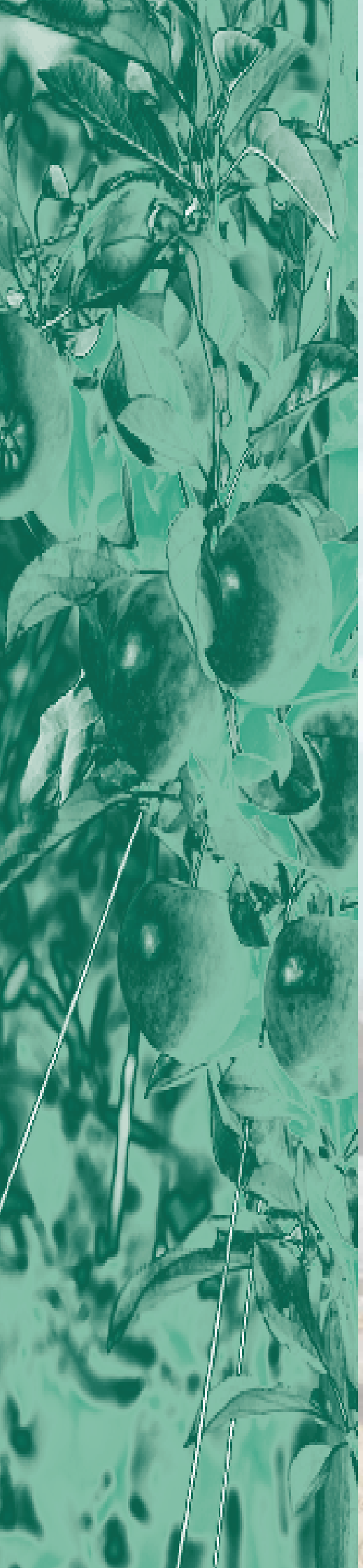

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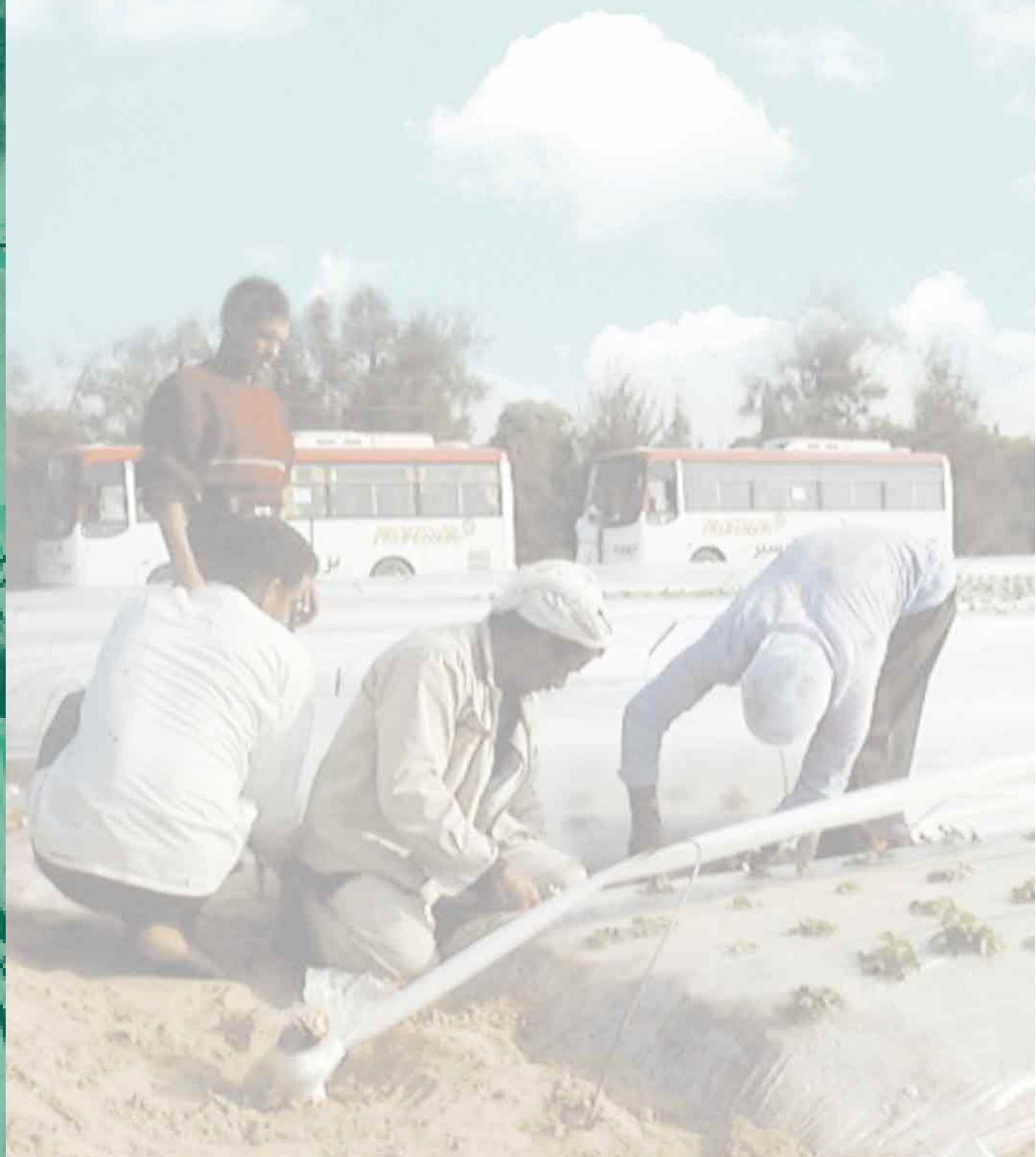
UNITED NATIONS ENVIRONMENT PROGRAMME
DIVISION OF TECHNOLOGY, INDUSTRY AND ECONOMICS
OZONACTION PROGRAMME

Towards methyl bromide phase out

A handbook for national ozone units



Towards Methyl Bromide Phase Out

A handbook for national ozone units

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The team at UNEP TIE *that managed this publication was*:

Jacqueline Aloisi de Larderel, Director, UNEP TIE
Rajendra Shende, Chief of Energy and OzonAction Unit, UNEP TIE
Cecilia Mercado, Information Officer, UNEP TIE
Corinna Gilfillan, Consultant, OzonAction Programme, UNEP TIE

Author: Dr Melanie Miller
Editor: Geoffrey Bird
Design and layout: Words and Publications

Technical reviewers:
Dr Abdul Elah Al-Wadaee, Dr Tom Batchelor, Mr Jorge Leiva, Ms Catalina Mosler, Dr Ian Porter, Ms Kristin Schafer and Mr Bill Thomas

Cover photograph by Tom Batchelor

United Nations Environment Programme (UNEP TIE)
39–43 quai André Citroën, 75739 Paris Cedex 15, France

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Preface

This H*andbook* provides assistance in the development and implementation of national action plans to phase out methyl bromide and replace it with alternative techniques. In particular, it will assist in:

- assessing methyl bromide use;
- identifying appropriate alternatives;
- encouraging stakeholder participation;
- establishing a policy framework;
- raising awareness;
- implementing alternatives; and
- reviewing progress.

The H*andbook* has been written for National Ozone Units in the government departments responsible for implementing control measures under the Montreal Protocol, the international ozone protection treaty. However, many of the planning steps it contains will also be applicable to other relevant government departments, methyl bromide users, companies and non-governmental organizations (NGOs) wishing to show leadership in phasing out methyl bromide.

The planning process is presented in the H*andbook* in seven broad stages. However, there is not just one method for developing a plan suitable to every situation. The route you will eventually take will depend much on your country's situation and objectives, and on the outcome of your consultation with other government departments and stakeholders. This H*andbook* is intended to provide you with a flexible tool to help you build a planning framework appropriate to your specific needs, and to guide you to sources of relevant information.

– UNEP TIE OzonAction Programme

Background

It is well established that some widely used man-made chemicals containing chlorine and bromine are destroying the ozone layer—the delicate layer of ozone molecules in the stratosphere, shielding the Earth from harmful ultraviolet-B (UV-B) radiation. If this destruction is not halted, depletion of the ozone shield will have grave consequences for human health, for our food production systems and, ultimately, for the ecosystem that supports life on Earth.

Methyl bromide, a broad spectrum pesticide, has been identified as an ozone depleting substance. According to the Montreal Protocol's Scientific Assessment Panel, each atom of bromine from methyl bromide that reaches the stratosphere destroys approximately 60 times more ozone than each atom of chlorine from CFCs.

Methyl bromide is used as a fumigant to control a wide range of pests in:

- **Soil:** before planting of certain economically important crops such as tomatoes, peppers, melons, strawberries, flowers and tobacco seeds.
- **Commodities:** such as grains, timber, wooden items, fruit and flowers.
- **Buildings, vehicles or other structures:** in limited cases.

UNEP's Methyl Bromide Technical Options Committee (MBTOC) estimates that around 71,500 tonnes of methyl bromide were used worldwide in 1996. Of this, some 17,300 tonnes (about 24 per cent) were used in developing countries (see Table 1.1).

Table 1.1
Estimated consumption of methyl bromide in Article 5* regions in 1995–96

Article 5 regions	MB consumption 1995 (tonnes)		MB consumption 1996 (tonnes)	
Latin America and Caribbean	7,377	45%	6,616	38%
Africa	4,002	25%	4,269	25%
Asia and Pacific	3,329	20%	4,177	24%
Middle East	1,504	9%	2,120	12%
Other A5 regions	145	1%	141	1%
Total Article 5 consumption	16,357	100%	17,323	100%

Source: MBTOC Assessment Report, 1998

*__Article 5 countries__ are developing countries that consume less than 0.3 kg per capita per annum of certain controlled substances. They are so called because their status is defined in Article 5 of the Montreal Protocol.

Phasing out methyl bromide

Because of the danger it represents for the ozone layer, methyl bromide was added to the Montreal Protocol's list of ozone depleting substances (ODS) in 1992. It is now due to be phased out:

- by 2005 in industrialized countries, with interim reductions in 1999, 2001 and 2003; and
- by 2015 in Article 5 countries, with a freeze at average 1995–98 base levels in 2002, and 20 per cent reduction by 2005.

The Protocol also encourages countries to phase out methyl bromide and other ODS ahead of schedule whenever they are able.

Quarantine and pre-shipment uses of methyl bromide are exempt from these controls. Exemptions will be allowed after phase out for limited critical uses if it is demonstrated that technically and economically feasible alternatives are not available.

'Quarantine' means officially-required use of methyl bromide to avoid inadvertently transporting pests, along with commodities, to places where those pests are not already present, or where they are being officially controlled. 'Pre-shipment' refers to treatments applied directly prior to exporting commodities, to meet official pest-control regulations in either the importing or exporting country (see Box 1.1).

Quarantine and pre-shipment uses are known collectively as 'QPS' uses. At present they represent about 22 per cent of global methyl bromide consumption.

The Protocol provides additional time, and technical and financial assistance, for Article 5 countries to phase out ODS, in recognition of their special social and economic circumstances. Developing countries are attempting to deal with issues such as poverty, global inequalities, debt repayments, and social and industrial changes. Agricultural sectors are trying to adjust to changes brought about by globalization and face constraints such as insufficient research, extension and training capacity, and difficulties in technology transfer. However, on the positive side, MB phase out presents opportunities to modernize horticultural methods and to develop new exports for supplying the global market for alternatives.

Alternatives to methyl bromide

Viable and cost-effective alternatives to methyl bromide exist and are used in both developed and developing countries. MBTOC has identified alternatives in use, or at advanced stages of development, for the vast majority of methyl bromide uses. In many cases a combination of practices and techniques should be used as an Integrated Pest Management (IPM) system in order to achieve satisfactory pest control.

The advantages of a national action plan

Once governments have committed to phasing out ODS, National Ozone Officers are often expected to act as 'change agents'—people who facilitate or organize changes in institutions or industries. But introducing change can seem daunting, and experience has shown that good planning and full consultation with users and other stakeholders make the process easier.

Preparing a **national action plan** for phase out of methyl bromide offers the following benefits:

- full consultation, enabling stakeholders to develop the plan and understand the reasons for reductions and phase out;
- opportunities for methyl bromide users to articulate their needs;
- appropriate strategies, reflecting the agricultural, economic and social characteristics of your country;
- coordinated efforts of government agencies, methyl bromide users and stakeholders, avoiding duplication and gaps;
- clear signals for users, putting them in a better position to make their own plans at enterprise level;
- raised awareness about sources of information and assistance; and
- disruption minimized as a result of early planning.

What we did

Examples of national methyl bromide phase-out activities showing diverse approaches

Brazil: Encouraging reductions

- Situation analysis and planning
- National workshops and consultation
- Demonstration of alternatives
- Awareness raising

Colombia: Most methyl bromide uses phased out

- Alternatives developed for technical and commercial reasons
- Alternatives promoted by users and grower associations
- Most methyl bromide uses prohibited under health regulations
- Technical assistance from specialists in Colombia

Bahrain: Methyl bromide phased out

- International sources of information utilized
- Methyl bromide uses analysed
- Suitable alternatives identified
- No further permits for importing methyl bromide—under existing system for controlling pesticide imports

Stage 1: Assessing methyl bromide use

Before starting to develop a plan, it is necessary to gather key data about methyl bromide use patterns in your country.

1.1 Organizing data collection

Under Article 7 of the Montreal Protocol, NOUs are expected to report data on methyl bromide consumption. This data provides an important starting point for your analysis. If there are significant gaps, you could organize a survey to collect further information such as:

- Main uses of methyl bromide
  - Which crops use methyl bromide?
  - Which commodities (non-QPS) use methyl bromide?
  - What are the QPS uses of methyl bromide?
  - Which groups are major users of methyl bromide?

- Consumption trends
  - Which uses are increasing, and why?
  - Which uses are decreasing, and why?

Tables 1.1–1.4 of this section will provide you with useful tools for gathering data.

1.2 Data sources

It makes sense to ask methyl bromide users and other stakeholders to help collect data. Some possible sources of data are:

- agricultural ministries;
- pesticide control authorities;
- methyl bromide importers and fumigation companies;
- horticulture, plant pathology, nematology and stored product sections of institutions;
- extension personnel; and
- major methyl bromide users.

The data you collect must be reliable, because it will be used to determine the activities within a national action plan. Cross-checking of different sources will help to refine estimates and increase reliability.

1.3 Data on QPS uses

Data can also be collected on QPS uses of methyl bromide. Even though QPS is currently exempt from control, collecting this data provides an opportunity to review your QPS situation. The possible relevance of this to a national action plan is explained in Section 4.8.

It is not always easy to decide whether a given use of methyl bromide is covered by the definition of QPS. The QPS 'Decision Tree' in Box 1.1 will help to classify uses.

Table 1.1 National consumption trends

Year	Total methyl bromide imported or consumed (*tonnes*)	Trend in consumption compared to previous years		
		Stable	*Decreasing*	*Increasing*
1991				
1995				
1996				
1997				
1998				
1995–98 average				
1999				
2000				
2001				
2002				

If consumption has changed in recent years, list the main reasons why:

Table 1.2 Major sectors using methyl bromide

Sectors using methyl bromide	Tonnes of methyl bromide used per year	Percentage of total
Soil treatments		
Durable commodities (excluding QPS)		
Structures (excluding QPS)		
Perishable commodities (excluding QPS)		
Quarantine and pre-shipment treatments		
TOTAL		**100%**

What we did

Consumption surveys

UNEP-UNDP surveys on methyl bromide consumption

UNEP and United Nations Development Programme (UNDP) have organized surveys on methyl bromide use patterns in South-East Asia and the Pacific, Latin America and Africa. A resource pack was developed to provide:

- *tips for carrying out a survey;*
- *list of tasks;*
- *'template' tables for entering data;*
- *checklists of crops and commodities; and*
- *ideas about where to look for data.*

The surveys were carried out by NOUs or consultants, and results were discussed at regional workshops organized with UNEP.

Further information:
UNEP's Reports of Regional Workshops listed in the Resources List.

Table 1.3 Crops grown on soil treated with methyl bromide

Major crops	Minor crops

Commodities treated with methyl bromide

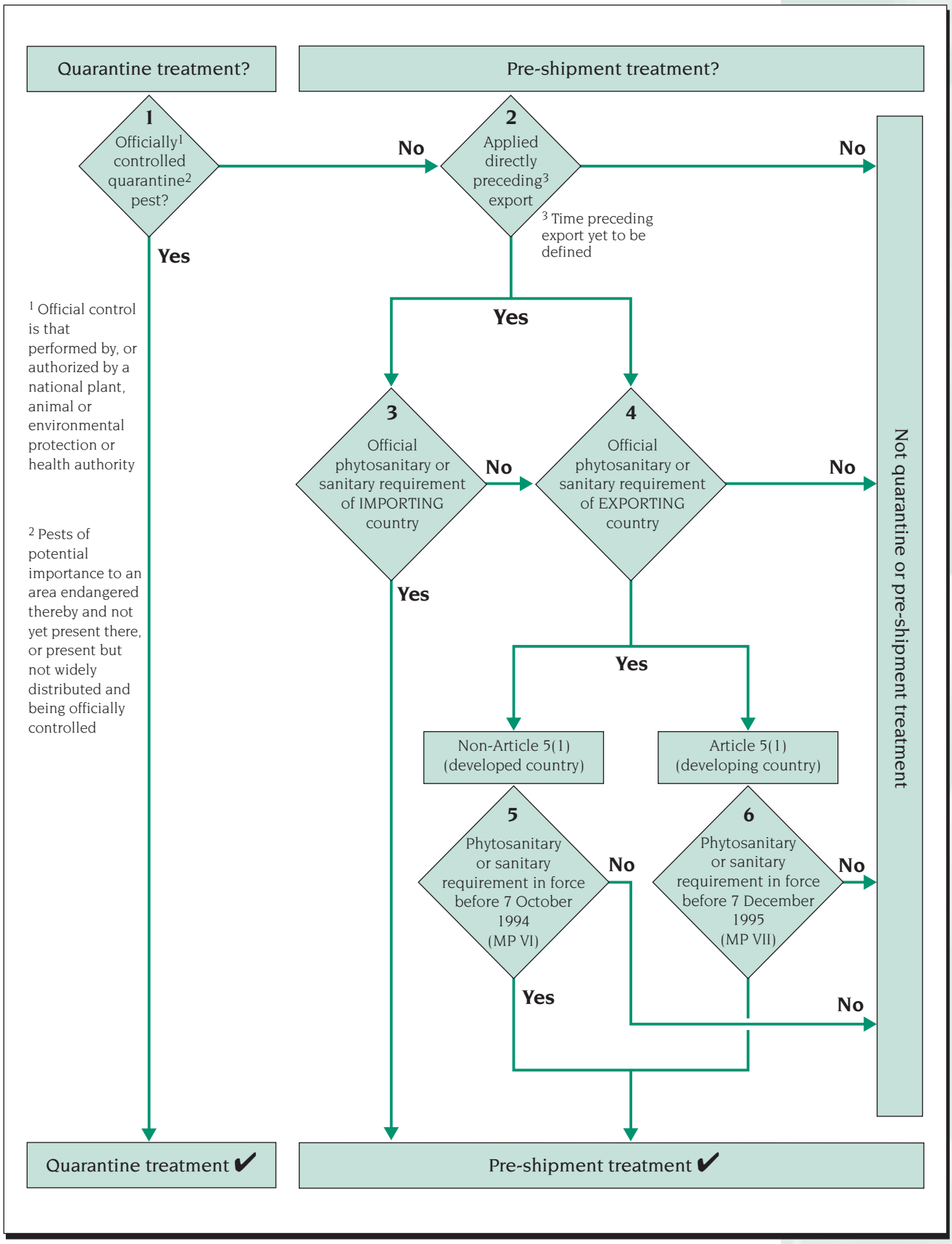
Major commodities	Minor commodities

Other uses of methyl bromide

Table 1.4 Profiles of major methyl bromide user groups

User group	Characteristics e.g. number, ownership, access to technical information
Fumigation companies providing soil applications	
Fumigation companies providing applications for commodities or structures	
Internationally-owned farm businesses large farms	
Small farms, medium-sized farms	
Government operated grain stores	
Commercial stores for durable products	
Wholesale purchasers, traders or auction houses and others	

Box 1.1 Quarantine and pre-shipment—decision tree



Source: MBTOC Assessment Report, 1998

Stage 2: Identifying appropriate alternatives

The key to identifying alternatives is to focus on the pests that methyl bromide is used to control, and to then identify equally effective techniques to replace it.

2.1 Compiling crop and pest lists

You may already have a list of the pests for which methyl bromide is used. If not, Table 2.1 below will serve as a tool for gathering this information.

2.2 Identifying pest control methods

In order to help Article 5 countries to identify viable alternatives to methyl bromide, UNEP established the Methyl Bromide Technical Options Committee (MBTOC) to provide technical information to the Parties to the Montreal Protocol.

MBTOC has identified alternatives in use or at an advanced stage of development for the vast majority of methyl bromide uses, in both developed and developing countries. Information on these can be obtained from UNEP's information brochure *Methyl Bromide: Getting Ready for the Phase Out*. More detailed information can be obtained from the UNEP Technology and Economic Assessment Panel (TEAP) Reports and MBTOC Reports. Details of where to obtain these and other relevant publications are given in the Resources List.

Methyl bromide is one of the few remaining pesticides which kills a very wide range of organisms. In order to kill or control the same range of pests it is

Table 2.1 List of pests for each crop or commodity

Crops and commodities using methyl bromide	Key pests controlled by methyl bromide
Tobacco	
Cut flowers	
Tomatoes	
Melons	
Courgettes	
Cucumbers	
etc.	

Note: The list above just gives examples of possible crops or commodities and will depend upon the specific crops that use methyl bromide in your country.

often necessary to use a combination of practices and techniques. An integrated pest management (IPM) approach can be helpful because it focuses on specific pests. IPM strategies are providing successful means of replacing methyl bromide in numerous countries. They are an important tool in replacing methyl bromide.

A useful starting point is to use available reference material to identify alternatives used in other countries with similar climates. Once you have identified relevant alternatives, you could contact experts from those countries to ask for technical information. UNEP's *Inventory of Technical and Institutional Resources for Promoting Methyl Bromide Alternatives* provides sources of information and contacts in many countries (see **Resources List**).

2.3 Opportunities for local economic development

In most countries, methyl bromide is an expensive imported product. Its phase out creates opportunities for import substitution—to create local employment by encouraging local small and medium sized enterprises (SMEs) to supply alternative products and services. There will also be opportunities for companies in Article 5 countries to create new export markets, supplying alternatives to other countries. The global phase out of methyl bromide will create a new global market for alternative products and services. Experience with other ODS has shown that countries that take early action are best placed to gain a market lead.

You could consider producing a leaflet to encourage local companies to take advantage of the business opportunities. Some questions to consider are:

- Do any local companies supply alternative services and products?
- What size will the markets be for alternative products and services—nationally and regionally?
- What economic benefits can be gained by substituting imports of methyl bromide with locally-produced products and services?
- How can local companies, especially SMEs, take advantage of the new business opportunities?
- What sources of technical and financial assistance are available for companies?

What we did

Integrated Pest Management (IPM)

Flower growers in Colombia use successful IPM systems

Factors which have contributed to the success of IPM systems in operation by flower growers in Colombia have included:

- *sanitation (cleanliness), to prevent disease being brought onto farms or spread within them;*
- *varieties resistant to soil pests;*
- *biological controls, including beneficial fungi to help suppress nematodes;*
- *frequent pest and disease monitoring, so that early action can be taken to control pests before they become a problem; and*
- *spot treatments including removal of diseased plants and use of selected pesticides on problem areas only.*

Stage 3: Encouraging stakeholder participation

Stakeholders include groups affected by phase out—normally users of methyl bromide—and all other groups that can make a contribution to action plans. It is useful to encourage all stakeholders to undertake voluntary and market-based activities to reduce reliance on methyl bromide.

3.1 Who are the stakeholders?

There are two main groups that need to be consulted and involved in planning. These are:

- other government departments or agencies dealing with methyl bromide; and
- methyl bromide users and stakeholders.

Stakeholders include the following:

- farmers using methyl bromide;
- farmers using alternatives;
- methyl bromide importers, suppliers, fumigation companies;
- agricultural trainers;
- extension staff;
- experts in alternatives;
- NGOs working on agricultural and environmental issues;
- companies offering alternative services or products; and
- others who can make a positive contribution to action plans and activities.

Involving all stakeholders in the development of a national action plan gives them some ownership of the issue, ensures that plans are realistic for users, and helps ensure success.

3.2 Benefits of support networks

Before embarking on consultation and other activities with stakeholders, it will be useful to find some sources of support. Informal and formal support networks can help you here.

3.3 Creating an informal network

An informal support network will provide you with people to turn to for:

- an informal sounding board for ideas;
- discussing next steps and progress, informally;
- technical information, especially on alternatives;
- moral support when you need it;
- vocal support in public meetings;
- combating misinformation about methyl bromide; and
- reviewing draft documents.

Include two or three people who strongly support the process of developing action plans on methyl bromide—people who:

- fully support the aims of the Montreal Protocol; and
- are able to speak confidently in public meetings about the need for stakeholders to take constructive action.

Ideally, one person in your network should be an expert on existing alternatives for the major uses of methyl

bromide in your country. UNEP's *Inventory of Technical and Institutional Resources for Promoting Methyl Bromide Alternatives* and *Sourcebook of Technologies for Protecting the Ozone Layer: Methyl Bromide* will help you to find experts and institutions able to offer assistance (see **Resources List**).

3.4 Creating a formal network

The creation of a formal support network within the organization can also be an important and useful step. Before the consultation process begins, a formal network or working group could be set up in order to provide direction and assistance on how to conduct consultation, and to ensure that expected results are achieved. The working group could be composed of:

- representatives from the ministries responsible for agriculture, pesticides, etc.
- representatives from the ministries responsible for industries, customs, etc.
- technical specialists from the NOU.

3.5 Government departments—working group

You could also set up a working group of government officials, to provide a forum for identifying and evaluating options for a framework of policies and regulations (see **Stage 4**). Some government departments that may already have responsibilities for methyl bromide are:

- Environment
- Agriculture
- Rural development
- Health
- Hazardous chemicals
- Border control
- Customs
- Industry
- Trade

The National Ozone Unit would normally take the lead in convening meetings. **Box 3.1** provides some tips for effective meetings.

Box 3.1 Tips for effective meetings

- ✔ Circulate an agenda
- ✔ Be clear about what you want the meeting to achieve—state the objectives
- ✔ Consider having a facilitator
- ✔ Keep focused on the topic
- ✔ Make sure everyone has a chance to have their say
- ✔ Find areas of agreement
- ✔ Record action points (what, who, when)
- ✔ At the end, reiterate the areas of agreement and decisions
- ✔ Fix the date of next meeting
- ✔ Circulate action points

Confidence building, cooperation and full discussions provide an important basis for making a successful plan.

What we did

Involving companies in Canada

Companies offering alternatives to methyl bromide are an important part of Canada's national strategy. The companies were strongly encouraged to get involved in activities of the industry/government methyl bromide working group. As a result, a number of Canadian companies assisted or led demonstrations of alternatives and worked with users to develop new systems and guidelines.

Voluntary levy in Australia

In 1995 farmers and methyl bromide importers in Australia decided to place a voluntary levy on methyl bromide. By 1998 the levy was raising around US$300,000 per year. The money is used to support trials, and for disseminating information about alternatives.

Box 3.2 Long-term needs of stakeholders

Users and other stakeholders often feel that they need methyl bromide, and that there is no alternative to it. However what is needed is an effective way of controlling pests.

- Farmers need:
  effective, safe and cost-effective systems for controlling soil pests, so they can make a living from selling their crops.
- Other methyl bromide users, such as grain-store operators need:
  effective, safe and cost-effective pest control methods.
- Methyl bromide fumigation companies need:
  to make a livelihood from selling pest control services, equipment or products.
- Wholesale purchasers of crops and commodities (e.g. supermarkets) need:
  confidence of consumers, and confidence in environmental standards of agricultural producers.

3.6 Possible stakeholder activities

Before approaching stakeholders, it is useful to develop an understanding of their point of view, which means understanding their long term needs. Box 3.2 outlines some needs. You could use them as a starting point for discussions with a stakeholder group.

NOUs can help stakeholder groups to identify options for voluntary activities to encourage the adoption of alternatives to methyl bromide, such as the following:

- identifying companies offering alternatives;
- seminars and training;
- purchaser's specifications;
- environmental labelling;
- voluntary levies;
- voluntary reductions; and
- industry commitments.

3.6.1 Identifying companies offering alternatives

Companies that can supply alternative services and products—now or in the future—have a very important role to play in national action plans. The stakeholder group and other agricultural organizations could help to compile a list of such companies. The stakeholder group could also help to inform local companies about the new business opportunities for supplying alternatives in the future (see Section 2.3).

3.6.2 Seminars and training

Agricultural organizations, research stations and farmers' organizations could hold seminars, workshops or training sessions to inform methyl bromide users about alternatives. Agricultural organizations or companies could set up full training programmes. NOUs could work with these bodies and link such programmes to a wider

training strategy developed for methyl bromide alternatives.

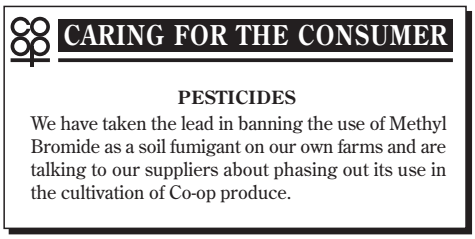
3.6.3 Purchaser's specifications

Companies that purchase crops and commodities treated with methyl bromide—such as supermarket chains, wholesale traders, import/export companies and auction houses—could write policies and adjust their specifications and contracts.

3.6.4 Environmental labelling

Food manufacturers, supermarkets and other shops could provide information to customers, to allow them to choose products grown with non-methyl bromide techniques. This can be done by:

- providing customer information leaflets about methyl bromide;
- labelling products which have not been grown or treated with methyl bromide; and
- labelling products which have been treated with methyl bromide.



Leaflet from the Co-operative supermarket chain in the United Kingdom stating their leadership action on methyl bromide.

3.6.5 Voluntary levies

Farmers and methyl bromide users could place a voluntary levy (tax) on imports of methyl bromide. If the resulting revenue is used for trialling alternatives, training, or disseminating information, farmers could receive positive benefits from the levy.

3.6.6 Voluntary reductions by users

Farmers and other users can reduce consumption and reliance on methyl bromide by a variety of means, such as:

- adopting soil pest and pathogen monitoring to determine whether any treatment is necessary;
- reducing the frequency of methyl bromide treatments, e.g. alternating methyl bromide treatment with another treatment;
- reducing doses (application rates) of methyl bromide by combining methyl bromide with a suitable treatment, such as solarization; and
- adopting alternatives on at least part of the production area.

3.6.7 Industry commitments—phase-out pledges

Some sectors or companies may be willing to make commitments or pledges to reduce and phase out methyl bromide. Major manufacturers and users of CFCs have made public pledges.

What we did

Industry commitment: Stakeholders' Charter, Brazil

At a national meeting in Brazil in 1996, stakeholders wrote a charter containing commitments to reduce and eliminate methyl bromide, with government, researchers, extensionists and farmers working cooperatively to introduce new, safe alternatives as quickly as possible.

Ecolabels for New Zealand food exports

New Zealand farmers and food companies are in the process of developing a system of environmental criteria for production methods used on farms. Farms able to meet the criteria will be eligible to place an ecolabel—an environmental logo—on their food products. The criteria will require use of IPM systems, and will restrict use of pesticides, fertilizers, water and energy. Farms will pay to have their production methods examined and certified.

Stage 4: Establishing a policy framework

What we did

Pesticide controls in the Philippines

In the Philippines, pesticide regulations restrict methyl bromide to particular applications, so it is used primarily for banana crops, golf courses and for certain commodities. Methyl bromide cannot be sold over the counter because it is a toxic chemical. It carries warning labels and can only be used by trained and certified fumigators. The Committee on Environment and Natural Resources of the Philippine Senate has conducted public hearings on the environmental impact of methyl bromide use on golf courses.

Having a policy framework, especially effective legislation and regulations, has been found to be one of the most important factors in bringing about smooth and timely ODS phase out. However, if these policies are to be effective, adequate enforcement is also necessary.

4.1 Policy options

This chapter examines the following measures which you could consider to establish a policy framework for methyl bromide reductions and phase out:

- ratifying the Copenhagen Amendment;
- preventing new uses of methyl bromide;
- adjusting pesticide controls;
- monitoring and controlling imports;
- adopting departmental policy statements;
- adopting early phase-out steps;
- reviewing quarantine requirements; and
- using economic measures.

Consultation remains important throughout this stage. The feedback you will obtain from your support networks and from other stakeholders will be extremely useful in shaping the national action plan and ensuring its successful implementation.

Other peoples' experience can be another useful source of information. UNEP's *Methyl Bromide Phase-Out Strategies: A Global Compilation of Laws and Regulations* outlines various policy approaches in more than 90 countries. It includes descriptions of programmes promoting alternatives and pesticide use reductions, barriers to phase out, and specific country examples (see **Resources List**).

4.2 Ratifying the Copenhagen Amendment

If your country has not yet ratified the Copenhagen Amendment, this is a first step. The Copenhagen Amendment was adopted by the 4th Meeting of the Parties to the Montreal Protocol and officially listed methyl bromide as a controlled substance under the Protocol. One of the benefits of ratification is that it will make your country eligible for financial assistance for methyl bromide alternatives training and investment projects under the Montreal Protocol's Multilateral Fund. The Multilateral Fund provides technical and financial assistance to Article 5 countries in phasing out ODS. Countries that have not ratified are eligible only for information exchange and policy dialogue programmes under Multilateral Fund guidelines developed in 1998.

4.3 Preventing new uses of methyl bromide

The Multilateral Fund Guidelines note the desirability of establishing regulations to prevent new uses of methyl bromide.

In countries where methyl bromide is not used at present:
NOUs may propose regulations to prevent importation or use of methyl bromide. Measures could be introduced under pesticide regulations or import controls.

In countries where methyl bromide is used:
NOUs could establish a controlled list of permitted uses of methyl bromide reflecting current uses, so that new uses cannot start unless they are reviewed and added to the permitted list. Such controls could be introduced under pesticide regulations.

In countries where methyl bromide is manufactured:
NOUs could place limits on the production capacity and new facilities. China, for example, has introduced regulations to prohibit new methyl bromide production facilities.

4.4 Adjusting pesticide controls

Many countries have legislation and/or regulations controlling the sale, use and labelling of pesticides, including methyl bromide.

NOUs could consider encouraging pesticide regulatory authorities to review and improve existing controls on methyl bromide as a pesticide. Some ideas include:

- restricting use of methyl bromide to a list of permitted uses;
- limiting the frequency of soil fumigations to one year in two—encouraging farmers to use alternatives in the interim;
- requiring methyl bromide to be combined with another technique, (such as solarization or another fumigant) so that users get some experience of alternatives;
- requiring safety zones and warning signs at each fumigation site; and
- requiring permits to use methyl bromide, based on proof that other techniques cannot control the pest problem.

4.5 Monitoring and controlling imports

Since most developing countries using methyl bromide import it, there are opportunities to introduce import permits, licence fees and other import controls. Systems to monitor imports would assist in meeting the Protocol's reporting requirements. Import controls would also enable Article 5 countries to prevent dumping of methyl bromide after it is phased out in industrialized countries.

4.6 Adopting departmental policy statements

You could consider asking relevant government departments to produce a policy statement endorsing the goals of the Montreal Protocol. In Egypt, for example, all key government departments have adopted the Articles of the Montreal Protocol as departmental policy statements.

4.7 Adopting early phase-out steps

Where appropriate, the Protocol encourages countries to reduce and eliminate ODS faster than the scheduled dates. Early action could be encouraged in countries where government and users are able to agree on early reductions and phase out. Setting interim targets in addition to

What we did

Agricultural grants in Italy

Grants for new agricultural technologies

The regional government of Ragusa in Sicily subsidized the purchase of new agricultural equipment to encourage farmers to adopt new agricultural technologies in general (not as a measure to replace methyl bromide). Grants were available for purchasing plastic for solarization (25 per cent of cost reimbursed) and machinery (13 per cent reimbursed) to lay plastic for open-field solarization.

Grants for methyl bromide alternatives

For several years the Lazio region of Italy provided grants for steam equipment in an intensive horticultural area where methyl bromide was prohibited in 1983 (due to concerns about water pollution). Subsidies of about US$1.0/m^2 and $0.76/m^2 per crop in greenhouses and open fields, respectively, assisted the change.

What we did

Pesticide taxes in India

The Indian government has placed an 18 per cent import duty on imports of pesticides. But to encourage use of less toxic plant-based pest control substances, duties on these products have been reduced from 30 per cent to 5 per cent.

UNEP's Mentor Programme

UNEP has set up a Mentor Programme to provide expert-to-expert policy-setting assistance for NOUs. Under the system experts from developed countries, known as 'Mentors', are matched with counterparts in Article 5 countries seeking help with policy setting. Mentors make themselves available on a regular basis to answer questions, discuss issues, assist with insights, and share practical experiences in effective policy setting.

In addition, UNEP's Regional Networks of ODS Officers provide opportunities for Officers to discuss common practical problems and experiences.

the scheduled reductions focuses users' attention on alternatives sooner. This will also help to avoid a 'cold turkey' situation resulting from a sudden drop in methyl bromide supplies when the phase-out date arrives.

4.8 Reviewing quarantine requirements

Although QPS treatments are not controlled by the Montreal Protocol, the Parties do encourage all countries to refrain from use of methyl bromide and to use non-ozone-depleting substances wherever possible. QPS use is increasing globally so it might be controlled under the Protocol in the future. NOUs could therefore discuss the issue of methyl bromide with quarantine authorities to try to identify commodities or situations where use of methyl bromide might be replaced by other treatments.

4.9 Using economic measures

Economic measures can be another important component in a national policy framework. Price signals will have a major influence on use of methyl bromide. Existing economic measures which encourage use of methyl bromide —such as agricultural grants—need to be identified and amended. The four types of measures outlined here are:

- adjusting agricultural and rural development grants, subsidies and loans;
- introducing ODS taxes;
- introducing pesticide and product taxes; and
- government-supported environmental labels.

4.9.1 Agricultural grants and loans

A number of governments currently promote agricultural production and exports by providing grants, subsidies or cheap loans for specific activities. These give important economic signals to farmers and others in the agricultural sector, and can have a significant impact on their choice of pest control methods, including choice of methyl bromide or alternatives.

NOUs could encourage government agricultural departments, development agencies and rural banks to review grants and subsidies that affect methyl bromide.

4.9.2 ODS taxes and pesticide taxes

Placing a tax on methyl bromide imports raises prices and encourages users to look for alternatives. If the revenue is used to assist users in adopting alternatives, methyl bromide taxes can serve a dual purpose. Malaysia, Australia and other countries have placed import duties on ODS including methyl bromide, while India and others have placed duties on many pesticide products.

4.9.3 Environmental labels

Some governments have introduced ecolabel standards so that products complying with a specification can carry a special symbol or label. The symbol helps consumers to choose products that are better for the environment. Mandatory warning labels provide another way to inform consumers. Products manufactured with CFCs in the USA, for example, carry labels warning that CFCs harm public health by destroying ozone.

Stage 5: Raising awareness

Farmers, pest control companies, agricultural organizations, non-governmental organizations (NGOs) *and the public all have roles to play in building a national action plan. However, they cannot become involved until they become aware and motivated to do so. Awareness is a pre-condition for action.*

Refer to UNEP's publication *Five Steps for Raising Awareness on Ozone Depletion* for details of the steps (see **Resources List**).

5.1 Steps for raising awareness

UNEP has identified five main steps for raising awareness. These are:

- defining objectives;
- choosing audiences;
- developing messages;
- delivering messages; and
- measuring success.

5.2 Identifying information needs

Where methyl bromide is concerned there is a need for targeted awareness raising and for supplying objective information to specific groups. **Box 5.1** includes a checklist for common misconceptions and concerns found amongst methyl bromide users.

Box 5.1 Checklist of concerns of methyl bromide users

Check: ✔ = relevant in your country
✘ = not relevant

- ☐ Some users are subject to strong marketing policies of methyl bromide manufacturers/distributors.
- ☐ Methyl bromide users believe methyl bromide is not an ODS.
- ☐ Methyl bromide users believe there are no alternatives.
- ☐ Methyl bromide users believe there are no cost-effective alternatives.
- ☐ Methyl bromide users are afraid of competitive disadvantage because they believe some alternatives will be more effective in countries with cooler climates than their own country.
- ☐ Methyl bromide users believe that alternatives are not effective for the long term.
- ☐ Methyl bromide users are concerned that IPM and similar approaches are very expensive.

Other concerns …

What we did

Plan for raising awareness in the Philippines

The Philippines NOU decided on the following plan for raising public awareness of ozone depletion:

Objective

Increase number of people who know ozone depletion is a problem.

Audience

School children; policy makers; industrialists; trade associations; youth; consumers; general public.

Message

Ozone layer depletion is a problem; causes of ozone layer depletion; Philippines is taking action; resources are available from the Multilateral Fund; alternatives to ODS are available.

Medium

Poster contest in schools; public service announcements for radio and television; questions on ozone depletion for popular TV quiz show; one-minute film for cinemas; touring puppet show; insert in comic magazine; industry workshops; flyers and press releases.

Measure

Study levels of awareness in four major cities before and after awareness raising campaign to help measure success.

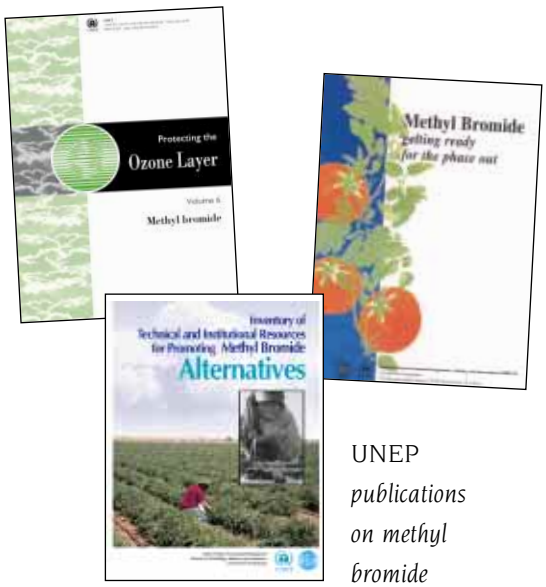
You could tick issues relevant to your country and check whether or not you are equipped with the information to address these concerns. A similar exercise could be undertaken with stakeholder groups. Identifying current perceptions will make it easier to determine the information needs of different groups.

5.3 Selecting delivery tools

When you have decided what you want to say, and to whom, the next step is to decide how best to deliver the messages. The advantages and disadvantages of some widely used awareness raising tools are described in UNEP's *Five Steps for Raising Awareness on Ozone Depletion*. Together with the stakeholder group, you might consider producing selected information materials. Possible options include the following:

- leaflets for the public;
- lists of specialists, farmers, extensionists and researchers who have worked with successful alternatives for several years;
- information on safe and effective alternatives for each major pest;
- technical manuals for farmers and other methyl bromide users, explaining how to use alternative techniques successfully;
- list of financial and technical assistance available to farmers;
- list or directory of companies supplying alternative products and services; and
- report on the new business opportunities for SMEs for supplying alternative services and products, and a leaflet advertising the opportunities for distribution by rural development organizations.

Agricultural organizations, extension personnel, wholesale purchasers (e.g. auction houses, supermarkets) and NGOs can all play important roles in disseminating information.



UNEP *publications on methyl bromide*

Stage 6: Implementing alternatives

Training and technical advice for farmers is essential in introducing alternatives, since most alternatives require different skills from those needed to use methyl bromide. Know-how will often be more important than products or equipment, so 'technique transfer' may be a more appropriate concept than 'technology transfer'. Demonstrations provide opportunities for farmers to see positive results from alternatives. Research may also be useful to adapt and improve techniques where necessary.

6.1 Demonstrating alternatives

Personal experience counts—many people find it hard to believe that alternatives exist until they see them for themselves. Demonstrations provide opportunities for farmers and policy makers to learn about the performance of alternatives. Whether or not your country has a demonstration project under the Multilateral Fund, you can encourage farmers, extension agencies and researchers to set up farm plots to demonstrate the best alternatives. Box 6.1 gives more information about the Multilateral Fund and methyl bromide phase-out activities.

6.2 Promoting alternatives

Guidance for selecting the most appropriate alternatives is found in UNEP's *Sourcebook of Technologies for Protecting the Ozone Layer: Methyl Bromide* (see Resources List). The Sourcebook also provides addresses of companies supplying alternative products and services in many parts of the world. Ideas for promoting the implementation of alternatives include:

- Involve technical specialists who have long-standing and successful experience in using your chosen

Box 6.1 The Multilateral Fund and methyl bromide

The Multilateral Fund of the Montreal Protocol provides technical and economic assistance for Article 5 countries to phase out ozone-depleting substances. The Parties to the Montreal Protocol decided, at their 9th Meeting, to allocate US$ 25 million per year in 1998 and 1999, primarily for demonstrating alternatives to methyl bromide.

By the end of 1998, funding was approved for about 50 demonstration projects in more than 30 countries. Now that the scheduled 2002 freeze is approaching, the Multilateral Fund is placing greater emphasis on investment, training and policy development to promote widespread adoption of alternatives.

Box 6.2 Lessons from agricultural technology transfer

- ✔ Farmers learn best from other farmers.
- ✔ Set up demonstrations on farms where possible.
- ✔ Encourage farmers to come and see demonstrations for themselves.
- ✔ Promote opportunities for farmers to talk with others who already use alternatives successfully.
- ✔ Encourage farmers to set up their own demonstration plots.
- ✔ Give training in fields (on site) rather than in classrooms.
- ✔ Ensure farmers become able to monitor pests and beneficial organisms, and know about their life cycles.

alternatives. They might include farmers, extension staff, agricultural researchers and/or companies supplying alternatives.

- Involve local agricultural organizations e.g. extension agencies, development organizations, bilateral agencies, international agencies like the Food and Agriculture Organization (FAO), and NGOs working in agriculture.
- Select project personnel with relevant skills and experience.
- Select suitable alternatives that are used successfully in other places with similar pests and conditions.
- Learn from experiences of other agricultural projects, especially IPM programmes. Box 6.2 lists some of the lessons learned from successful technology (technique) transfer.
- Monitor key indicators to measure the performance of alternatives—such as marketable yields, key soil pests, costs and profits of the production system, and the acceptability of alternatives to farmers, regulators, wholesale purchasers and consumers.
- Summarize successful results in a fact sheet.
- Work with the stakeholder group to disseminate results, encouraging more farmers to try successful alternatives themselves.

6.3 Training and agricultural extension

When viable and relevant alternatives have been identified, it is possible to set up programmes for training and extension (farm advice). Some alternatives will be ready for training programmes, others may need additional adaptive research. Needs will vary from region to region. UNEP's *Inventory of Technical and Institutional Resources for Promoting Methyl Bromide Alternatives* can help identify partners in your region to assist with training.

Some points to consider:

- **Transfer of know-how**
  Alternatives for soil and stored products do not generally require sophisticated equipment. Transfer of skills and knowledge will be

considerably more important than transfer of technology (equipment and hardware). To emphasize the importance of training the term 'transfer of know-how' is usually used rather than 'transfer of technology'.

- **Learning from experience**
  Experience is available from agricultural training programmes which have already successfully transferred new methods, such as IPM, to large numbers of farmers.

- **Involving specialists who know the alternatives**
  As with demonstrations, involve technical specialists who have long-standing and successful experience in using your chosen alternatives. Advice from researchers, extension agencies and commercial companies may be limited or skewed if the personnel are familiar with particular products (e.g. use of methyl bromide) but are not familiar with alternatives **(Box 6.3)**.

- **Building on existing agricultural extension services**
  In some countries, agricultural extension agencies provide technical information, advice and training to farmers about pest control and many aspects of farm production. Such groups might assist in disseminating information, demonstrations, training and technical support for farmers. Some

Box 6.3 Sources of technical advice for farmers

Extension services	Comments
Government agricultural advisory services	Advice may be free or subsidized
Agricultural institutes, horticultural institutes and research stations	Advice may be free or subsidized
Farmers' associations, farmers' cooperatives	Advice may be free or subsidized or commercial service
Bilateral development agencies providing agricultural programmes	Advice may be free or subsidized
Wholesale purchasers of farm products	Advice may be free or subsidized, promotes pest control methods preferred by purchasing company
Agricultural and horticultural consultants (commercial)	Commercial service, may be independent or tied to particular pest control products
Companies selling pest control products	Advice offered while selling products e.g. agro-chemicals, promotes products of own company

extension personnel currently promote methyl bromide, while others give advice on other options, so training will be important.

- **Training the trainers**
  An effective way to reach larger numbers of farmers is to focus on training extension staff and other agricultural trainers.

6.4 Applied research

Research to find a one-shot replacement for all methyl bromide uses is not likely to be fruitful—such a pesticide would probably be too toxic to pass today's safety standards. Furthermore there is little need for research to develop entirely new alternatives, since MBTOC has identified a wide range of alternatives. Time and resources will be saved by applying existing techniques, and combining them in new ways (using IPM approaches) to control the full range of pests. Research may not, therefore, be necessary. However, applied research may be desirable for optimizing and improving selected alternatives.

What we did

Benefits of IPM training

Small- and large-scale IPM *training programmes have been implemented in many countries. More than* 570,000 *farmers have been trained in* IPM *in seven Asian countries. For example,* IPM *training in Sri Lanka more than doubled farmers' profits from growing chilli and cabbage.*

Stage 7: Reviewing progress

Reviewing progress at regular intervals allows you to see whether the objectives will be met, adjust activities as necessary, and deal with new issues.

7.1 Keeping track of progress

Keeping track of progress will be easier if you use something like the workplan and timetable shown in Tables 7.1 and Table 7.2. This will allow you to see quickly whether people who promised to carry out certain activities have done so by the agreed date. You could consider reviewing the chart at regular intervals, noting activities that are due imminently (or falling behind schedule) and reminding the responsible persons about deadlines.

7.2 Learning from our experiences

Reviewing activities which have been completed is always a useful way of learning from experience. Questions you could consider are:

- What went well? Why?
- What could have been done better? Why?
- How could things be improved?
- How should we amend future activities or parts of the national action plan to take account of these lessons?

7.3 Updating plans

It is desirable every six or twelve months to stand back and take an objective look at your national action plan for methyl bromide. Sometimes it is helpful to ask someone who has not been directly involved to comment on the plan, bringing a fresh eye. Questions to consider include:

- Are we on track for meeting the reduction and phase-out schedule?

Box 7.1 Opportunities to share experiences

The OzonAction newsletter published quarterly by UNEP TIE provides examples of experiences and achievements by governments and companies around the world. Each edition normally carries several articles on these topics. National Ozone Units (NOUs) and stakeholder groups are encouraged to send their experiences to:

Mr Rajendra Shende
OzonAction Newsletter
UNEP TIE
Tour Mirabeau 39–43, Quai André Citroën,
75739 Paris cedex 15, France
tel: +33 1 44 37 14 59 fax: +33 1 44 37 14 74
e-mail: ozonaction@unep.fr

What we did

Monitoring activities

It is possible to measure the impact of specific ODS phase-out activities by measuring baselines before an activity begins.

Awareness survey in the Philippines

The Philippines conducted a survey to find out the level of awareness of ozone issues in four major cities, to provide baseline information. After conducting their awareness-raising campaign the survey will be repeated to measure the success of the activity.

- Will the agreed tasks allow us to reach the goal of phase out?
- Have any methyl bromide sectors been able to adopt alternatives faster than anticipated?
- Are there opportunities for speeding up action?
- What new activities would help reduce reliance on methyl bromide faster?
- What are the major barriers to farmers adopting alternatives, and what actions could be taken to remove the barriers?
- How can plans be improved, to make them more effective and efficient?

7.4 Sharing experiences

We can all learn from the experience of others. Information sharing was identified as a useful project component in the Multilateral Fund's guidelines for methyl bromide projects in 1998. Identify your group's achievements and tell other people about your experiences and successes. Possibilities include meetings of UNEP's ODS Officers' Networks, or newsletters like the one published by OzonAction (see Box 7.1).

Table 7.1 Template for agreed tasks

Activity	Expected impact of activity	Person(s) responsible	Start and finish dates

Table 7.2 Timetable

Activity	Year 1 (quarters)				Year 2 (quarters)				Year 3 (quarters)			
	1	2	3	4	1	2	3	4	1	2	3	4

Resources List: contacts and publications to assist in phasing out methyl bromide

This list of resources is not exhaustive. The publications and resources below have been selected because of their relevance to the planning process described in the *Handbook*. Many other publications are available.

UNEP TIE OzonAction Programme, Paris, France

CONTACT FOR PUBLICATIONS: e-mail, ozonaction@unep.fr; fax, +33 1 44 37 14 74,

Website: www.unepie.org/ozonaction.html

- *Methyl Bromide Phase-Out Strategies*: A *Global Compilation of Laws and Regulations*. UNEP TIE (1999).
- *Twenty Case Studies on Alternatives to Methyl Bromide*: *Technologies with Low Environmental Impact*. UNEP TIE (1999).
- *Sourcebook of Technologies for Protecting the Ozone Layer*: *Methyl Bromide*. UNEP TIE (1999).
- *Inventory of Technical and Institutional Resources for Promoting Methyl Bromide Alternatives*. UNEP TIE (1999).
- *Healthy Harvest*: *Alternatives to Methyl Bromide* (*video*). UNEP TIE (1999).
- *The OzonAction Newsletter*. Published quarterly. UNEP TIE.
- *Methyl Bromide Public Service Announcement* (*video*). UNEP IE (1998).
- *Methyl Bromide*: *Getting Ready for the Phase Out*. UNEP IE (1998).
- *Protecting the Ozone Layer*, *Volume 6*: *Methyl Bromide*. UNEP IE (1998).
- *Methyl Bromide*: *Gearing Up for Phase Out*. Methyl Bromide Special Supplement. UNEP IE (1998).
- *Report and Survey of Regional Workshop on Methyl Bromide in French-Speaking Africa*. UNEP IE (1998).
- *Report of Regional Workshop on Methyl Bromide for Asia and the Pacific*, *Bangkok*. UNEP IE (1995).
- *Report of Regional Workshop on Methyl Bromide for Latin America*, *Bogotá*. UNEP IE (1995).
- *Report of Regional Workshop on Methyl Bromide for English-Speaking Africa*, *Harare*. UNEP IE (1995).

UNEP Ozone Secretariat, Nairobi, Kenya

Websites: www.unep.org/ozone. For MBTOC reports: www.teap.org

- MBTOC 1998 *Assessment Report*. UNEP (1998).
- MBTOC *progress report in* TEAP *report April*, *Volume* II. UNEP (1997).
- *Report of the Methyl Bromide Technical Options Committee* (MBTOC) *for the* 1995 *Assessment*. UNEP (1995)—review of alternatives to methyl bromide.
- MBTOC *Report on* QPS *in* TEAP *Report*, *Volume* 2. UNEP (1999).
- Reports of the Parties to the Montreal Protocol.

Agriculture & Agri-Food Canada and Environment Canada, Ottawa, Canada
CONTACT FOR PUBLICATIONS: e-mail, epspubs@ec.gc.ca

Websites: www.ec.gc.ca/ozone/mbrfact.htm and http://strategis.ic.gc.ca/ces

- *Improving Food and Agriculture Productivity—and the Environment: Canadian Initiatives in Methyl Bromide Alternatives*. Government of Canada (1998).
- *Integrated Pest Management in Food Processing: Working Without Methyl Bromide*. Sustainable Pest Management Series S98-01, Pest management Regulatory Authority (1998).
- *Heat, Phosphine and CO_2 Collaborative Experimental Structural Fumigation*. Agriculture and Agri-Food Canada (1996).
- *Improving Food and Agriculture Productivity—and the Environment. Canadian Leadership in the Development of Methyl Bromide Alternatives*. Environment Canada (1995).

Bio-Integral Resource Center (BIRC), Berkeley, California, USA
CONTACT: fax +1 510 524 1758

Website: www.birc.org

- *The* IPM *Practitioner.* Newsletter on integrated pest management; includes articles on alternatives to methyl bromide, such as 'Alternatives to Methyl Bromide in Florida Tomatoes and Peppers' Vol XX, No 4, (April 1998).
- IPM *Alternatives to Methyl Bromide*. A compilation of articles from The IPM Practitioner. BIRC. Quarles & Daar (eds) (1996).

CSIRO Entomology Division, Canberra, Australia
CONTACT FOR PUBLICATIONS: e-mail, yvonneh@ento.csiro.au

Website: www.csiro.au

- *Agricultural Production Without Methyl Bromide—Four Case Studies*. CSIRO Division of Entomology for UNEP IE, Banks (ed) (1995).
- *Carbon Dioxide Fumigation of Bag-Stacks Sealed in Plastic Enclosures: An Operations Manual.* ASEAN Food Handling Bureau, Australian Centre for International Agricultural Research, Annis and van Graver (1991).
- *Phosphine Fumigation of Bag-stacks Sealed in Plastic Enclosures: An Operations Manual*. ASEAN Food Handling Bureau, Australian Centre for International Agricultural Research. van Graver & Annis (1994).
- Resource Centre and library of publications on treatments for durable commodities.

Centro de Ciencias Medioambientales, CSIC, Madrid, Spain
CONTACT: e-mail, evbv305@ccma.csic.es; fax, +34 91 564 0800 (Attn: Dr Antonio Bello)
Website: www.ccma.csic.es/agroecol/mebr/

- *Alternatives to Methyl Bromide for the Mediterranean Region*. Proceedings of International Workshop, May 1998, Rome. Bello *et al* (ed) (1999).
- *Alternatives to Methyl Bromide for the Southern European Countries*. Proceedings of International Workshop, April 1997, Tenerife. Bello *et al* (ed) (1997).
- *Alternativas al Bromuro de Metilo en Agricultura*. Proceedings of International Seminar, April 1996, Almería. Bello *et al* (ed) (1997).

Danish Environmental Protection Agency, Copenhagen, Denmark
CONTACT FOR PUBLICATIONS: fax, +45 33 92 76 90

- *Production of Flowers and Vegetables in Danish Greenhouses: Alternatives to Methyl Bromide*. Environmental Review No 4, Danish EPA. Gyldenkaerne & Hvalsoe (1997).

ENEA, Italian Committee of Innovation Technology, Energy and Environment, Rome, Italy.
CONTACT: fax, +39 06 30 48 42 67 (Attn Prof L Triolo, Dr A Correnti)

- *Attivit dell* ENEA *nell ambito degli interventi per la salvaguardia igienico sanitaria del lage di Bracciano. Sviluppo di attivit agricole compatibili nei territori prospicienti il lago*. Technical Report ENEA. Correnti and Di Luzio (1994)—soil alternatives to methyl bromide for Bracciano region.

Environment Australia, Canberra, Australia
CONTACT AT ENVIRONMENT AUSTRALIA: e-mail, ozone@ea.gov.au
Institute for Horticultural Development: e-mail, ian.j.porter@nre.vic.gov.au
Website: www.environment.gov.au/portfolio/epg/pubs/mb_strategy.html

- *National Methyl Bromide Update*. Newsletter about methyl bromide phase out and alternatives.
- *National Methyl Bromide Response Strategy*. Methyl Bromide Consultative Group (June 1998).

EPAGRI, Itajaí, Santa Catarina, Brazil.
CONTACT: e-mail, jmuller@epagri.rct-sc.br

- *La Reunião Brasileira sobre Alternativas ao Brometo de Metila na Agricultura*. 21–23 October, Florianópolis, Brazil, Muller (ed) (1996)—Proceedings of First Brazilian Meeting on Alternatives to Methyl Bromide in Agricultural Systems.
- Proceedings of other Brazilian meetings on alternatives to methyl bromide.

European Commission, DGXI, Brussels, Belgium
CONTACT: Unit D4, DGXI, fax +322 296 9557

- *Alternatives to Methyl Bromide for the Mediterranean Region*. Proceedings of International Workshop, May 1998, Rome. Bello *et al* (ed) (1999).
- *Prospect Background Report on Methyl Bromide*. B7-8110/95/000178/MAR/D4, Prospect Consulting and Services, Brussels (1997).
- *Alternatives to Methyl Bromide for the Southern European Countries*. Proceedings of International Workshop, April 1997, Tenerife. Bello *et al* (ed) (1997).

European Vegetable Research & Development Centre, Sint-Katelijne-Waver, Belgium
CONTACT FOR INFORMATION: fax, +32 15 553 061

- A *Decade of Research on Ecologically Sound Substrates*. Acta Horticulturae 408, 17–29. Benoit & Ceustermans (1995).
- *Economic Aspects of Ecologically Sound Soilless Growing Methods*. European Vegetable R&D Centre. Benoit (1990).

Food and Agriculture Organization (FAO), Rome, Italy
Global IPM Facility: Clearing-house for IPM Resources
CONTACT: e-mail, global-ipm@fao.org; fax, +39 06 5225 6347
CONTACT FOR PUBLICATIONS: e-mail, publications-sales@fao.org;
fax, +3906 570 533 60,
Website: www.fao.org/library/

- *Soil Solarization and Integrated Pest Management*. Plant Production and Protection Paper, FAO (1998).
- *Soil Solarization*. Plant Production and Protection Paper 109, FAO (1991).

Friends of the Earth, Washington DC, USA
CONTACT: Ozone Protection Campaign, e-mail, foe@foe.org; fax, +1 202 783 0444
Website: www.foe.org

- *Reaping Havoc: The True Cost of Using Methyl Bromide on Florida's Tomatoes*. FoE (1998).
- *The Technical and Economic Feasibility of Replacing Methyl Bromide in Developing Countries: Case Studies in Zimbabwe, Thailand and Chile*. Research report, FoE (1996).

GTZ Proklima bilateral agency, Eschborn, Germany

CONTACT: e-mail, gtzproklima@compuserve.com; fax, +49 6196 796 318.

Website: www.gtz.de/proklima

- *Proklima Yearbook* 1999. GTZ (1999).
- *Methyl Bromide Substitution in Agriculture*. Objectives and Activities of the Federal Republic of Germany concerning the support to Article 5 Countries of the Montreal Protocol, GTZ (1998).
- *Manual on the Prevention of Post-harvest Grain Losses*. GTZ (1996).
- *Integrated Pest Management Guidelines*. No 249, GTZ (1994).

HortiTecnia, Santafé de Bogotá, Colombia

CONTACT: e-mail, hortitec@openway.com.co; fax, +571 617 0730

- *Case studies on successful* IPM *systems used in Colombia cut flower industry*. HortiTecnia, Pizano (1998).

Insects Limited and Fumigation Services & Supply, Indianapolis, USA

CONTACT: e-mail, insectsltd@aol.com; fax, +1 317 846 9799

Website: www.insectslimited.com

- *Fumigants and Pheromones*. Newsletter for the pest management industry.
- *Stored Product Protection*. Insects Limited, Mueller (1998).

International Institute for Biological Control, Selangor, Malaysia

CONTACT: e-mail, l.soon@cabi.org; fax, +603 942 6490

- *Review of methyl bromide alternatives and non-chemical soil pest control methods for horticultural crops in Asia*. IIBC. Vos & Soon (1997).

International Research Conference on Methyl Bromide Alternatives and Emissions Reductions.

CONTACT: e-mail, gobenauf@concentric.net

- *Proceedings of Annual International Research Conference on Methyl Bromide Alternatives and Emissions Reductions*, 1994–1998.

Methyl Bromide Technical Options Committee (MBTOC) of UNEP

CONTACT: e-mail, tombatchelor@compuserve.com

Website: www.teap.org/html/methyl_bromide.html

- MBTOC *Report on* QPS *in* TEAP *April* 1999 *Reports, Volume* 2. UNEP (1999).
- MBTOC *Assessment Report* 1998. UNEP (1998).
- MBTOC *Progress Report in* TEAP, *April* 1997 *Report, Volume* II. UNEP (1997).
- MBTOC *Assessment Report* 1995. UNEP (1995).

Ministry of Agriculture Extension Service and Department of Plant Pathology, Hebrew University, Israel
CONTACT: fax, +972 3 6971 649 (Attn Mr A. Tzafrir)

- Video: *Soil Solarization*. Ministry of Agriculture Extension Service, video No 6127.

Natural Resources Institute, Chatham Maritime, Kent, UK
CONTACT FOR PUBLICATIONS: fax, +44 1491 829 292

- *Using Phosphine as an Effective Commodity Fumigant*. NRI. Taylor & Gudrups (1996).
- *Alternative Methods for the Control of Stored-Product Insect Pests*: A *Bibliographic Database*. NRI. Rees, Dales & Golob (eds) (1993).

Netherlands Ministry of the Environment, The Hague, Netherlands
CONTACT: Dept for Information, VROM, PO Box 20951, The Hague, Netherlands

- *Good Grounds for Healthy Growth*. Ministry of Housing, Spatial Planning and the Environment, the Hague (1997)—how phasing out methyl bromide boosted innovation and alternatives in horticulture.
- Video: *Good Grounds for Healthy Growth*.

Nordic Council of Ministers, Copenhagen, Denmark
CONTACT FOR PUBLICATIONS: fax, +45 33 14 35 88

- *Alternatives to Methyl Bromide—Control of Rodents on Ship and Aircraft*. TemaNord 1997:513, Nordic Council (1997).
- *Alternatives to Methyl Bromide*. TemaNord 1995:574, Nordic Council (1995).
- *Methyl Bromide in the Nordic Countries—Current Use and Alternatives*. Nord 1993:34, Nordic Council (1993).

Pesticide Action Network (PANNA), San Francisco, California, USA
CONTACT: e-mail, panna@panna.org.
Website: www.panna.org/panna/

- *Funding a Better Ban: Smart Spending on Methyl Bromide in Developing Countries*. PANNA (1997).
- *Alternatives to Methyl Bromide: Excerpts from the UN Methyl Bromide Technical Options Committee 1995 Assessment*. PANNA, San Francisco (1995).

Sustainable Agriculture Directory of Experts and Expertise
Website: www.agnic.org/agdb/sustagex.html

- *Directory of individuals and organizations involved in sustainable agriculture and willing to share their expertise.*

US Environmental Protection Agency, Washington DC, USA
CONTACT: fax, +1 202 233 9637 (Attn Methyl Bromide Program)

Websites: www.epa.gov/ozone/mbr/mbrqa.html

- *Alternatives to Methyl Bromide Ten Case Studies—Soil, Commodity and Structural Use, Volume Three*. 430-R-97-030. EPA (1997).
- *Alternatives to Methyl Bromide Ten Case Studies—Soil, Commodity and Structural Use, Volume Two*. 430-R-96-021. EPA (1996).
- *Alternatives to Methyl Bromide Ten Case Studies—Soil, Commodity and Structural Use*. 430-R-95-009. EPA (1995).

US Department of Agriculture, USA
CONTACT FOR NEWSLETTER: ARS Information Staff, fax, +1 301 705 9834
CONTACT FOR APHIS QUARANTINE TREATMENT MANUAL: Distribution dept., fax, +1 301 734 8455

Website for research: www.ars.usda.gov/is/mb/mebrweb.htm

Website for sustainable agriculture resources: www.sane.org/san/

Website for newsletter: www.ars.usda.gov/is/np/mba/mebrph.htm

Website for National Agricultural Library: www.nal.usda.gov and www.nal.usda.gov/afsic

- *Methyl Bromide Alternatives*. USDA newsletter.
- *Plant Protection and Quarantine Treatment Manual*. USDA *Animal and Plant Health Inspection Service* (APHIS) (1998)—lists alternative quarantine treatments approved for specific commodities.
- National Agricultural Library—information on pest management, including Alternative Farming Systems Information Center (AFSIC).

Contacts for Implementing Agencies, the Multilateral Fund Secretariat and the Ozone Secretariat

Implementing Agencies

Mr Frank J. P. Pinto
Principal Technical Advisor and Chief
United Nations Development Programme (UNDP)
Montreal Protocol Unit, EAP/SEED
304 East 45th Street, Room FF-9116
New York, NY 10017, USA
Tel: +1 212 906 5042
Fax: +1 212 906 6947
E-mail: frank.pinto@undp.org
Web: www.undp.org/seed/eap/montreal

Mr Rajendra Shende, Chief
Energy and OzonAction Unit
United Nations Environment Programme
Division of Technology, Industry and Economics (UNEP TIE)
Tour Mirabeau
39–43 quai André Citroen
75739 Paris Cedex 15, France
Tel: +33 1 44 37 14 59
Fax: +33 1 44 37 14 74
E-mail: ozonaction@unep.fr
Web: www.unepie.org/ozonaction.html

Mr Angelo D'Ambrosio, Managing Director
Industrial Sectors and Environment Division
United Nations Industrial Development Organization (UNIDO)
Vienna International Centre, P. O. Box 400
A-1400 Vienna, Austria
Tel: +43 1 21131 3782
Fax: +43 1 21131 6804
E-mail: ssi-ahmed@unido.org
Web: http://www.unido.org

Mr Steve Gorman, Unit Chief
Montreal Protocol Operations Unit
Environment Department
World Bank
1818 H Street, NW
Washington, DC 20433, USA
Tel: +1 202 473 5865
Fax: +1 202 522 3258
E-mail: sgorman@worldbank.org
Web: www.esd.worldbank.org/mp/home.cfm

Multilateral Fund Secretariat

Dr Omar El-Arini, Chief Officer
Secretariat of the Multilateral Fund for the Montreal Protocol
27th Floor, Montreal Trust Building
1800 McGill College Avenue
Montreal, Quebec H3A 6J6
Canada
Tel: +1 514 282 1122
Fax: +1 514 282 0068
E-mail: secretariat@unmfs.org
Web: http://www.unmfs.org

UNEP Ozone Secretariat

Mr K. Madhava Sarma, Executive Secretary
UNEP Ozone Secretariat
P. O. Box 30552
Gigiri, Nairobi
Kenya
Tel: +254 2 623 855
Fax: +254 2 623 913
E-mail: madhava.sarma@unep.org
Web: http://www.unep.org/secretar/ozone/home.htm

About the UNEP TIE OzonAction Programme

Nations around the world are concerned about the emissions of man-made CFCs, halons, carbon tetrachloride, methyl chloroform, methyl bromide and other ozone-depleting substances (ODS) that have damaged the stratospheric ozone layer—a shield around the Earth which protects life from dangerous ultraviolet radiation from the Sun. More than 167 countries have committed themselves under the Montreal Protocol to phase out the use and production of these substances. Recognizing the special needs of developing countries, the Parties to the Protocol established the Multilateral Fund and appointed implementing agencies to provide technical and financial assistance to enable the developing countries to meet their commitments under the treaty. UNEP is one of the Fund's implementing agencies; the others are UNDP, UNIDO and the World Bank.

Since 1991, the UNEP TIE OzonAction Programme in Paris has been strengthening the capacity of governments (especially National Ozone Units) and industry in developing countries to make informed decisions on technology and policy options that will result in cost-effective ODS phase-out activities with minimal external intervention. The Programme accomplishes this by delivering the following need-based services:

Information exchange—
to enable decision makers to take informed decisions on policies and investments.
Information and management tools already provided for developing countries include: the OzonAction Information Clearinghouse (OAIC) diskette and World Wide Web site; a quarterly newsletter; sector-specific technical publications for identifying and selecting alternative technologies; and policy guidelines.

Training and networking—
to provide platforms for exchanging experiences, developing skills, and tapping the expertise of peers and other experts in the global ozone protection community.
Training and network workshops build skills for implementing and managing phase-out activities, and are conducted at the regional level (support is also extended to national activities). The Programme currently operates eight regional and sub-regional Networks of ODS Officers comprising 95 countries, which have resulted in member countries taking early steps to implement the Montreal Protocol.

Country Programmes, Institutional Strengthening and Refrigerant Management Plans—
that support the development of phase-out strategies and programmes especially for low-volume ODS-consuming (LVC) countries. The Programme currently assists 74 countries in the development of their country programmes and implements Institutional Strengthening projects for 67 countries. UNEP also assists LVC countries in the development of Refrigerant Management Plans, an integrated national strategy to phase out ODS in the refrigeration sector.

For more information about these services please contact:

Mr Rajendra Shende, Chief
Energy and OzonAction Unit
UNEP Division of Technology, Industry and Economics (UNEP TIE)
OzonAction Programme
39–43 quai André Citroën
75739 Paris Cedex 15, France
E-mail: ozonaction@unep.fr
Tel: +33 1 44 37 14 59
Fax: +33 1 44 37 14 74
Web: http://www.unepie.org/ozonaction.html

About the UNEP Division of Technology, Industry and Economics

The mission of the UNEP Division of Technology, Industry and Economics is to help decision makers in government, local authorities and industry develop and adopt policies and practices that:

- are cleaner and safer;
- make efficient use of natural resources;
- ensure adequate management of chemicals;
- incorporate environmental costs; and
- reduce pollution and risks for humans and the environment.

The UNEP Division of Technology, Industry and Economics (UNEP TIE) located in Paris, is composed of one centre and four units:

The International Environmental Technology Centre (Osaka), which promotes the adoption and use of environmentally sound technologies with a focus on the environmental management of cities and freshwater basins, in developing countries and countries in transition.

Production and Consumption (Paris), which fosters the development of cleaner and safer production and consumption patterns that lead to increased efficiency in the use of natural resources and reductions in pollution.

Chemicals (Geneva), which promotes sustainable development by catalysing global actions and building national capacities for the sound management of chemicals and the improvement of chemical safety worldwide, with a priority on Persistent Organic Pollutants (POPs) and Prior Informed Consent (PIC, jointly with FAO)

Energy and OzonAction (Paris), which supports the phase-out of ozone depleting substances in developing countries and countries with economies in transition, and promotes good management practices and use of energy, with a focus on atmospheric impacts. The UNEP/RISØ Collaborating Centre on Energy and Environment supports the work of the Unit.

Economics and Trade (Geneva), which promotes the use and application of assessment and incentive tools for environmental policy and helps improve the understanding of linkages between trade and environment and the role of financial institutions in promoting sustainable development.

UNEP TIE activities focus on raising awareness, improving the transfer of information, building capacity, fostering technology cooperation, partnerships and transfer, improving understanding of environmental impacts of trade issues, promoting integration of environmental considerations into economic policies, and catalysing global chemical safety.

For more information contact:
UNEP Division of Technology, Industry and Economics
39–43, Quai André Citroën
75739 Paris Cedex 15, France
Tel: 33 1 44 37 14 50
Fax: 33 1 44 37 14 74
E-mail: unepie@unep.fr
Web: http://www.unepie.org