represent the most complete data[6] reported by Parties on QPS production. These data, together with the production for 1992 estimated by TEAP[3], are shown in Figure 2. Global production for QPS in 2006 was reported to be 10,275t.

The trend is generally downwards apart from a sharp increase in 2005 to almost 14000t, which could be due to additional QPS production necessary to satisfy uses "... *that were not previously considered as QPS, the impact of the adoption of ISPM* – 15, *and stock issues*"[3]. At the current rate of reduction of QPS production we estimate that QPS – MB will approach zero in about 55 years or 2063.

Figure 2: Reported production of methyl bromide by Parties for QPS in 1999 and from 2002 to 2006 (Ozone Secretariat 2008). TEAP estimate of production for 1992.

The Use of QPS – MB by Category

The use of QPS – MB reported by Parties for 15 categories was 5 273 tonnes (TEAP 2006)[7]. However, TEAP cautioned that Parties had reported less than 25% of more than 4,000t estimated by TEAP to be used annually for whole logs and timber[7]. Based on the available data, Table 1 indicates that the top seven categories account for 98.8% of the total

quantity used for QPS – MB.

The single largest category comprises wood (including sawn timber and whole logs), which accounts for almost 50% of the total. Two surveys undertaken recently in Australia and the Asia-Pacific region also identified timber and wooden materials as major users of QPS – MB[3]. These data have implications for the deployment of resources for the adoption of relevant alternatives (Section 7).

Table 1. Quantity of methyl bromide used for QPS by 32 Parties reporting quantities in various categories of QPS use (data from 2002, 2003 and 2004)[7]

Categories of QPS Use	Quantity (tonnes)	Percent of total	Number of Parties Reporting
Wood, including sawn timber & whole logs	4,000[1]	48.80%	Note[2]
Soil (pre – plant)	1,527	18.63%	2
Grain and cereals for consumption	1,262	15.40%	14
Fresh fruit and vegetables	722	8.81%	11
Wooden packaging materials	335	4.09%	19
Dried foodstuffs	160	1.95%	11
Cotton and fibre	91	1.11%	10
Other[3]	99	1.21%	
TOTAL	8,196		

TEAP (2006) estimate, as Parties did not report; 2 Not all Parties reported; 3 Other = Equipment; cut – flowers and branches; personal effects; bulbs, corms, tubers and rhizomes; nursery stock; hay, straw and fodder; seeds for planting

Decisions that aim to Minimise the Use and Emissions of QPS – MB

Since 1994, six Decisions[4] on QPS – MB have been agreed in the Montreal Protocol, summarised in Table 2. They aim to promote the adoption of alternatives, minimise QPS – MB use, and reduce emissions. Decisions in the Montreal Protocol are not legally binding, unlike control schedules which are legally binding.

To date most Parties have generally not taken significant and concerted action to implement these Decisions, particularly in regard to adopting available alternatives, installing recovery equipment, and reviewing national regulations with a view to removing the requirement to use MB for QPS.

Table 2. Summary of Montreal Protocol decisions that encourage reduction in the use and release of QPS – MB

Decision	Parties are encouraged to…
VI/11 (1994)	· Use containment, recovery and recycling technologies more widely
VII/5 (1995)	· Refrain from the use of QPS – MB where possible · Use non – ozone – depleting technologies where possible · Minimise emissions and use of MB through containment, recovery, re cycling to the extent possible, which should be more widely applied
X/11 (1998)	· Submit to the Ozone Secretariat a list of regulations that mandate the use QPS – MB · Report volumes of QPS – MB consumed
XI/13 (2001)	· Report volumes of QPS – MB consumed · Review their national plant, animal, health and stored product regulations with a view to removing the requirement for the use of MB for QPS where technically and economically feasible alternatives (TEFAs) exist · Monitor the use of QPS – MB by commodity and quantity to target efficient use of resources to develop and implement TEFAs · Identify TEFAs early, where they exist
	· Encourage the use of recovery and recycle technology, where technically and economically feasible, until alternatives for QPS – MB become available

Decision	Parties are encouraged to…
XVI/10(2004)	· Provide best – available data to a "QPS Task Force" that identifies QPS – MB, by commodity and application · Provide information on applying TEFAs for MB uses that are more than 10% of QPS consumption or highest volume uses · Provide information on known QPS – MB uses, where data are available
XV1/11(2004)	· Apply heat or use alternative packaging materials rather than MB, in response to ISPM – 15 · Accept imported wood packaging treated without MB

Adoption of Alternatives

The Protocol urges governments to identify and adopt technically and economically feasible alternatives(TEFAs), where possible, which are discussed in the last Section.

Methyl Bromide Recovery and Recycle Technology

In cases where alternatives are not available, the Protocol asks governments to reduce MB emissions by encouraging the use of recovery technology. TEAP (2006) estimates that 90% of the QPS – MB is emitted[7] to the atmosphere.

Some countries have attempted to reduced these emissions by attaching recapture technology to fixed fumigation facilities. Deployment of recapture technology is increasing but is still low[8]. Canada and the USA have developed and installed MB recovery equipment for fixed fumigation facilities over the past 10 years. The relatively high cost of installing and operating this equipment[9] has limited investment in this technology. In addition, recovery technologies do not reduce reliance on MB, and still allow substantial emissions in most cases. For this reason, some countries have preferred to invest in research on MB alternatives, rather than recovery technology, to provide a permanent solution.

A second approach which has been developed recently captures MB emissions before shipping containers are opened to unload fumigated materials. Although these have been installed mainly to address health and worker safety, a co-benefit is enhanced protection of the ozone layer protection.

Companies are operating in the Netherlands and Belgium. Belgium, for example, has two companies with a combined capacity to service up to 75 000 containers per year[3]. Similar recovery units are also reported to be operating in Australia (10 units), India (1), Malaysia(2), and USA(1). Recent legislation in New Zealand requires recovery equipment to be used within a local port on all fumigations using more than 3 kg of MB.

List of Regulations that Require the Use of Methyl Bromide

In 1998 Decision X/11 requested governments to submit to the Ozone Secretariat a list of regulations that require the use of MB. In 1999 MBTOC requested 96 countries to provide information on the use of QPS – MB, including this list of regulations. Only one third of countries provided some information on uses[9], and few provided a list of regulations.

In 2001, Decision XI/13 requested governments review their national plant, animal, health and stored product regulations, with a view to removing the requirement for the use of MB for QPS where technically and economically feasible alternatives exist. Countries were not asked to report on this activity, so there is no information on the number of countries that implemented this Decision.

Monitoring QPS Uses to Target Resources for Alternatives

Decision XI/13 in 2001 encouraged governments to monitor the use of QPS – MB, by commodity and quantity, to target efficient use of resources to develop and implement TEFAs. In general, countries have not put in place procedures to monitor the use of QPS – MB by commodity and quantity, as evidenced by the difficulty government's face in reporting on use by sector. TEAP (2006) surmised that Parties may have not have had sufficient time between 2001 and 2003/2005 to implement such procedures[7]. As a result, there is little information available to governments on targeting resources to develop and implement alternatives.

Alternatives to QPS – MB

MBTOC reports since 1994 have identified alternatives for a large portion of QPS – MB uses, including many non-MB phytosanitary treatments approved by national authorities. Forty-two Parties, in responding to an earlier

survey, reported that 65% of the QPS – MB could be replaced with commercially-available alternatives, but they considered that cost, location and lack of acceptance by trading partners were major impediments to their implementation[10]. TEAP has noted that many approved alternatives are available for major uses, but there has been little incentive for their adoption[11].

Activities that Reduce the Use of QPS – MB

Despite the lack of response to Montreal Protocol decisions, which are non-binding on governments, a number of countries have undertaken activities to reduce or eliminate QPS – MB, or are in the process of doing so, as illustrated by the following examples.

Legislative Action Targeting all Uses of QPS

The EC was the first region to limit QPS – MB by capping[ ] the annual consumption of QPS – MB to 1012t from 1 January 2001. EC Member States are required to report annually to the European Commission on the quantities of QPS – MB authorised in the previous year, the purposes for which it was used, and progress in evaluating and using alternatives for QPS. The quantity authorised for consumption was in practice about one third less than the cap each year since 2001 and, moreover, the cap did not increase when the EU expanded from 15 to 27 countries beginning on 1 May 2004.

The total QPS – MB used in the EC in 2004, 2005 and 2006 was 400, 354 and 362t respectively. Ten countries used no QPS – MB, 11 averaged less than 20t per year and 6 averaged more than 20t (but five of them were reducing annually)[13]. Legislation in some EC countries prohibits the use of QPS – MB and has done so for many years[14].

Logs and Wood Products

New Zealand recently placed a levy on MB imports to finance work to reduce emissions and use[15]. An international symposium in New Zealand in 2008 discussed 28 possible alternatives to QPS – MB. Research is underway on the use of generated phosphine on key exports crops including logs, sawn timber, apples and onions. QPS – MB use in 2006 was 74% of the total used of 177 tonnes and is increasing at 14% per year due to exports to China, India and Malaysia[7]. Trials are underway that aim to gain approval for in-transit fumigation of logs with phosphine to India, following the success of similar shipments to China that eliminated some 200 tonnes per year of QPS – MB. In the longer term, an ecologically-based, risk assessment system is under development for forestry exports that ensures that quarantine pests are treated only when necessary and with the most environmentally benign fumigant.

Uptake of Alternatives for Wood Packaging Materials (ISPM – 15)

ISPM – 15 standard was endorsed by the IPPC in March 2002, and most countries had implemented legislation by mid – 2005. The standard requires the use of either MB or heat for wood packaging material (WPM). Now three years later, heat or MB treatment of WPM, compliant with the ISPM – 15 standard, is required in 37 countries. Many independently-certified heat treatment facilities exist in developing and developed countries including Australia (56 facilities), the EU[16] (>1500), India (41), Malaysia (30), NZ (146), and the US (>4000). Canada and China (Taiwan) no longer use QPS – MB to meet ISPM – 15 requirements and instead rely on heat treatments[3]. There has also been an increase in non-wood packaging material made from recycled plastic, which completely avoids the disinfestation requirement. The large increase in MB use from 2002 predicted by TEAP (2005) is therefore unlikely to eventuate, given the significant global deployment of heat treatment facilities over the past 4 years[17].

In regard to imported logs typically fumigated on arrival in Japan, that country may soon register two new fumigants (sulfuryl fluoride/methyl isothiocyanate mixture and methyl iodide), following successful trials that concluded in March 2008[3].

Soil Fumigation

According to estimates by TEAP, the second largest user of QPS – MB is for "Soil (preplant)", which refers to soil fumigation with MB in the USA and Chile[7] for strawberry runner production and certain other nursery crops. Live plant material is certified by the government as "pest-free" on the basis of soil fumigation several months earlier, with the intention of reducing the risk of soil nematodes as pests being shipped to importing countries and regions.

Discussions in the Montreal Protocol in 2006 questioned whether soil fumigation with MB can control pests several months later to applicable quarantine standards[18], and noted that QPS – MB used for this purpose does not

appear to comply with the definition of QPS. Approximately 1,500t of MB are used annually for this purpose. TEAP reported that fumigation with MB was highly effective in reducing soil-borne pathogens but did not consistently eradicate them[19]. Moreover, alternatives are available to replace QPS – MB for pre-plant soil fumigation[19,7]. It appears that this use should be replaced by alternatives which would reduce QPS – MB uses by almost 20% ,or be evaluated by MBTOC again as a potential critical use.

Conclusions

Several countries put in place legislation that prohibited QPS – MB in the 1990s, without adverse effects. The EC placed limits on the volume that can be used, and the use of QPS – MB has fallen. Other countries have also adopted alternatives in specific sectors and have targeted sectors that consume the most QPS – MB such as logs and stored grain. More countries are now focusing on the high-volume sectors and have begun to take action to reduce QPS – MB. However, many countries have taken little action to date. QPS – MB use has declined very slowly relative to the other uses of methyl bromide. QPS – MB is the largest uncontrolled emissive use of any ozone-depleting substance. For this reason the Montreal Protocol is likely to explore other options that could result in greater controls on the use of QPS – MB.

Developing countries would benefit from controls on QPS – MB because controlled uses in the Montreal Protocol enable countries to apply for financial assistance to comply with the controls.

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