Antigua and Barbuda

National Implementation Plan

for the

Management of

Persistent Organic Pollutants

Prepared by:
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Persistent Organic Pollutants

And

Toxic Chemicals

TABLE OF CONTENTS

LIST OF ACRONYMS

APC	Air pollution control
APUA	Antigua Public Utilities Authority
BAT	Best Available Technology
BEP	Best Environmental Practice
CARICOM	Caribbean Community and Common Market
CARIRI	Caribbean Industrial Research Institute
CBD	Convention on Biological Diversity
CBH	Central Board of Health
CBO	Community Based Organization
CGPC	Coordinating Group of Pesticides Control Boards of the Caribbean
COP	Conference of the Parties
DDT	1,1.1-trichloro-2,4-bis(4-chlorophenyl)ethane
EPMB	Environmental Protection and Management Bill
EIA	Environmental Impact Assessment
FAO	Food and Agriculture Organisation
GAP	Good Agricultural Practice
GARDC	Gilberts Agricultural & Rural Development Centre
GDP	Gross Domestic Product
GEF	Global Environment Facility
GIS	Global Information System
HCB	Hexachlorobenzene
IICA	Inter-American Institute for Cooperation on Agriculture
MAL&F	Ministry of Agriculture, Lands and Fisheries
MARPOL	Marine Pollution Agreement
IPM	Integrated Pest Management
MSDS	Material Safety Data Sheet
NCM	National Coordinating Mechanism for Environmental Conventions
NEMS	National Environment Management Strategy
NFP	National Focal Point
NGO	Non-Governmental Organisation
NIP	National Implementation Plan
NODS	National Office of Disaster Services
NRMU	Natural Resources Management Unit
NSWMA	National Solid Waste Management Authority
OAS	Organization of American States
OECS	Organisation of Eastern Caribbean States
PAHO	Pan-American Health Organisation
PBBs	polybrominated biphenyls
PCB	Pesticides Control Board
PCB(s)	Polychlorinated Biphenyl(s)
PCDD(s)	Polychlorinated dibenzo dioxin(s)
PCDF(s)	Polychlorinated dibenzo furan(s)
PIC	Prior Informed Consent
POP(s)	Persistent Organic Pollutant(s)
PTC(s)	Persistent Toxic Chemical(s)
PTCCB	Pesticides and Toxic Chemicals Control Board (proposed)
PTS	Persistent Toxic Substances
SIDS	Small Island Developing States
TEQ	Toxic Equivalents
UK	United Kingdom
UN	United Nations
UNEP	United Nations Environment Programme
WHO	World Health Organisation
WNV	West Nile Virus
WTO	World Trade Organization

EXECUTIVE SUMMARY

The Antigua and Barbuda Persistent Organic Pollutants (POPs) National Implementation Plan (NIP) is a comprehensive, strategic policy document, the aim of which is to formalise an effective POPs management system through the implementation of a sustainable policy to secure human health and environmental protection as defined in the Stockholm Convention.

As a signatory to the Stockholm Convention on Persistent Organic Pollutants, there are certain requirements which must be met, and, in the implementation of these requirements, several actions must be taken. Table 1 below summarises some of the basic requirements of the Convention, the current status with respect to these and further actions which need to be taken by Antigua and Barbuda.

Table 1. Summary of the Basic Requirements of the Stockholm Convention on Persistent Organic Pollutants and Actions for inclusion in the NIP

Requirement	Current Status	Comments/Further Action Needed
Article 3 Measures to reduce or eliminate releases from intentional production and use		
Annex A, Part I: Eliminate the production and use of all the intentionally produced POPs [i.e. Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Hexachlorobenzene, Mirex, Toxaphene]	• All Annex A chemicals used as pesticides are currently effectively prohibited from entry and no manufacture takes place. • POPs chemicals are not recognised by the draft PTCC Bill in its current draft form. • The legal basis for the importation control process needs to be provided by enactment of the PTCC Act.	1. Draft Pesticides and Toxic Chemicals (PTCC) Act needs revision to cover new requirements under Stockholm Convention, particularly with respect to the way toxic chemicals are defined and to cover unintentional releases and their control. 2. Regulations pertaining to the PTCC Act need to be approved and implemented, including the setting up of the expanded Pesticides and Toxic Chemicals Control Board with a functional Secretariat. 3. Draft Environmental Protection and Management Bill (EPMB) needs revision regarding existence/compatibility with PTCC Act. 4. Rationalisation is needed among PTCC Act, EPMB, Medical Act Cap 269, Misuse of Drugs Act Cap 283, Pharmacies Act (Draft) and Precursor Chemicals Act (Draft) to identify any ambiguities/overlap in the regulation of the substances controlled by these pieces of legislation. 5. Toxic chemicals database needs to be established and maintained. 6. Registration of all importers of toxic chemicals needs to be implemented.
Annex A, Part II: Identify, label and remove from use, equipment containing > 10% PCBs and volumes >5 litres	• No legal requirements regarding PCB use or importation are in place. • No current known importation or manufacture taking place. • Presence of PCB-containing oils identified in	1. PTCC Act (draft) needs revision and passage into law [but see comments above]. Revision shall take into account regulations to identify and control PCB levels in electrical equipment. 2. PTCC Board needs possible revision in light of expanded regulation needs. Board representative from Barbuda should be considered.

Requirement	Current Status	Comments/Further Action Needed
	two larger transformers. Status of older, smaller transformers not accurately known. Some evidence of PCB contamination of storage sites found	
Annex B, Parts I & II	DDT not currently being used for insect vector control.	1. Decision needs to be made formally whether Antigua and Barbuda should require an exemption for any future need to use DDT or to comply with Part II and eliminate any possibility of its use in the future. This would be preferable, but West Nile Virus and other mosquito-borne diseases could become established and would need to be controlled. 2. Need to seek funding to evaluate alternative responses to re-introduction of DDT for management of disease vectors.
Article 4 Register of Specific Exemptions		
	Not applicable	None needed, unless decision is made to reserve right to use DDT in the future.
Article 5 Measures to reduce or eliminate unintentional releases		
Annex C, Part I: Applies to unintentional releases from anthropogenic sources of Polychlorinated dibenzo dioxins (PCDDs) and furans (PCDFs), Hexachlorobenzene (HCB) and Polychlorinated biphenyls (PCBs)	• Public is generally unaware of these pollutants • Preliminary assessment of their unintentional production and release suggests that the major source of these pollutants is from burning of municipal garbage. • Utilization of sanitary landfills in Antigua and Barbuda should reduce this source dramatically. • Burning of household rubbish not assessed – contribution not known • Contribution of forest and agricultural fires not assessed. • Regulation of unintentional release of these chemicals is not covered under any existing legislation. • Draft Environmental Management Bill addresses some of the pollution issues.	1. Evaluation of potential releases needs to include assessment of additional sources to enable better prioritisation of targets for reduction and to develop action plan. Gathering of the ancillary data needed will require considerable effort and time. Some workable estimates can be made from data already available and "best guess" assumptions (e.g., for bush fires) 2. Legal measures regarding unintended production and release are needed and could probably best be incorporated under pollution legislation (air, land etc.) in Environmental Management Bill 3. Reduction of burning [(1) for agricultural purposes (e.g. crop residues, Citronella grass and brush, land clearing debris, dead animals), (2) of household/institutional garbage especially in off-road areas, and (3) construction waste] may be difficult to enforce and/or to find practical alternatives. Any legislation will need to be carefully considered before introduction.
Annex C, Part V:	• Knowledge of available	1. Information and awareness programmes

Requirement	Current Status	Comments/Further Action Needed
Best available technology and Best environmental practices	technology and best practices is minimal at all levels. • Much of available technology is geared to developed country needs, scale and capability.	needed at all levels to inform decisions and develop climate for compliance (See Article 10) 2. Assessment of priority target sources and their relative importance should provide focus for development of practical measures to be implemented 3. Potential for regional approach to appropriate technology
Article 6. Measures to reduce or eliminate releases from stockpiles		
Requires stockpiles and wastes consisting of, containing or contaminated with, chemicals listed in Annexes A or B to be identified, managed and disposed of in an environmentally sound manner	• POPs inventory and PCB monitoring of many potential pesticide stocks indicates that significant quantities of pesticide POPs probably do not exist. However, users remain unregistered and some key sites remain unexamined. • Soil sampling has identified a few "hot spots" that require more detailed sampling, especially regarding toxaphene levels • Contamination of soil around transformer sites has also revealed some PCB contamination. • Water, sediment and biological tissues which can provide "tell tale" evidence of unrecognised contaminated sites are only now being addressed. • No facilities presently exist for the environmentally sound elimination/ destruction of any PTSs or contaminated objects. Given the small quantities and the high cost of such facilities, it is likely that the State will have to seek alternative means of disposal	1. Public assistance should be sought to locate and identify any facilities or sites where significant quantities of pesticides, transformers/transformer oils, or other materials/equipment that may have included POPs were stored or disposed of. 2. Specific individuals with appropriate historical knowledge, particularly from the 1960s to the 1980s should be sought to provide additional information. 3. If such sites are identified, they should be mapped using GIS technology and made available to relevant authorities and public if found to be contaminated. 4. Widespread environmental sampling should be conducted in order to determine the presence of any residual contamination and to assess its significance. 5. NSWMA, which is responsible for the disposal of solid wastes containing such chemicals, needs to develop a strategy to do so in an environmentally acceptable manner. 6. Efforts should be made as part of the NIP to develop a regional (CARICOM) or sub-regional (OECS) plan for the organised collection, storage, and bulked shipment of POPs and POPs-like contaminated materials to a country with the capacity for disposal in an ironmentally acceptable manner.
Article 7 Implementation Plans		
Develop and endeavour to implement a plan at the national level to provide compliance with the obligations of the Convention	Implementation Plan under way	Some opportunity for discussion at a regional level (CARICOM/OECS) should be sought to provide opportunity for member governments to evaluate areas of common interest in their NIPs and to look for areas that could benefit from a coordinated approach
Article 8 Listing of Chemicals in Annexes A, B and C		
Parties may make proposals for	No immediate plans for this are	Antigua & Barbuda's production and

Requirement	Current Status	Comments/Further Action Needed
the inclusion of additional chemicals in the listing of POPs	evident	implementation of the NIP and continued attendance at the Conference of Parties will help it to participate in such a process.
Article 9 Information Exchange		
Each party shall facilitate or undertake the exchange of information, either directly among Parties or through the Secretariat. Each country Party shall appoint a person to act as the National Focal Point. Information on health and safety of humans and the environment shall not be regarded as confidential	• National Focal Point already established in Ministry of Environment • NIP development in progress • Public availability of information is frequently not part of existing administrative culture and not generally required by legislation	1. PTCC Act draft needs revision to include rights of public to know. The legislation should require the Board to publish reports on pesticide and toxic chemicals registration, importation and use. [See also comment on contaminated sites.] 2. Some CARICOM/OECS or SIDS grouping of POPs Focal Points could be organised so that they can meet occasionally to share information and discuss concerns to raise at COP meetings including addition of new chemicals to the list of POPs
Article 10 Public Information, awareness and education		
This article requires each Party to promote and facilitate: - POPs awareness among policy and decision makers - public availability of POPs information - public awareness programmes on the nature, dangers to health and environment and types of alternatives to POPs [– such programmes are to target women, children and the least educated] - public participation in developing adequate responses to the issues of POPs use and reduction	• The Plant Protection Unit, Extension Division and Gilbert Centre (GARDC) have over the last 10 years provided considerable information to farmers about pesticides and their safe use. • The POPs Enabling Activities Project has provided information to technical and middle management levels in the public and private sectors regarding POPs. • Pesticide input suppliers and pest control operators have received very little attention regarding information and safety training. • The general public has not had much exposure to the information about POPs, their persistence, accumulation and the effects of low level chronic exposures. • There appears to be very little information at the public level about PCBs, PCDDs and PCDFs.	1. This Article represents perhaps the most important challenge to achieving compliance with the Stockholm Convention. 2. Effective public awareness programmes will be required to provide information, allow discussion and achieve appreciation of POPs issues in a variety of formats and to different target groups. 3. The NIP needs to identify the kinds of information required by whom and in what format. It will also need to specify who has responsibility for doing what. 4. Several agencies are already involved in the process of public education about pesticides and these will need to be strengthened by provision of information in different forms and through training and capacity building, including provision of better equipment and technology. Their work will need to be broadened to increase the scope to include other toxic chemicals and also to reach a wider public.

Requirement	Current Status	Comments/Further Action Needed
Each Party shall ensure that the public has access to the public information referred to in paragraph 1 above and that the information is up to date	Public access to government information has not been a major consideration up to now and systems are generally not efficient or "user friendly" and are frequently not up to date, even for government use.	1. New opportunities have been provided by the new E-government policies, including the development of a government website and its use for publishing of government documents, such as laws etc. 2. The PTCC Board, as the body with primary responsibility for management of toxic chemicals, should be provided resources to develop and maintain a Toxic Chemicals website, hosted by or linked to the Government website 3. Such a facility could also be used to facilitate registration and approval for importation.
Each Party shall encourage industry and professional users to promote and facilitate the provision of the information referred to in Paragraph 1 at national, sub-regional, regional and international levels. In providing information on POPs and their alternatives, parties may use MSDS, reports, mass media and other means of communication and may establish information centres at national and regional levels	• To date, pesticide input suppliers and pest control businesses have not provided significant financial or informational support to public information needs. • Regional mechanisms do not presently exist in any organised framework to provide information on toxic substances to the industry or the general public. • It has been proposed on several occasions that CARIRI in Trinidad become the Regional Information Centre for the Stockholm Convention as it is already the Regional Centre for the Basel Convention	1. At present levels of imports, it is difficult to see how these businesses could fully support the work of the Pesticides and Toxic Chemicals Control Board through fees for import approvals or such mechanisms. This needs some discussion. 2. It may be worth discussing the possibility of making available the fees collected through the services of the Board to provide public information on pesticides and toxic chemicals and their alternatives. 3. Pesticide suppliers and pesticide operators could assist in the information dissemination process by undertaking to distribute leaflets and sponsor informational meetings on pesticide use and safety issues 4. Much of the informational material needed in one country of CARICOM would be the same, or very similar, to that required in other member countries. This raises the possibility of looking at a regional approach to providing much of the general information needs about POPs. This could be very cost and human resources effective, once proper consultation mechanisms are established to plan and appraise the material produced.
Each Party shall give sympathetic consideration to developing mechanisms such as pollutant release and transfer registers, for the collection and dissemination of information on estimates of POPs that are released or disposed of.	• At present the PCB obtains data for the annual importation of pesticides into Antigua and Barbuda. This is not currently available or disseminated in any effective form. • Recent work has produced some release estimates of toxic chemicals, but these need to be supplemented with further environmental monitoring	1. A systematic approach to the tracking of pesticide and toxic chemical imports and their disposal will have to be developed and instituted by the new PTCC Board. 2. Additional data gathering and training of Board personnel will have to be carried out in order to produce reasonable estimates of unintentional releases for reporting and priority setting purposes (See Article 5)

Requirement	Current Status	Comments/Further Action Needed
Article 11 Research development and monitoring		
Parties shall, within their capabilities, encourage and/or undertake research, development, monitoring and cooperation pertaining to POPs and their alternatives, including: - sources & releases - environmental monitoring and behaviour - human and environmental health effects - socio-economic & cultural impacts - release reduction/elimination	• Antigua-Barbuda has very limited resources to do much in this area. • Environmental monitoring is costly to do but is the only way that confidence in the management systems can be obtained. • The Government already promotes use and implementation of IPM and use of botanical pesticides in agriculture.	1. Antigua-Barbuda should play a leading role in promoting regional approaches to appropriate technology generation and to the provision of resources from developed countries for research work in developing countries towards BAT development which is appropriate for small developing states. 2. Regional/International fora such as the Coordinating Group of Pesticides Control Boards of the Caribbean (CGPC) and the COP meetings may be useful opportunities for promoting these goals.
Article 15 Reporting		
Each Party shall report to the COP on the measures it has taken to implement the provisions of the Convention and on the effectiveness of such measures.	• These reports will require that Antigua-Barbuda has an efficient and transparent system for determining importation, manufacture and use of listed POPs. • Currently, pesticide import data is gathered, but importers are not responsible for providing this information. Results are not published or publicly available.	The responsibility for providing information on pesticide imports should fall on the importers. Government's responsibility should be to monitor their performance in this respect and to analyse the data and provide public reports. The PTCC Board, in collaboration with the Environment Division, will have the responsibility of setting up efficient systems of registration for toxic chemicals and their importers and to provide the POPs information required under the Convention.
Article 25 Ratification, acceptance approval or accession		
States or regional economic integration organisations may accede, ratify, approve or accept the convention after the period for signature has closed	Antigua-Barbuda has signed and ratified the Convention	As the only CARICOM country to have ratified the Convention, Antigua-Barbuda should make every effort to access all the assistance and information that this membership will entitle it to receive and use this experience, where possible, to assist other CARICOM countries.

1. Introduction

1.1. Purpose of the Antigua and Barbuda National Implementation Plan for Persistent Organic Pollutants

The Antigua and Barbuda Persistent Organic Pollutants (POPs) National Implementation Plan (NIP) for 2006 – 2015 is a comprehensive, strategic policy document whose aim is to provide the basis for an effective POPs management system in Antigua and Barbuda. Through its acceptance and implementation, the nation will comply with its obligations to the international community under the Stockholm Convention and will also improve its ability to secure human health and provide environmental protection from the threats and undesirable consequences posed by POPs and POPs-like chemicals in the daily environment.

The preparation of the NIP was guided by the multi-sectoral approach to environmental management identified in the National Environment Management Strategy (NEMS) which recognizes that 'the environmental, planning and development agencies, as well as agencies involved in natural resource management, the private sector, NGOs, and community based organizations'[1] are key to the implementation of environmental management strategies.

The plan is structured along the lines recommended in the World Bank/UNEP Guidelines for the preparation of the National Implementation Plan[2].

1.2. Organisation of the National Implementation Plan

The Plan provides an overview of the nature of POPs, POPs-like substances as well as toxic chemicals, as a basis for understanding the importance of their effective management and the consequences of continued releases of these substances into the environment. It provides information on the requirements of the Stockholm Convention, the international legal agreement between consenting national parties, as to how the reductions in use of these chemicals and their release to the environment are to be achieved in the national context. An overview of the status of POPs use and presence in the country is also provided with indications regarding further work that will need to be done to bring the nation to full compliance with the Convention. A second part of the Plan provides recommendations regarding activities that will need to be undertaken in order to achieve full compliance as well as proposals for funded projects that will provide the necessary financial and human resources to develop the management systems in areas where there are recognised deficiencies.

[1] Environment Division: National Environmental Management Strategy and Action Plan (2004-2009) – Approved by the Antigua and Barbuda Cabinet 03 August 2004

[2] UNEP/World Bank (2004). Interim guidance for developing a national implementation plan for the Stockholm Convention: Revised December 2004

The plan, while focusing primary attention on the management of currently designated POPs, is intended to provide a framework within which the management of toxic chemicals in general can be accommodated. This approach is taken bearing in mind the fact that the current selection of chemicals under the Stockholm Convention was a compromise between competing interests at the time of setting up the Convention and that, as allowed under the Convention, additional chemicals are likely to be included in the future. Also, given the narrow industrial base in which toxic chemicals are used and the very limited technical and financial resources available to Antigua and Barbuda for achieving compliance under the Convention, it would be unduly burdensome to establish separate procedures and organisations for management of POPs in distinction to toxic chemicals in general.

1.3. POPs – Persistent Organic Pollutants

1.3.1. What are POPs?

Persistent organic pollutants are a class of synthetic organic products that are not only highly toxic, but which, because of their stable chemical structure, are able to resist photochemical and biological breakdown into simpler, non-toxic products. They therefore remain active in the environment for considerable periods of time, often for decades. Another feature of many of these POPs is that they are highly fat soluble. This leads to their accumulation, after ingestion into the food chain, in the fatty tissues of organisms, particularly animals, and also to an increase in this concentration at higher levels of the food chain. It is because of this that the first indications of their build-up in the environment were discovered in predatory birds such as hawks and eagles.

Thus, humans, wildlife and other environmental organisms are exposed to POPs, in many cases for extended periods of time spanning generations, resulting in both acute and chronic toxic effects. Introduced to humans through the food chain, POPs are passed on from mother to child and are known to have significant immunological, neurological and reproductive health effects.

1.3.2. Why are they important?

POPs are semi-volatile chemicals which are transported over long distances in the atmosphere. They are also discharged directly or by atmospheric deposition into waterways and are transported by movement of fresh and marine waters. The result is widespread distribution of POPs across the globe, including regions where they have never been used. POPs occur at low levels in air and water, so human concerns arise from their ability to bio-accumulate in organisms rather than from direct exposure. Because of the tendency to accumulate in the fatty tissues of organisms, LMOs are transferred along terrestrial and aquatic food chains. People relying on marine foods with a high fat content are especially susceptible to high accumulations of these pollutants, and high body fat concentrations of POPs have been found in people living thousands of kilometres from the nearest sources of such chemicals.

POPs are therefore a global issue for the environment and for human health. They can cause birth defects, various cancers, immune system dysfunction, and reproductive problems in wildlife. The weight of evidence indicates that high levels of exposure over the long term may contribute to increasing rates of birth defects, fertility problems, greater susceptibility to disease, diminished intelligence, and some types of cancers in humans. Of major concern for human health is the effect of exposure to POPs on the developing foetus. POPs can accumulate in human tissues and pass through the placenta to the foetus. Furthermore, POPs have been detected in the breast milk of women throughout the world. Emerging evidence also indicates that many POPs may act as endocrine disruptors.[3]

1.3.3. What is the importance of POPs to Antigua and Barbuda?

Antigua and Barbuda is not currently involved in the manufacture of any POPs-like substances and given the small size and tourism base of the economy, is unlikely to become involved in the foreseeable future. However, several POPs were routinely used as agricultural and household pesticides from the 1960s until their importation was banned by the Pesticide Control Board in the early 1980s.

Until the Pesticides Control Act was passed in 1973, there was little attention given to pesticides and little was known of their potential danger to human health and the environment. Recognition of the dangers of pesticides has grown only slowly as more information has become publicised in the media and through awareness activities carried out by the Ministry of Agriculture and the Pesticides Control Board. Because, until very recently, there has been almost no monitoring of toxic chemicals in the Antigua and Barbuda environment, there are concerns about possible POPs concentration build up in the population during the time of their use and about residues still existing in the environment as well as stockpiles that may be undocumented.

As well as those POPs that were intentionally used, there are others that have been introduced into the environment through incorporation in other products, such as transformer oils, and other compounds that are produced as by-products of burning. Fossil fuels, domestic and agricultural waste all generate small quantities of POPs when burnt in normal circumstances. The Stockholm Convention also requires that efforts be made by member parties to monitor and reduce, as far as possible, these kinds of emissions.

As a responsible member of the international community, Antigua and Barbuda is committed to both protecting its population from the harmful effects of these substances and to joining the international effort to do this on a global basis, since all of humankind is affected.

[3] Fisher, Brandy E., "Most Unwanted: Persistent Organic Pollutants", Environmental Health Perspectives, Vol. 107, No. 1, January 1999.

1.4. The Stockholm Convention

1.4.1. Overview of the Convention

Antigua and Barbuda was an original signatory to the Stockholm Convention on May 23, 2001, along with 113 other nations in Stockholm. This was followed by ratification of the Convention on 10th September 2003. So far, Antigua and Barbuda is the only CARICOM country to ratify the Convention. This convention, a global agreement under the United Nations Environment Programme (UNEP), is intended to reduce or eliminate emissions of persistent organic pollutants. The Convention:

- sets out obligations for countries covering the production, use, import, export, release and disposal of persistent organic pollutants (POPs);
- requires countries to promote, and in some cases require, the use of the best available techniques (BAT) and best environmental practices (BEP) to reduce and/or eliminate emissions of unintentionally produced POPs from certain combustion and chemical processes; and
- includes provisions aimed at preventing the introduction of new POPs and for adding other POPs to the Convention in the future.

Ratification by a minimum of 50 countries was achieved in 2004 and on May 17, 2004 the Convention duly entered into force. As at 12 December 2006, one hundred and fifty six (156) countries had signed and one hundred and one (101) countries had ratified the Convention. A further thirty five countries had either acceded (30), accepted (3) or approved (2) the Convention.

Because the Convention includes obligations related to hazardous wastes and their transboundary movements, it is closely linked with the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal (www.basel.int) and the Rotterdam Convention on the Prior Informed Consent (PIC) Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (www.pic.int)[4].

1.4.2. Overview of the 12 currently designated POPs

Having ratified the Convention, Antigua and Barbuda has agreed to the management and control of 12 chemicals – the POPs (sometimes known as the "dirty dozen") – and to a formal process to consider adding additional substances to the Convention. These 12 POPs that were included when the Convention came into force fall into three broad categories: pesticides, industrial chemicals and unintentionally produced POPs. The following description of the three broad categories is based upon UNEP's *Ridding the World of POPs: A Guide to the Stockholm Convention on Persistent Organic Pollutants* (2002) and provides a list of the substances and a summary of the key uses for each chemical.

[4] Canada is a Party to both the Basel and Rotterdam Conventions.

Pesticides:

- **Aldrin** – A pesticide applied to soils to kill termites, grasshoppers, soil and other insect pests.
- **Chlordane** – Used extensively to control termites and as a broad-spectrum insecticide on a range of agricultural crops.
- **DDT** – Perhaps the best known of the POPs, DDT was widely used during World War II to protect soldiers and civilians from malaria, typhus, and other diseases spread by insects. It continues to be applied against mosquitoes in several countries to control malaria.
- **Dieldrin** – Used principally to control termites and textile pests, dieldrin has also been used to control insect-borne diseases and insects living in agricultural soils.
- **Endrin** – This insecticide is sprayed on the leaves of crops such as cotton and grains. It is also used to control mice, voles and other rodents.
- **Heptachlor** – Primarily employed to kill soil insects and termites, heptachlor has also been used more widely to kill cotton insects, grasshoppers, other crop pests, and malaria-carrying mosquitoes.
- **Hexachlorobenzene** (HCB) – HCB kills fungi that affect food crops. HCB is also an industrial chemical and can be released as an unintentional by-product of combustion processes.
- **Mirex** – This insecticide is applied mainly to soils to kill fire ants and other types of ants and termites. Mirex is also an industrial chemical.
- **Toxaphene** – This insecticide, also called camphechlor, is applied to cotton, cereal grains, fruits, nuts, and vegetables. It has also been used to control ticks and mites in livestock.

Industrial Chemicals:

- **Polychlorinated Biphenyls (PCBs)** – These compounds are employed in industry as heat exchange fluids, in electric transformers and capacitors, and as additives in paint, carbonless copy paper, sealants and plastics. They are also released as an unintentional by-product of combustion processes.
- **Hexachlorobenzene (HCB) –** HCB is used in the production of rubber, aluminium, munitions and dyes and in wood preservation and other manufacturing.
- **Mirex** – This chemical is used as a fire retardant in plastics, rubber, and electrical goods.

Unintentionally Produced POPs:

- **Dioxins** – Often referred to as PCDDs, these chemicals are produced unintentionally due to incomplete combustion, as well as during the manufacture of certain pesticides and other chemicals. It was an unfortunate contaminant in some of the herbicide, Agent Orange, used in the Vietnam War. In addition, certain kinds of metal recycling and pulp and paper bleaching can release dioxins. Dioxins have also been found in automobile exhaust, tobacco smoke and wood and coal smoke.
- **Furans** – These compounds are often referred to as PCDFs and are produced unintentionally from the same processes that release dioxins. They are also found in commercial mixtures of PCBs.
- **Hexachlorobenzene (HCB)** – HCB is a by-product of the manufacture of industrial chemicals and is released as a result of certain combustion processes.
- **PCBs** - PCBs can also be unintentional by-products of combustion processes.

2. POPs in the National Context

2.1. Overview of Antigua and Barbuda

2.1.1. General physical characteristics

The islands of Antigua and Barbuda are located in the eastern arc of the Leeward Islands, between Guadeloupe and Saint Martin as shown in Figure 1.1. Antigua is situated at latitude 17° 10' N by 61° 55' W while the island of Barbuda is found 45 km north of Antigua at 17° 35' N by 61° 48' W. Redonda, a small rocky island about 40 km west of Antigua, is uninhabited and will not be included in this report. Antigua occupies a land area of 280 sq. km. (108 sq. miles) while Barbuda is approximately two thirds this size, occupying 160 sq. km. (62 sq. miles).

The island of Antigua is divided into three topographic zones: the mountainous south west region, the relatively flat Central Plains and the rolling limestone hills and valleys in the north and east (see Figure 1.2). The highest point in Antigua is Boggy Peak, 402 m (1,319 ft.). Barbuda is relatively flat with some low limestone hills rising to just under 40 metres (125 ft.) in the Highlands area (see Figure 1.3).

Antigua and Barbuda both experience a tropical maritime climate with little variation in daily or seasonal temperatures. Average monthly minimum temperatures range from 22.4°C in February to 25.4°C in August, while monthly maximum temperatures range from 27.9°C in February to 30.5°C in September. Soil temperatures show little change during the year and average approximately 27°C. Relative Humidity averages range from lows of 72% - 78% in mid-afternoon to early morning highs of between 81% and 85%. The drier conditions and lower temperatures are experienced during the months of January to April.

The islands lie in the path of the north-easterly Trade Winds and experience fairly steady winds off the Atlantic ranging from the north east to the south east. Monthly average wind speeds are 17 to 26 km/hour, with lowest speeds in September to November. Winds associated with Tropical Storms and Hurricanes can exceed these levels and have been in excess of 200 km/hr during some storms in the last 15 years.

Rainfall is probably the most important and variable climatic feature and severe droughts are experienced every few years. Conversely, depending on the major climatic cycles associated with El Nino/La Nina, quite wet years are also possible. Average annual precipitation averages about 1050 mm (40 inches), but has ranged from 667 mm to 1708 mm since 1960. The months of January to April constitute the driest period while September to November are considered wet season months. These months coincide with the period of active tropical waves and tropical storms mentioned above. May is particularly variable and while often quite dry, can also be extremely wet.

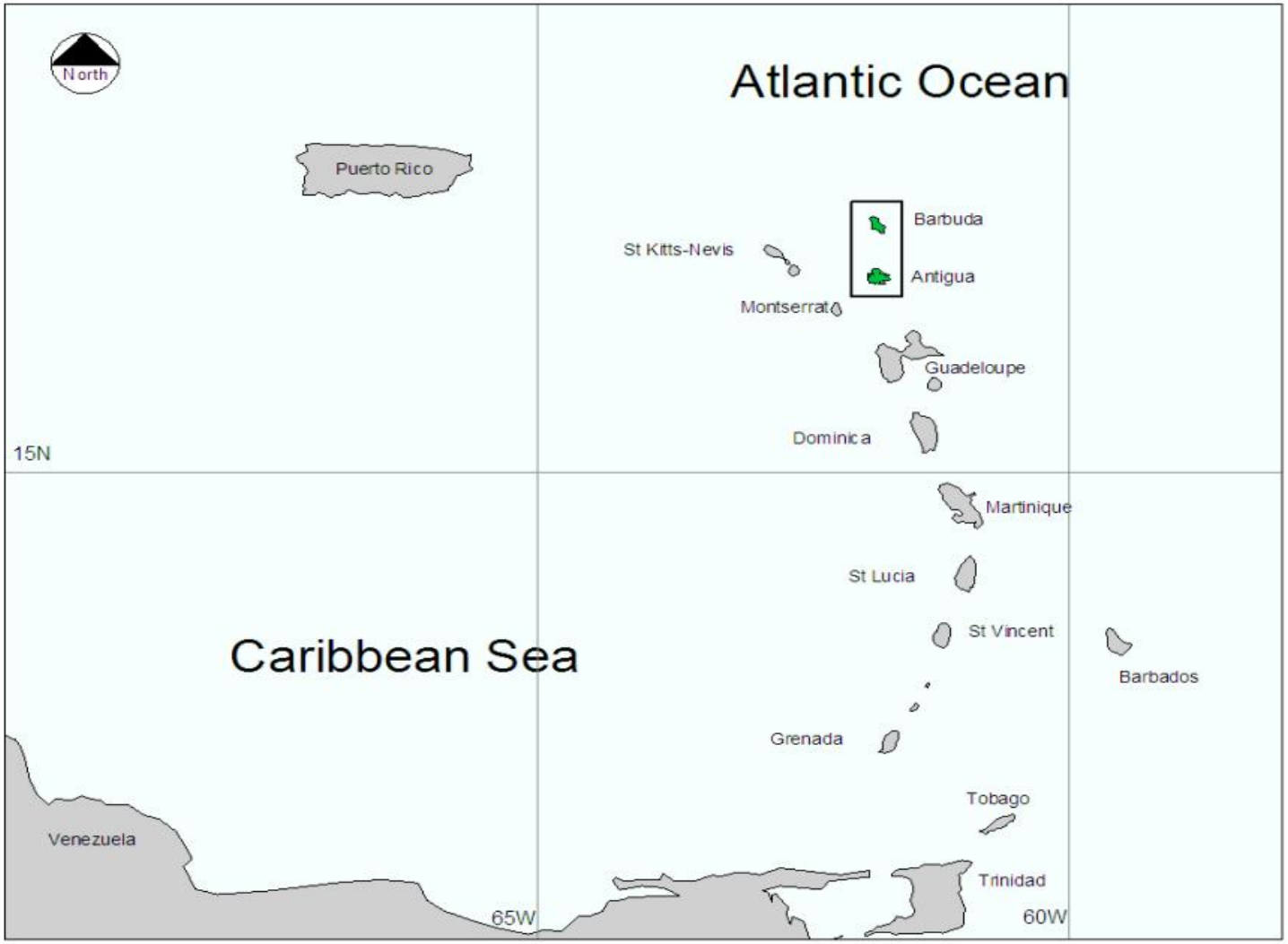

Figure 1.1. Map of the Eastern Caribbean showing the locations of Antigua and Barbuda

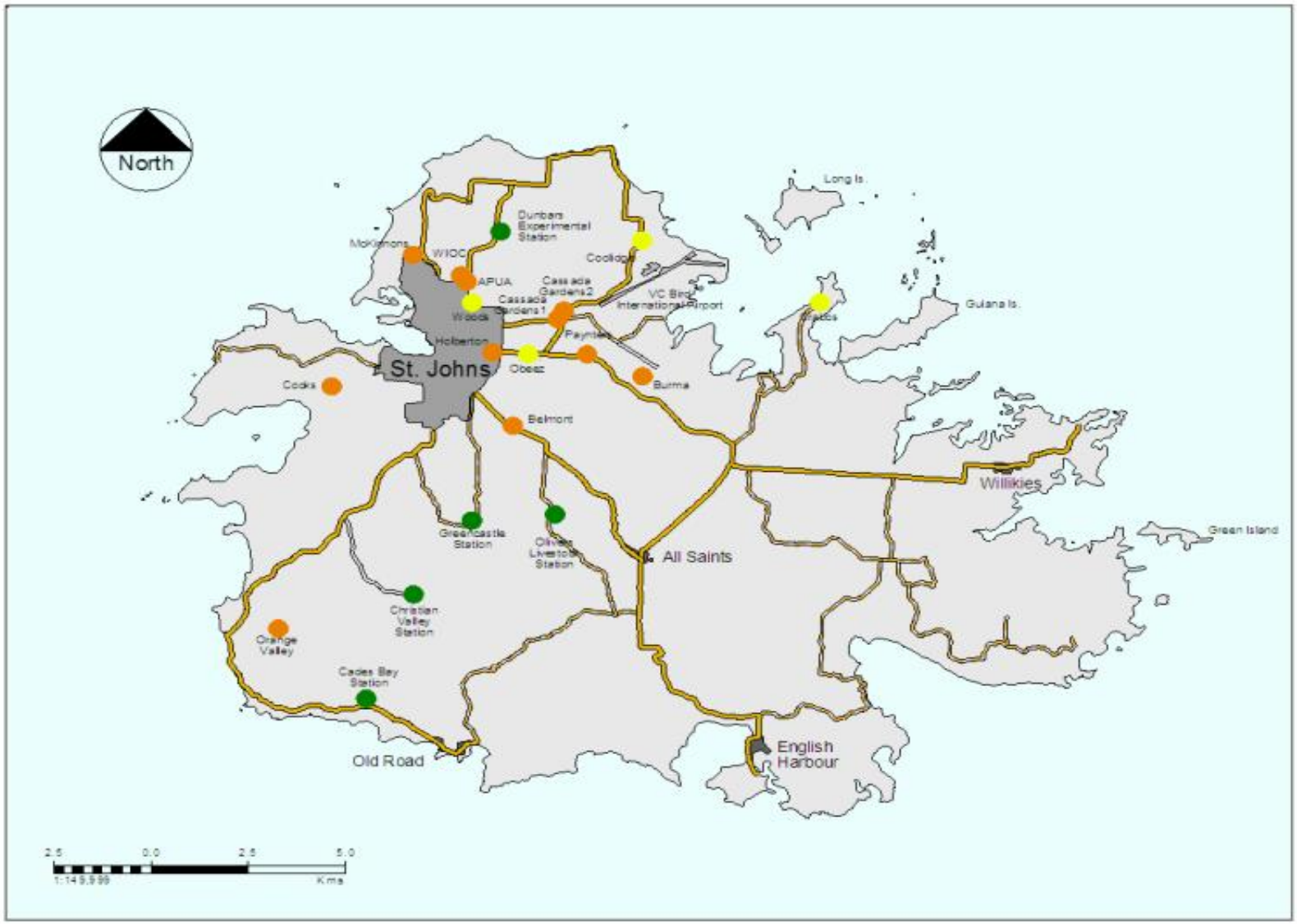

Figure 1.2. Map of Antigua

Figure 1.3. Map of Barbuda

Rainfall is unevenly distributed over Antigua, with the drier areas being located in the flatter eastern and northern regions and the highest rainfall areas occurring in the mountainous south west. Barbuda (see Figure 1.3) is significantly drier, as would be expected from its low lying topography. Annual rainfall averages 750 to 900 mm (30 to 35 inches).

2.1.2. Socio-Economic description

2.1.2.1. Population and Human Resources

In 2003, the population of Antigua Barbuda was estimated at nearly 79,000, with a growth rate of 1.9 % per annum[5]. The last official census was in 2001. Of the total, Barbuda contributes approximately 1,200 persons. The population density of 172 persons per square kilometre is somewhat lower than the OECS average, largely due to the low population density of Barbuda (about 7 persons per sq. km.). Nearly 60% of the population lives within the city and parish of St. John's, giving rise to a population density of approximately 2,700 persons per square kilometre in the main urban area. The remaining population is relatively well distributed over the rural areas and highest population concentrations are on the coast. Average size per household is 3.2 persons.

The labour force in 2004 stood at 37,100, while the unemployment rate was 7%[6], with seasonal shifts due to hotel closures or low occupancy during the off season. Unemployment is higher in Barbuda. There has been universal primary education since the mid-60's and school enrolment rates are about 95%. Adult literacy is estimated at 90%. Primary, post-primary, and secondary education to CXC level, are offered at approximately 30 public schools and 12 private schools. Many private pre-schools have come into existence during the last fifteen years. There is one sixth-form college which also teaches some first and second year courses for the University of the West Indies. There are several specialist training centres, including the Antigua and Barbuda International Institute of Technology, specialising in computing and information technology, and the Hotel Training School which provides vocational training for the hotel sector.

2.1.2.2. Physical Infrastructure and Public Utilities

Antigua's sheltered harbours and flatter topography have facilitated development of better physical facilities than many neighbouring islands. The growth of the economy due to tourism has been supported by an excellent communications and transport infrastructure, including international airport, deep water harbour, cruise ship berthing facilities, and an extensive road network linking all parts of the island. Electronic communications are also well developed including cellular telephone services, with fibre optic and microwave linkages between major communication nodes, suitable for rapid data transmission.

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[5] Caribbean Development Bank Annual Economic Review, 2004
[6] IMF Country Report (Antigua and Barbuda) 2004/36 – November 2004

Power generation and transmission have been extensively improved in recent years providing a relatively reliable, hurricane resistant service. Domestic water shortages such as those of the 1980's have been replaced by an expensive but more reliable water generation system that relies heavily on desalinated water to provide up to 60% of the daily requirement.

Barbuda's infrastructure lags significantly behind that of Antigua but is now being upgraded. The small runway at Codrington Airport limits use to small aircraft with up to 20 passengers. Telecommunications are modernised.

2.1.3. Economic Development

2.1.3.1. National Economic Status

According to the World Bank, Antigua and Barbuda is classified as an upper middle-income country. GDP per capita is currently in excess of US $ 9710[7]. In 2004, real GDP grew at the rate of 5.2% and was estimated at US $805.46 million compared with US $468.89 million in 2000. Growth in 2004 was fuelled primarily by growth in the banking sector with lower growth recorded in the tourism, transport, and wholesale. Traditionally, the economy was highly dependent on exports of sugar and cotton. However, since the 1960s, the economy has been transformed to the provision of tourism and related services, which accounts for the major share of foreign exchange earnings (85 %[8]). Tourism employs approximately 8000[9] persons directly in the hotel sub-sector (26% of the labour force) and another 3000 indirectly in activities providing services for the tourist industry.

Of all of the sectors identified in Antigua and Barbuda, Industry and Agriculture have impacted the most on the use of pesticides and toxic chemical.

2.1.3.2. Industry and Business Sector

The manufacturing sector's share of GDP has declined steadily from 4.1% in 1988 to 2.5% in 1998. This decline, in part, reflects the rapid growth of the tourism sector with which manufacturing has to compete for labour. High utilities costs have also had a negative effect. Difficulties in accessing regional or extra regional markets also limit expansion and cost reduction through economies of scale.

Industrial activity is limited to light manufacturing in which most raw materials are imported. Such operations include manufacture of paints, furniture and some household fittings and garments. There is also a brewery – which produces beers and a range of soft drinks – and a rum distillery. Service industries include those supporting the airlines operating out of Antigua such as airline catering and aircraft maintenance, and yacht and boat maintenance at the two larger marinas in English Harbour and Jolly Harbour. Apart from light machine works, there are no metallurgical industries, paper or chemical manufacturing plants in Antigua or Barbuda. There are also a number of photographic processing outlets. However, use of conventional photography is steadily giving way to digital processes.

Since Antigua and Barbuda never had the economic advantage in this sector there are limited opportunities for the importation and use of pesticides and toxic chemicals. It is not expected that this will ever become a sector for great concern. The country will however have to be vigilant for the use of POPs like substances like that used in the dry cleaning businesses.

2.1.3.3. Agriculture

[7] World Bank Fact Sheet – Antigua at a Glance
[8] Antigua and Barbuda – European Community Country Strategy Paper and Indicative Programme for the period 2001 - 2007
[9] Tourism Sector Study – Antigua and Barbuda conducted by the Ministry of Tourism and Civil Aviation, 2004

The agricultural sector's contribution to the economy is relatively small. In 2003 it reached US $24.45 million, or 3.7% of GDP[10] when compared to 6.1% of GDP in 1983. These figures reflect the relative stagnation of agriculture as the service industries have grown. In 2003, the contribution of the fisheries sub-sector accounted for 50% of the agricultural sector's economic output, while crops represented 27%, livestock 21% and forestry 2%.

Agriculture is constrained by a number of factors, including high cost of labour, small size of local market and lack of marketing structures and infrastructure, competition from imported foodstuffs, inadequate supply of water for irrigation as well as a regular succession of severe droughts and, in recent years, destructive hurricanes. Agriculture is therefore limited mostly to meet the local market.

The dry climate of Antigua and Barbuda is well suited to livestock production and the grassland areas support considerable populations of cattle and small ruminants. However, production remains a part time hobby for many livestock owners, who rely on waste land as pasture. Production practices are basically impossible to improve under these conditions and even for those with land, livestock production generally remains a low-input/low-output enterprise, subject to the vagaries of the weather.

Pest problems are a major challenge for Antiguan farmers and pesticides have provided an effective tool to assist them in the management of these threats to production. Herbicide use has also been widespread, mostly involving post-emergent herbicides.

In the last few years, import requirements in the markets of developed countries have become more stringent with increased concerns about food safety, both from biological and environmental contamination. Demand for good agricultural practices (GAPs) to be certified at points of produce origin have forced local farmers to observe strict codes of practice with respect to sanitation and use of toxic chemicals in their production systems.

2.1.3.4. Environmental Issues

Antigua and Barbuda is the largest of all the Leeward Islands states and, despite the destruction of more than 90 percent of its original vegetation to grow sugar cane in the eighteenth and nineteenth centuries, it has still retained a surprising degree of biodiversity. Secondary re-growth of forest from primary remnants has taken place in the higher elevations despite loss of topsoil during previous cultivation of these areas. The mainland, besides the habitat destruction, has had to suffer from introduction of several invasive species that have proved costly to indigenous fauna and flora. Fortunately, the numerous offshore islands around Antigua have largely been spared these threats and have continued to provide a refuge for species extirpated from the mainland. Over 1,100 higher plant species have been recorded as comprising the flora of Antigua and Barbuda. These include many herbs and medicinal plants which are still widely in use today. There are also several rare or threatened species. The many inlets, lagoons and wetland areas around the coast are attractive to migratory waders and sea birds. Barbuda is home to the largest breeding colony of Magnificent Frigate Birds in the Eastern Caribbean and also has an endemic warbler. Antigua and Barbuda's many vegetation fringed beaches are suitable as egg laying sites for

[10] Eastern Caribbean Central Bank Socio Economic Data, 2004

several endangered species of turtles, the Hawksbill turtle being the most common. Marine mammals are also found in our offshore waters including the majestic Humpback whale which passes through Antigua and Barbuda's waters on its way to breeding grounds further south.

Threats to the environment are mainly due to human activities as well as natural disasters, although introduction of invasive species continues to be an ever present danger. As the economy expands, habitat destruction resulting from the building of hotels, marinas and housing in sensitive areas is also gradually exerting its toll, especially in the absence of a clear land use policy for the nation.

The monitoring of these resources for the presence and harmful effects of chemical pollution has not, until recently, been the focus of much attention. Given the use of a wide range of broad spectrum pesticides, some of which in the past were POPs or had POPs-like qualities, it is still important that the levels of pollution and contamination of environments with these toxic chemicals should be effectively monitored. At the moment, very little is known with any degree of confidence or precision, as to what the state of contamination of the environment actually is.

2.2. Management and use of Toxic Chemicals including POPs

2.2.1. National policy and legal framework for Toxic Chemicals management

At present there is no specific formal statement regarding a national policy for management of toxic chemicals. Antigua and Barbuda has, however, adopted a national strategy for the management of the environment. The NEMS or National Environmental Management Strategy in its Action Plan 2004-2009, enunciates a vision for the country which reads:

> '*An Antigua and Barbuda in which all citizens strive to build a nation that treasures the environment and voluntarily acts to ensure the protection, conservation and sustainable use of natural resources*.'

In furtherance of this, the objectives of the NEMS are to provide:

- **Policy and Planning framework -** To integrate environmental and natural resources management into development policies, plans, legislation and budget processes at all levels.
- **Improved legal and institutional framework -** To protect the environment, while improving the quality of development projects and programs.
- **A framework for Sustainable Livelihoods -** The private sector needs a framework for enhanced participation and maximization of economic benefit derived from natural resources.
- **Civil Society participation -** Ensuring meaningful participation by civil society in environmental decision-making.
- **Capacity Building –**
  - To strengthen local expertise and technical ability in planning and implementing sustainable natural resource management programs and for negotiating multilateral environmental agreements through the development of appropriate tools and techniques, training, policy formulation, and cooperation in science and technology.
  - To foster a culture of participation by Civil Society in decision-making and implementation and to build capacity to achieve this.
- **Economic incentives** - Develop a package of economic instruments that will provide incentives or disincentives and the necessary funds to protect and or restore the environment.
- **Environmental education, training and awareness -** To strengthen environmental education, raise awareness and provide training in support of environmental management and the sustainable use of natural resources.

In addition, the Sector Plan for the Agriculture Sector: 2001-2005 includes Objective 6, which reads: "*To promote and support environmentally friendly pest management methods and the adoption of an Integrated Pest Management (IPM) approach to improve the safety and wholesomeness of local food production*".

2.2.2. Existing legal framework for management of toxic chemicals

At present there is no legislation specifically dealing with management of POPs. The following sections provide information on existing legislation and regulations as well as draft legislation which deals with various classes of toxic chemicals.

2.2.2.1. Pesticides Control Act

Pesticide use is currently regulated by the Pesticides Control Act #15 of 1973, which is described as "*an Act to provide for the control of the importation, sale, storage and use of pesticides*'. Under the Act, a Pesticides Control Board has been established. It is made up of five members appointed by the Minister responsible for Agriculture. The Board is responsible for advising him on the making of regulations and carrying out the provisions of the Act and its Regulations. The composition of the Board was required to include those qualified in matters relating to medicine, chemistry, science, agriculture or law and appointments are for 2 years in the first instance with reappointments allowed.

The Act allows the Governor General to make regulations concerning a number of matters relating to the management of pesticides. These include:

a) prohibitions on manufacture and importation, etc.;
b) controls on importation or use of specific pesticides or classes of pesticides;
c) controls on use of pesticides in agriculture generally;
d) controls on use of pesticides on produce during storage or distribution;
e) controls on storage of pesticides;
f) protection of workers;
g) protection of interests of owners and/or users of land or property adjacent to where pesticides are used, and
h) establishment of permissible levels of any pesticide in any produce on offer for sale.

Additional specific provisions were allowed that dealt with a wide range of management issues including *inter alia*:

- Quantities imported, packaging, labelling and disposal of pesticides;
- Keeping of records and furnishing returns on stocks, sales and disposal;
- Setting conditions on the use of specific pesticides;
- Restrictions and obligations on Pest Control Operators and employers of workers using or handling pesticides;
- Uses of protective gear and other protective measures and the observance of precautions against poisoning, as well as limitations to exposure to pesticides;
- Special precautions for susceptible segments of society;
- Measures for investigating poisoning, including sampling, analyses and medical testing;
- Requiring of issuance of licences for importation and sale of pesticides and charges for same;

- Requirements for training in adherence to the regulations and observance of precautions.

The Act also enables the Minister to appoint inspectors who are allowed entry, with written authorization, to any premises, except dwelling houses, where pesticides were used, stored, packaged or sold and, further, they are given powers to inspect any records or documents and entitled to detain or seize any sample suspected to be or to contain pesticides. However, no regulations were ever issued under the Act and the Board has operated since its inception without adequate organizational support or the authority to meet its management responsibilities.

2.2.2.2. Pesticides and Toxic Chemicals Control Act (Draft)

The 1973 Act did not include reference to toxic chemicals other than pesticides. This new bill was drafted to make good some of these deficiencies and to broaden the scope of the legislation. This draft Act is called the Pesticides and Toxic Chemicals Control Act. The draft bill, if it becomes law will provide, with the Regulations, a more comprehensive legal framework for the control and management of toxic substances, including agricultural pesticides.

The Act is described as "*A Bill to regulate the importation, storage, manufacture, sale, transportation, use and disposal of pesticides and toxic chemicals and for matters incidental thereto*" and it is clearly based on the 1973 Bill. Like its predecessor, this Bill calls for a Board, this time called the Pesticides and Toxic Chemicals Control Board. The functions of the Board are set out in Section 4 and are somewhat more detailed. The Board is charged with:

a) advising the Minister on setting regulations;
b) determining applications for registration, licences and permits;
c) granting or cancelling the above;
d) advising on and monitoring the implementation of regulations;
e) furnishing reports to the Minister as required;
f) certifying pest control operators.

The composition of the board is expanded to nine members, who shall be appointed for a period not exceeding three years and representing at least the following interests and expertise:

a) medical and health services;
b) agricultural services;
c) plant and animal health services;
d) trade and customs services;
e) Bureau of Standards;
f) chemistry and scientific services;
g) legal counsel; and
h) environmental services.

The new Bill also calls for: the appointment of a registrar of pesticides and toxic chemicals; the licensing of pest control operators; the appointment of official Analysts, Inspectors and Medical Examiners; the specification of products or substances as either prohibited or

controlled, and the making of regulations by the Minister on a wide range of matters for effecting the provisions of the Act, *inter alia* the control of toxic chemicals in agriculture, arts, commerce, industry or domestic or other purposes; prescribing of standards; the manner and content of advertisement; the reporting of poisonings and the warning of workers by employers.

2.2.2.3. National Solid Waste Management Act (& 2004 Amendment)

The National Solid Waste Management Act (No. 10) of 1995 is described as: *an Act to establish the National Solid Waste Management Authority with responsibility for solid waste, storage, collection, treatment and disposal; and for matters incidental thereto and connected therewith*. It is currently the legal instrument governing the management of solid waste in Antigua and Barbuda.

The Authority is to comprise a chairman, the Town and Country Planner (*ex officio*), the Chief Health Inspector (*ex officio*), a senior representative of the Ministry of Finance, an environmental engineer and two members – not civil servants and selected by the Minister.

The 2004 NSWMA (Amendment) Act defines Hazardous wastes (Schedule 1) according to chemical type and then by possession of hazardous properties according to the UN code. Although POPs are not mentioned by name, a number of persistent toxic substances, including PCBs, PBBs, PCTs, and dioxin/furan congeners are included in the list in Schedule 1.

The Act prohibits the importation of wastes, except those associated with normal aircraft and ship generated waste, or any secondary resource specifically allowed as part of a manufacturing process.

2.2.2.4. Marine Pollution Act (Draft)

This legislation is at the draft stage. It deals with marine pollution from ships, the on-board management of wastes, the management of hazardous wastes and reporting of spills, intervention and liability, the control of land based sources of marine pollution and control at ports.

2.2.2.5. Litter Act (CAP 250) of 1983

The Litter Act of 1983 is described as an Act respecting the littering of public places and of premises. Litter is very broadly defined and includes any solid or liquid material or product, including those materials and products commonly found in municipal waste as well as waste from construction and demolition sites, human and animal waste or any other refuse, rubbish or waste material.

The Minister may also designate other materials as waste by notice published in the Gazette. In the definition of waste, the following categories are included: scrap material or unwanted

surplus substances, any contaminated or otherwise spoiled substance, industrial or commercial waste. Chemicals or toxic substances are not specifically mentioned as constituting litter.

The Act prescribes penalties for depositing litter in a public place, other than in a receptacle placed for the purpose of collecting it, or in an approved site. Litter deposited from any vehicle is also included. Likewise any person who deposits litter onto the premises of another without his expressed consent is also guilty of an offence.

Litter Prevention Wardens (LPWs) may be appointed by the Minister under the Act and include *de facto* every peace officer, every public health inspector acting under the Public Health Act, and every forest officer appointed under the Forestry Act. Wardens shall be issued with official evidence of their authority. Wardens are empowered to order the person committing an offence to remove the litter to an approved place, or failing that to bring prosecution against the person.

Litter wardens may also issue clean up orders for any premises visible from any public right of way which the LPW considers to be unsightly or seriously detrimental to the amenities of the neighbourhood.

Section 18 of the Act provides for the payment of a fixed penalty by a person considered by the Litter Prevention Warden to have committed an offence and prescribes the procedures to be followed.

2.2.2.6. The Public Health Act (CAP 353) of 1957

Public Health Act makes no direct mention of POPs toxic chemicals, but deals with management of general health matters and public nuisances.

2.2.2.7. The Food Safety Bill (Draft)

This Bill has implications for POPs management as it is cited as "as an act to provide for the safety of food produced, processed or packaged in, imported into, or exported from Antigua and Barbuda, intended for human consumption, to ensure its quality and safety; and to provide for matters connected therewith or incidental thereto".

Administration of food safety related matters will be managed by a Food Safety Committee which will advise the minister on all such matters. National interests to be represented on this committee include:

(a) Veterinary Medicine;
(b) Plant Protection;
(c) Chemistry and Food Processing;
(d) Bureau of Standards;
(e) Trade and Commerce;
(f) Fisheries;

(g) Customs and Excise;
(h) Two persons to represent consumers and private sector interests;
(i) Food Safety Authority.

The Chief Public Health Inspector has been cited as the food safety authority under the act with responsibilities including implementation of the relevant aspects of the Sanitary and Phytosanitary (SPS) Agreement, coordination of food safety activities among agencies with relevant functions from the field to the plate and ensuring the training and general awareness of public and private sectors in matters relating to food safety. The act further provides for the appointment of inspectors and analysts to execute the activities of the act.

The act makes provision for the development of standards in agriculture, processing and manufacturing and the development and execution of measures to handle food safety emergencies.

2.2.2.8. Animals (National And International Movement And Disease Prevention) Act (draft)

This draft bill is cited as "an act to control the movement of animals into, out of and within Antigua and Barbuda and to prevent the introduction and spread of animal prescribed diseases within Antigua and Barbuda and other countries, and to ensure the safe and humane movement of animals to and from Antigua and Barbuda; and to provide for other matters related thereto and connected therewith". Although the act does not speak specifically to animal and meat contamination by substances, the provision is made for regulations to be made on the declaration of additional pests and diseases of animals which may be of concern and hence allows for the handling of matters not currently listed in the bill and which could have some impact on the management of POPs as it relates to animals.

2.2.2.9. Plant Protection Act (Draft)

The draft Plant Protection Act is cited as "an act to prevent the introduction and to control the spread of plant pests; to protect plant resources; to facilitate trade in plants and plant products; and to regulate other matters connected thereto". In the control of the spread of pests, various pesticides may have to be used to effect said control and as such, the act has implications for the use of pesticides, including fumigants, some of which may be POPs-like.

2.2.2.10. Environmental Protection and Management Bill (Draft)

The Bill is in fact a piece of omnibus legislation which seeks to bring together in one act, the major legal instruments for managing the environment in Antigua and Barbuda. In this respect, the Environment Division will be elevated to a Department and will have a major responsibility for management of this legislation.

The draft Act includes 15 parts which deal with Administration; EIAs; ozone depletion and climate change; management of hazardous substances, including POPs; pollution and waste management – including hazardous wastes; marine pollution, air and water quality management; environmental and resources management; management of coastal, fisheries, forestry and biodiversity resources and their conservation. There is also a section on energy conservation. It therefore cuts across the responsibilities of several government Ministries and deals with some areas already covered by existing legislation.

The legislation is generally directed at the development of national management plans. It delineates the management principles which should be adopted and urges the setting of standards for identified sectors of the environment.

The Parts of particular interest to the management of POPs and other toxic substances are the following Parts:

- Part IV Pollution and waste management – General
- Part V Management of Wastes
- Part VII Management of Hazardous Substances
- Part X Air Quality Management

Part IV: Pollution and waste management – General. This Section requires the NSWMA under the direction of the National Council for Sustainable Development to develop a Policy on Integrated Waste Management. The policy will establish standards, and procedures for management of all waste and for recovery, reuse and recycling. It will establish *inter alia* targets for the continuous reduction of POPs to be achieved and commencement dates, as well as targets for reduction in wastes generation. Polluter-pay and User-pay principles are promoted. The legislation provides measures for compliance and enforcement.

Part V: Management of Wastes. This part deals more specifically with the proper management of waste storage, collection and disposal in order to prevent pollution of water resources, or of the air or land. Unauthorised disposal of waste is prohibited under the Act. The legislation anticipates a broader responsibility of waste disposal functions, distributed among municipal, community and private bodies. Regulation of these activities is provided for by the granting of licences for waste management, disposal sites, and treatment plants. The draft proposes standards for landfill siting criteria, disposal of waste on land and incineration facilities, among other things. Incineration facilities shall treat or dispose of fly ash or residue in an environmentally acceptable manner and the incineration shall comply with all pollution prevention standards established under the Act.

Part VII: (Management of Hazardous Substances). Part VII deals with the handling, transport, storage, use and disposal of hazardous substances as defined by the United Nations classification system (described in Schedule 4 of the Bill). The legislation provides for the control and prohibition of import, manufacture, and the like, of any hazardous or toxic substance. Standards are defined for the labelling and marking of containers in which hazardous substances are shipped as well as the special documents that must accompany such shipments. Special provisions are detailed for importation by sea or air or transport by road.

The draft provides for the development of a National Hazardous Waste Management Policy document which will evaluate the nature and quantities of hazardous waste generated, management options for hazardous waste management, standards and procedures, methods for reduction and prevention of waste generation as well as alternative technologies that may avoid, or reduce, generation of hazardous waste. Regulations may be developed by the Ministries responsible for environment and trade to implement the provisions of the Act.

Part X (Air Quality Management). Part X makes provision for establishing standards and limiting emissions of pollutants from point sources into the atmosphere according to the category of pollutant as outlined in Schedule 14 of the draft legislation. POPs as defined in the Stockholm Convention would fall into Category 1 - Environmentally Toxic and Persistent or Carcinogenic Substances. Part 5 of this Schedule provides emission standards for dioxins and furans, which are set at 0.5 nanograms/Nm^3 for any emission from a commercial or industrial facility.

2.2.3. Relevant international commitments and obligations

The Conventions that are most relevant to POPs management are the Stockholm, Basel and Rotterdam Conventions. The Stockholm Convention has been introduced already in Section 1.4 and will be described in detail in Section 3. Antigua and Barbuda is also signatory to the Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal and the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade.

The Basel Convention was adopted in 1989 and seeks to regulate and manage the movement of hazardous wastes between countries. The Basel Convention takes as a basic principle the need to reduce both the generation of hazardous wastes and their trans-boundary movement to a minimum. It asserts that all countries have the right to ban the import of hazardous waste. Under the Convention, Antigua and Barbuda has a responsibility to ensure that adequate disposal facilities are provided and that environmentally sound management of its own wastes is practiced.

The Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade was adopted by Antigua and Barbuda in 1998 and entered into force in 2004. It obliges Parties to notify the Secretariat of final regulatory actions taken to ban or severely restrict chemicals, for the information of other Parties and possible listing under the Convention.

Together the Basel, Rotterdam and Stockholm Conventions provide for “cradle-to-grave” management of POPs and other hazardous chemicals. Table 2.1 below shows the key hazardous waste management issues covered by the various conventions. Annex III shows a list of other Multilateral Environmental Instruments and Environmental Conventions of which Antigua and Barbuda is a Party.

Table 2.1. International Conventions and Management of Hazardous Chemicals

Key Management Elements	Stockholm	Basel	Rotterdam
Existing Chemicals	+		+
New Chemicals	+		
Import/export controls	+	+	+
Waste management.	+	+	
Environmental releases.	+		
Hazard communication.	+	+	+
Information Exchange and Research	+		
Replacement	+		

Antigua and Barbuda is also a signatory to the MARPOL 73/78 Convention under which it is obligated to provide adequate reception facilities for ship-generated (Annex 5) wastes. These reception facilities refer to a combination of collection, transport, treatment and final disposal systems in order to comply with the provisions of the convention.

2.2.4. The Institutional Framework for Management of Toxic Chemicals

At present, as the legal framework would indicate, a number of institutions have various levels of responsibility for some of the toxic chemicals in use in Antigua and Barbuda today. These institutions, which provide some regulation and management of toxic chemicals including POPs, are spread across the public sector in ministries and agencies that interact with the public and the private sector. The roles and responsibilities of ministries, agencies and other governmental institutions involved in management of toxic chemicals[11] are described in the following sections.

2.2.4.1. Pesticides Control Board

The Pesticides Control Board is established by the Pesticides Control Act. It is currently responsible for the regulation and control of pesticides in Antigua and Barbuda. Harmonisation of activities regionally is effected by the country's participation in the Coordinating Group of Pesticides Control Boards of the Caribbean (CGPC). In addition to the regulation of pesticides, the Board is engaged in training and public awareness activities, mainly concentrated around Pesticides Awareness Day which is celebrated on September 27th each year. Board activities also include the conduct of surveys of pest operator establishments to monitor pesticide handling, use and management issues. Advice on best practices is usually given while and after the surveys are conducted.

The Board is without a Secretariat and historically depends on the Plant Protection Unit and the Department of Agriculture to support its work. Despite the lack of effective regulations under the Act and the human and physical shortages for its implementation, it has been quite effective in raising awareness about the dangers of agricultural pesticides and in regulating the importation of undesirable pesticides. Its mode of operation has been that of seeking

[11] REPORT Development of POPs Information System for Antigua and Barbuda

consensus and obtaining compliance rather as operates with voluntary standards. In addition, other toxic chemicals remain under no kind of legal control.

As indicated in Section 2.2.2.2, a new Pesticides and Toxic Chemicals Control Bill has been drafted along with draft new regulations. This Bill is in its final stages of consultation with stakeholders. Under this Act, if approved, the Board will be enlarged and given additional responsibilities. The regulations will give the new Pesticides and Toxic Chemicals Board the proper authority to take legal action.

Both draft Bills provide significant improvement on the existing legal framework for toxic chemicals management but have differences in management framework, scope and other requirements/details pertaining to storage, handling, inspection and transportation. There is a clear need for harmonization of these two pieces of draft legislation to facilitate early implementation of a comprehensive toxic chemical management Act.

2.2.4.2. Plant Protection Unit

The Plant Protection Unit (PPU) is a small Unit within the Ministry of Agriculture responsible for protection of plants from pests and disease.

The Unit was set up to advise producers on the appropriate method to control disease and pests including the appropriate use of toxic chemicals. The Unit advocates the application of an integrated approach to pest management. It is also responsible for identification of pests and plant diseases, a task that it executes through a system of scouting and field inspections and pesticide application where necessary. The PPU provides an inspection service at the ports of entry to prevent the entrance of prohibited materials and the introduction of new pests and diseases within the country's borders.

Plant Protection could play a more effective role in ensuring a safer food supply – free from chemical residues – through rationalization of the use of agricultural chemicals. The Unit would however require appropriately trained staff, supporting modern laboratory facilities, and budgetary resources, including salary upgrade to facilitate its work. In addition, no physical plant protection services or human resources currently exist in Barbuda despite the recent designation of official ports of entry on the island.

2.2.4.3. Agricultural Extension Division

This Division is the training arm of the Ministry of Agriculture. There is no law currently governing the function of the Division but rather activities executed reflect current Ministry of Agriculture policy and programmes. The Extension Division provides training to farmers in a wide range of agricultural production practices and technology, including the safe and appropriate use and storage of toxic chemicals on the farm. The Division is also responsible for advising farmers on the efficacy of chemicals, waiting periods after using chemicals before entry or harvesting of crops, safety procedures including use of protective clothing and first aid procedures. The Division is currently participating in the promotion of Good

Agricultural Practices among crop and livestock farmers in the country in a bid to get them EUREPGAP certified.

The extension services are an important component in the regulating, monitoring and control system for toxic chemicals. With respect to these activities, the Division usually collaborates with several agencies, including the Plant Protection Unit, Pesticides Control Board and agricultural input suppliers.

2.2.4.4. Crop Research Unit

Crop Research is another unit in the Ministry of Agriculture that plays a role in toxic chemicals management. Agricultural Research is coupled with cotton research and development and has a loose relationship with a series of Government agricultural stations that were originally designed to be testing and demonstration centres for agriculture technology, including the efficacy and safe use of toxic chemicals.

One of the activities for which Crop Research is responsible is the testing of the efficacy of chemicals, their safety and impact on the local environment. This function is only carried out in the context of specific crop trials or management of specific pests and not routinely as a support function for the registration and importation of specific chemicals.

The Agricultural Research Unit is understaffed with inadequate resources to fulfil its support function and currently appears to have little functional relationship with other parts of the Ministry of Agriculture.

2.2.4.5. Central Board of Health

Antigua and Barbuda is a large importer of chemicals for use in the household. Environment Health Officers of the Central Board of Health have a role in advising the public on:

- the safe use of household chemicals;
- the use of chemicals in industry, health institutions;
- other commercial non-agriculture uses of chemicals.

Most chemicals used in households are not defined as toxic chemicals and their management is therefore not addressed in this NIP. It should be noted, however, that there is justification for monitoring even household chemicals on the basis of the alternative view that all chemicals are toxic and can be lethal if abused.

Most hotels in the tourism industry in Antigua and Barbuda are built and operated in close proximity to beaches. It is therefore important that the use of chemicals in hotels be closely monitored and regulated to minimize the possibility of leaching and migration into the marine ecosystems.

CBH is therefore an important entity in the management and regulation of toxic chemicals.

2.2.4.6. National Solid Waste Management Authority

The National Solid Waste Management Authority (NWSMA) is a Government statutory authority that was established by the National Solid Waste Management Authority Act (1995) with general responsibility of managing solid waste generated within the state of Antigua and Barbuda. Management of wastes includes storage, collection, treatment and disposal. One duty of the NSWMA is 'to provide facilities for the treatment and disposal of medical and hazardous wastes'.

The 1995 Act was amended in 2004 and now requires that the NSWMA:

- completes an inventory and characterisation of the solid waste generated in Antigua and Barbuda.
- prepares a National Waste Management Strategy (NWMS) which will, among other things, identify methods by which hazardous and bio-medical wastes and other specified classes of solid waste substances are to be managed.

The NSWMA has only rudimentary storage facilities for toxic materials at its landfill site and bulks materials for shipment overseas to approved disposal plants.

2.2.4.7. Environment Division

The Environment Division was formed in 1997 and was mandated by Cabinet to perform, among other things, the following duties:

- Develop and implement projects related to the rehabilitation and protection of the environment;
- Identify and coordinate the implementation of Antigua-Barbuda's commitments to International Environmental Agreements. This will include the coordination of the implementation of the recommendations of the National Coordinating Mechanism for Environmental Conventions (NCM);
- Coordinate the development of Environmental Legislation in all areas of environmental management;
- To provide advice to the general public and other government agencies on environmental issues;
- To coordinate the process of conducting environmental impact assessments for all major developments in the public and private sectors. In addition to request Operational Impact Assessments for existing business;
- Develop and implement any other activity as directed by the Cabinet, Minister or Permanent Secretary.

The Division is presently seeking to formalize the legal basis for its coordination and international negotiating role. It has completed the drafting of an integrated environmental Bill and the ratification of a series of international conventions, including the POPs Convention. The Environment Division's responsibility for implementation of the Stockholm Convention has made it the most recent Agency to become involved in the monitoring and regulation of chemicals. Presently, the Division has administrative authority

for its role as provided by Cabinet in a series of Cabinet decisions and budgeting authority as provided by Parliament through the passage of the national budget.

Part of its expanded role is the responsibility to review the effects of the work of other government agencies. This function has, not surprisingly, created tension between the Environment Division and other agencies that have direct responsibility for operational work. It is clear that a process of discussion, negotiation and decision making will be required to establish new systems of inter-agency cooperation and responsibility sharing in order to provide effective environmental management at a national level.

The Environment Division has a trained cadre of young professional staff members who are well placed for developing the human resources needed to provide the overall review and coordination of the management of toxic chemicals and ensuring that Antigua and Barbuda meets its international commitments in this area. It will also be necessary for the Environment Division to see that a proper programme of chemicals monitoring is carried out in an effort to ensure that the environment is safe.

2.2.4.8. Customs Department

The Customs Department provides border services in the regulation of import and export trade and in collection of customs duties and purchase taxes on imported goods. At present these revenues comprise a large proportion of Government revenue. At the moment, the Customs Division is the front line agency for the control and recording of pesticides and toxic chemicals importation into the country. In addition, the Customs Division has responsibilities for the enforcement of port handling and storage procedures for toxic chemicals, including any POPs. The Pesticides Control Board has established a good working relationship with the Customs Division and as a result, the Department, although not currently required to by law, refers all chemical importation warrants to the Pesticides Control Board for approval and inclusion in the Board's database. While this informal system has apparently worked quite effectively for pesticides in the absence of specific legislation for the monitoring of toxic substances, it is not satisfactory for the frontline agency to have no legal mandate for this responsibility. In fact, it could be subject to challenge in the courts and would not be adequate to comply with the requirements of the Stockholm Convention.

2.2.4.9. National Chemical Analytical Services

At present there are very limited analytical services for the effective monitoring of toxic chemicals in the environment and until recently there has been virtually no regular monitoring of food, water or the environment for the presence of toxic chemicals, despite the wide use of pesticides in agriculture and for grounds maintenance. Obvious environmental crises, such as fish kills at Potworks reservoir and McKinnon's lagoon, have provided impetus to analyse these fish for toxic substances, but due to the lack of information on background levels and the time taken to put systems in place for effecting the necessary tests, results have been less than conclusive.

The current resources providing analytical services are outlined below.

Government Chemist Laboratory: The Government Chemist Laboratory is part of the Chemistry and Food Technology Division of the Ministry of Agriculture, Lands, Marine Resources and Agro-Industry. The laboratory was intended to provide analytical services to the Ministry to assist in its research programmes and to service needs of producers and processors who required soil and water analyses. It also is the only laboratory to provide forensic analytical services to the police and judiciary.

The laboratory has the potential to provide a critical service for the chemical and biological analysis of soil, water and food. It is staffed by competent, trained analysts and headed by a chemist with a doctorate in analytical chemistry. However, there has been a chronic lack of adequate government support to maintain the laboratory in a reliable, functional condition. Timely access to vital supplies and services has been severely lacking over a number of years. These include:

1. Supplies of chemical reagents for the various tests;
2. Specialised materials, such as bottled gases for operating the various analytical instruments;
3. Chemical standards required for quality control and calibration of equipment;
4. Access to specialised technical service personnel and the requisite parts to maintain the precision analytical equipment in working order.

In addition, the laboratory has not kept pace with the rapid advances in analytical methodology and instrumentation and this has severely hampered its effective functioning. The laboratory was initially set up as a research facility and in some areas does not have adequate systems for handling large numbers of samples with a quick turn around time.

Water Quality Laboratory: This small laboratory is operated by the Water Division of the Antigua and Barbuda Public Utilities Authority (APUA). The APUA is a statutory body which has responsibility for the supply of electricity, water and line telephone services to the country. It comes under the purview of the Ministry of Works, Transportation and the Environment.

The laboratory carries out routine tests on water samples from the APUA water distribution system to determine chlorine and salinity levels. It does not have the capacity to carry out tests on levels of pesticides or other toxic chemicals. Such analyses, if required, would be sent to the Government Chemist Laboratory for analysis.

Plant and Animal Health Laboratories: Analytical resources for the plant protection and veterinary needs of the agricultural sector are currently the responsibility of the respective agencies of the Ministry of Agriculture. The Veterinary and Livestock Division has not had a functional laboratory since 1995, when hurricane Luis destroyed the existing laboratory. Facilities operated by private sector veterinary surgeons are generally utilised when required. These usually provide very minimal analytical services. The Government Chemist Laboratory is occasionally called on to provide analysis of tissue samples for toxic substances as part of a post mortem on an animal. The Plant Protection Unit has a small

laboratory for identification of pests and diseases, but has no facilities for monitoring of chemicals at toxic levels in soils or crop tissues. This would be handled by the Government Chemist Laboratory.

2.2.4.10. Bureau of Standards

The Antigua and Barbuda Bureau of Standards is a statutory body established under the Standards Act (Cap 411) to promote and encourage the maintenance of mandatory and voluntary standards in relation to goods, processes and practices. It has responsibility for monitoring the manufacture of goods and the production of services to both local and international standards.

The Bureau is currently preparing standards and developing services which are relevant to the economy of Antigua and Barbuda. In so doing it will provide a broad base of technical, advisory and monitoring services for producers and manufacturers. The Bureau is involved in the labelling of pesticides.

2.2.4.11. National Coordinating Mechanism for Environmental Conventions

The National Coordinating Mechanism (NCM) is proposed in the NEMS as a forum for the coordinated follow-up, at the national level, to all Environmental Conventions ratified by the Government of Antigua and Barbuda.

The NCM is a network of Government agencies/divisions (see list above), national focal points, competent authorities, and NGOs, working together to facilitate a co-coordinated and timely response to Antigua and Barbuda's treaty obligations as well as providing a forum for discussions on work-programmes for Government agencies. Its main role of the NCM is to strengthen communication links between the relevant Ministries, Departments and Statutory Authorities of Antigua and Barbuda directly involved with the implementation of the Conventions.

The institutional framework for the management of toxic chemicals in Antigua and Barbuda is illustrated in Figure 2 below.

2.2.5. Current use of toxic chemicals

As the economic review in Section 2.1.3 has indicated, there is minimal activity associated with chemicals manufacture and no pesticides are manufactured in Antigua or Barbuda. The major area where toxic chemicals are used is in agriculture, and in commercial pest management operations associated with grounds management or for domestic or industrial sites.

Characteristics of these users which have a bearing on the management systems that will be appropriate are provided in the following sections, where these are known. Since at present, no registration of pesticide users is required, documentation on some users is quite limited.

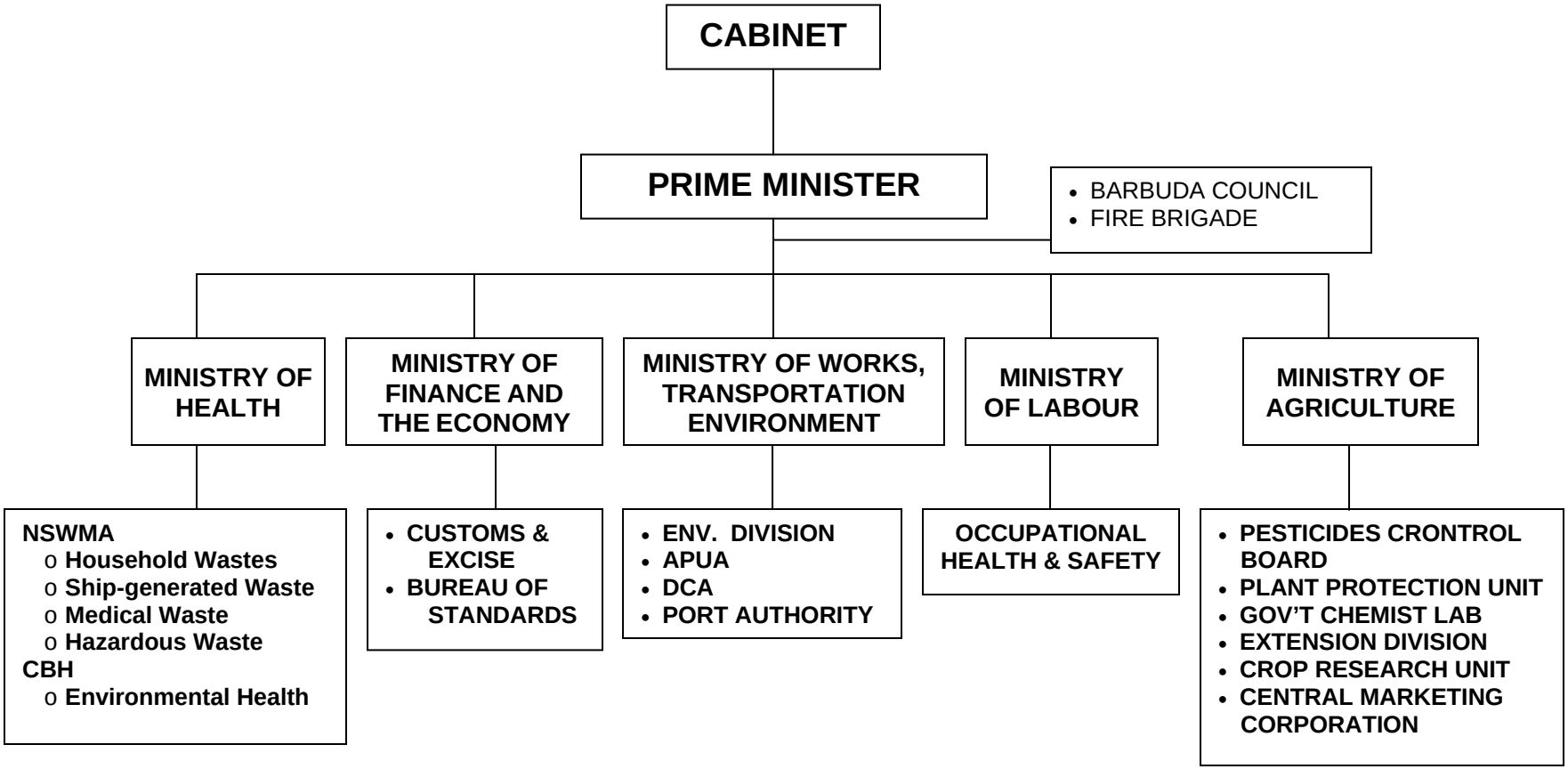

Figure 2. Diagram of Institutional Framework for the Management of POPs

2.2.5.1. Agriculture

The agriculture sector in Antigua and Barbuda is characterised by a large number of small farmers, many dealing with both crops and livestock. Farming systems and size of operation exhibit a considerable range, including many very small farmers with 0.5 ha or less to a few enterprises of 50 – 100 hectares. Accordingly, levels of technology in use also vary greatly, including pest management practices. Generally the small farmer will use a smaller range of agrochemicals and at relatively lower rates, though this is by no means consistent. For the small farmer, a typical range of agrochemicals would include a few insecticides and a contact herbicide. Larger farmers would use a larger range of insecticides and may deliberately rotate these to avoid resistance problems. They would also use several different herbicides and fungicides, depending on the crop mix. Most crop farmers are able to leave significant portions of their land in fallow for several months at a time, which allows weed growth and provides time for degradation of applied pesticides. Stocks of chemicals held by farmers are usually small as storage space is at a premium. However, since the vast majority of farmers do not live on their farms, pesticides are frequently stored at the farmer's home and only the bigger farmers will have purpose built agrochemical storage areas. Most farmers purchase their pesticides from the agricultural supply companies that also provide seeds and fertilizers. A few of the larger and more enterprising farmers who have special needs may import pesticides for their own use.

Crops commonly grown include a wide range of vegetable and root crops, as well as herbs and spices, vine fruits and tree crops. Maize is the only cereal grown and this is harvested at an immature stage for roasting or boiling. Cotton is also grown on a small scale for export of the lint. Sugar cane was an important crop but is now largely relegated to emergency animal feed and to fresh consumption of the cane stalks as a road side "snack".

Besides the farmers, pesticides are also used by the Ministry of Agriculture for management of the three Government demonstration/propagation stations and at the Central Cotton Station (germplasm maintenance) and crop experiment station located at Dunbars. There is also an experiment station operated by the Caribbean Agricultural Research and Development Institute (CARDI) where field scale research is carried out.

2.2.5.2. Hotel Grounds, Golf Courses and Nurseries

Given the high importance of the tourism sector, it is not surprising that there are a growing number of hotels with extensive grounds that require maintenance. Most of these are located in sensitive areas, within meters of the beach. While considerable use is made of local ornamental plants and shrubs, pesticides are used to manage troublesome pests. Some hotels are quite environmentally conscious and subscribe to programmes such as the Green Globe organisation which proscribe most synthetic pesticides and rely on organic and other environmentally softer substances. Golf courses are generally substantial users of pesticides to keep the turf and fairways green. There are two golf courses in active use at present.

In the last few years there has been considerable growth in nurseries providing potted trees, shrubs and ornamentals for homeowners, landscapers, grounds keepers and commercial firms

seeking ready made plants to decorate their properties. Some of these nurseries import their own chemicals for protecting their plants while others rely on the agricultural inputs suppliers to do that for them.

2.2.5.3. Pest Control Companies

A small number of pest control companies operate in Antigua and Barbuda to provide pest management services to domestic, commercial and industrial premises. At the moment there is no legal control over these businesses and they are not required to register with the Pesticides Control Board. However, the PCB has initiated discussions with some of these agencies and there is a degree of cooperation with the PCB. Under the draft Pesticides and Toxic Chemicals Act, there will be a legal requirement for such operations to register and to submit to checks on training and other requirements.

2.2.5.4. Power generation and distribution agencies

Electrical power is generated in Antigua and Barbuda by the Antigua Public Utilities Authority (APUA) and by a private company that sells its electricity to the Authority under contract. APUA is solely responsible for the transmission and distribution of this electricity to its consumers. Getting the electrical power from the generators to the consumer involves raising the voltage of the supplied current after generation to the high voltages used in the long distance transmission lines and subsequently reducing the voltage at the electrical substations located around the country for distribution into the communities. A further reduction in voltage is required in the distribution lines that supply individual houses. The generating stations and the sub-stations use a relatively small number of large transformers on the ground. These can be serviced regularly and the cooling oils are checked and replaced when necessary. The last stage in the distribution system uses a large number of much smaller transformers located on the utility poles of the supply lines. The power supply system produces significant quantities of used cooling oils removed from the transformers which have to be disposed of.

In the past, transformers used in electrical power generation, transmission and distribution were supplied with cooling oils containing polychlorinated biphenyls (PCBs) as additives to improve performance. Use of these compounds in new transformers has been discontinued since the 1990s but it is possible that some transformers still in use in Antigua and Barbuda contain cooling oils contaminated with these chemicals, particularly the smaller transformers on poles in the distribution system.

2.2.5.5. Other users

Small amounts of toxic chemicals are used in a number of industrial/commercial processes which have generally not been included in toxic chemical assessments. These include the dry cleaning establishments which use perchloroethylene, commonly referred to as “Perc”. Though not classified as a POP, this substance can be considered to be a Persistent Toxic Substance and has many similar properties to the “official” POPs.

There are concerns also about butyl tin, which is a component of some anti-fouling paints used for underwater protection of ship and boat hulls. There is a thriving yachting service industry in Antigua and at least two slipway operations are involved in haulouts for repairs and maintenance to underwater areas of yachts and pleasure craft. No information is presently available on the quantities of butyl tin being used in this way.

Households and commercial establishments are consumers of quite considerable quantities of insecticides and rodenticides for use in domestic and commercial buildings for control of ants, roaches, mosquitoes, and rats as well as other insects and spiders. Generally these chemicals are of low toxicity to humans. Synthetic pyrethroids are the major class of insecticides used in these formulations. These chemicals are usually not very persistent and biodegrade quickly in the environment. Use of somewhat more toxic and persistent pesticides have been in use against the imported red fire ant which has been a problem insect in households in some areas of the country. Concerns have been raised about the way household chemicals are sold and displayed, often in very close proximity to food stuffs.

2.2.6. Suppliers of Toxic Chemicals

As stated previously, there is currently no manufacture of toxic chemicals in Antigua and Barbuda. This situation is unlikely to change, given normal market considerations. All toxic chemicals in use are therefore imported from overseas. The Pesticides Control Board keeps a list of pesticide importers obtained from Customs import records, but other toxic chemicals are not included in this list.

The list for 2005 indicates that pesticides were imported by some 24 agencies, of which eleven were distributors or suppliers not involved in pesticide use and twelve were end users, at least two of which also functioned as retailers of pesticides. These were both pest control companies. Three farms involved in crop production were also listed. No hotels, golf courses or land management companies were included in the list and were apparently not involved in pesticide importation during that year.

Since the list only includes pesticides, other toxic chemical importers are not currently included.

2.2.7. Toxic Chemicals currently in use

Records of the Pesticides Control Board listing pesticides imported during 2005, indicate that a total of 225 separate pesticide products were imported, containing a minimum of 109 active ingredients, none of which were POPs substances. This supports the statement of the Board that no POPs chemicals are allowed into the country. According to previous reports[12] this has been the case since the early 1980s. The following table (Table 2.2) provides a breakdown of the various types of pesticides imported.

[12] Cooper, B (2003)

Table 2.2 Listing of pesticides imported into Antigua and Barbuda during 2005

Functional Type	Numbers of Products	Number of Active Ingredients (AI)	Notes
Fungicides	18	17	
Herbicides	26	15	2 AIs not identified
Insecticides			
Agricultural/General	98	49	19 AIs not identified
Household	56	20	
Molluscicides	2	2	
Rodenticides	19	7	5 AIs not identified

The list did not provide any indication of the quantities involved for any of the importers of the individual pesticides. This seems to be an important omission as amounts imported would provide a good indication of the relative importance of a particular active ingredient.

Most of the insecticides currently in use in agriculture or for domestic and commercial pest control are confined to chemicals belonging to the following chemical groups: synthetic pyrethroids, organo-phosphates, carbamates and other chemicals such as insect growth regulators, botanicals, and other biopesticides.

Other toxic chemicals that are not included in the above listings would include heavy metals in general, such as lead and mercury (batteries and other electrical equipment) as well as heavy metal containing products (such as paints used for anti fouling protection on yachts and ships and some wood preservatives), other organic compounds (such as solvents used in dry cleaning), drugs and toxins used in medicine, including strychnine.

2.3. The national inventory of POPs chemicals

The preceding sections have provided a general picture of toxic chemicals importation and use in Antigua and Barbuda as far as the available information will allow. This provides an important background to any discussion of management issues specific to POPs. The following sections provide some more specific information that has been recently acquired to focus specifically on the status of POPs importation and use, storage conditions and presence of stockpiles as well as some preliminary investigation of residues and contamination of the environment caused by prior use of POPs. It will also look at what information is available regarding the present sources and levels of unintentional release of POPs chemicals into the environment.

As part of the preparation for the development of this National Implementation Plan, some preliminary studies were carried out in 2004 on the presence, use, storage and disposal of POPs substances. Preliminary information was also gathered regarding the presence of stockpiles or residues of POPs at key sites where POPs pesticides were known to have been in use prior to their being prohibited from importation. An investigation was also carried out on presence of PCBs in transformer oils and measures currently in practice to minimise their contamination of the environment. This study also made some estimates of the levels of the unintentional production of POPs such as dioxins and furans from combustion of municipal and domestic waste, agricultural burning, bush fires and the cremation of animal carcasses.

In order to ascertain whether there was any significant contamination of the environment from POPs, a preliminary sampling programme was carried out beginning in 2004. This programme had two objectives as follows:

1. To make an initial assessment of any residues still present in significant concentrations resulting from contamination of storage sites and use areas where POPs pesticides such as DDT and Chlordane were being used before the 1980s.
2. To assess the current status of PCB contamination of transformer oils and of sites where old transformers or their oil had been disposed of.

2.3.1. Assessment of POPs use, storage sites and waste stocks in Antigua and Barbuda

Details of this study are provided in the consultant's report: *POPs Profile Report – 2*, on file at the Environment Division. A summary of the findings will be provided here.

2.3.1.1. Objectives

As explained above, the objectives of the study were to learn whether there were any remaining sources of POPs or PTCs existing in Antigua or Barbuda and, if so, to determine their location, status and contents.

2.3.1.2. Methodology

The report does not provide much detail regarding the procedures used, but it is believed that enquiries were made with knowledgeable persons who would have known about the use and presence of POPs during the period before 1980. Based on this information, a list of sites was chosen for examination. Table 2.3 shows the sites visited and examined.

At the Agricultural Stations, observations were made regarding the buildings where pesticides were stored, security, separation of chemicals from other functions, the condition of the flooring, facilities for handling spills, what chemicals were present, any unidentified chemicals and so on.

At the transformer storage sites, the chief concerns were the transformers that had known levels of PCBs in their cooling oil, storage of waste cooling oil, and handling of transformers being taken out of use.

At the waste disposal sites, information was sought regarding the kinds and volume of wastes received and disposed of, especially with regards to toxic chemicals, potential for leaching and fate of the leachate. Other sites such as the McKinnons Pond were of interest as sites where collection and deposition of pollutants that may have contained PTSs, including POPs, would have been likely to occur.

It should be noted that this was a preliminary assessment and several sites that may have been involved in use or storage of POPs chemicals were not assessed. The following establishments were not included in the visits: CBH, private companies engaged in commercial pest control,

farms, nurseries, hotels or golf courses, and crop production centres such as Diamonds and CARDI.

Table 2.3 Listing of sites visited and examined for presence of POPs

Location	Type	POPS Interest
ANTIGUA		
Dunbars	Research Station	Pesticides
Cades Bay	Agricultural Station	Pesticides
Greencastle	Agricultural Station	Pesticides
Christian Valley	Agricultural Station	Pesticides
McKinnon's Swamp	Drainage collection site	Pesticide residues, PTSs
Coolidge (old power station)	Former transformer storage site	PCBs
Friars Hill Power station	Transformer site	PCBs
Cassada Gardens	Transformer storage site	PCBs
Holberton Hospital (old sewage treatment facility)	Disused transformer storage site	PCBs
Friars Hill	WIOC waste oil biodegrading facility	Any POPs / PTSs
Crabbs	Explosives store	Any POPs / PTSs
Cooks Landfill	Municipal waste disposal site	Any POPs / PTSs
Burma	Special waste disposal site	Any POPs / PTSs
Obeez, St John's	Dry Cleaning Store	Perchloroethylene
Woods Plaza	Dry Cleaning Store	Perchloroethylene
Coolidge	Disused electronics Factory	Any POPs / PTSs
BARBUDA		
Coconut Plantation	Agricultural Station	Pesticides
Barbuda Landfill	Municipal waste disposal site	Any POPs / PTSs

2.3.1.3. Findings from site visits

Pesticides

The first main finding was confirmation that POPs had been used prior to the institution of the restriction on POPs imports. Table 2.4 below shows the POPs formerly in use and locations where they were stored or used.

No stocks of any of the POPs pesticides were found in any of the locations visited and no unidentified chemicals were reported. The only pesticide found of concern, was a small amount (50 litres) of Lindane at Cades Bay. Lindane is an organochlorine pesticide with properties similar to those of many POPs. Lindane is a moderately toxic compound and is categorized as a class II pesticide in the United States Environmental Protection Agency (EPA) toxicity ratings.

There were also some small quantities of other pesticides that are no longer allowed, such as carbofuran which was previously used as a nematicide. However, it would appear that the

current system has worked fairly well in restricting entry and use of POPs since the early 1980s.

Table 2.4 Historical information on POPs pesticides formerly used in Antigua and Barbuda

Pesticide	Use	Some important use sites
Chlordane	Dip and soil treatment for pineapple and seed beds	Green Castle
Dieldrin	Dipping and spraying sweet potatoes, cotton	Dunbars Experiment Station, Friars Hill, McKinnons, Pattersons, Picadilly, Powells, Royals
DDT	Control of malaria mosquito and cotton pest	Dunbar's Experiment Station, Friars Hill, McKinnons, Pattersons, Picadilly, Powells, Royals
Toxaphene	Wash for livestock; vegetable production	Olivers, Belmont, Matthews, Tyrells
Endrin	Cotton production	Dunbar's Experiment Station, Friars Hill, McKinnons, Pattersons, Picadilly, Powells, Royals

Some other observations give cause for concern regarding general occupational health and safety practices for pesticides. These would include the common practice of storing pesticides in the same building as offices where persons work. In fact there were reports of workers and staff complaining of insecticide smells in their offices in at least one site. This danger is increased where floors of pesticide stores are made of absorbent materials such as earth or wood. The study also reported that contingency supplies for dealing with spills of pesticides were not kept on hand.

The study did not report on the situation at the Central Board of Health (CBH) which is responsible for vector control. However, it is known that neither DDT nor any other POPs pesticides have been used by the CBH for mosquito control for over two decades. Current fogging practices rely on use of malathion in a diesel oil carrier.

Polychlorinated Biphenyls (PCBs)

This group of POPs substances was known to have been commonly present in transformer oils until around 1970 when its use was discontinued in the United States. Since then most manufacturing countries have prohibited the use of PCBs, but there are a few where it may still be in use. APUA reports that all its recent purchases have been from the US and are PCB free. The quality of the oil in the large transformers is routinely monitored by APUA. Samples are sent annually to the manufacturer's laboratory for routine analysis. Formerly, PCBs in excess of the tolerance limit were found in the older transformers, which have now been phased out. These have been replaced with transformers using oil free of PCBs. Of the current transformers in use, only two have oil that has tested positive for PCBs. These are located at the Friars Hill Power Station and have been tagged by management to allow for easy identification. On checking these transformers, one was found to be intact and in use, while the other was out of service and all the oil removed.

Questions remain regarding the actual disposal of the original oils containing PCB and any contamination around these transformer sites. There are also some concerns about the contents of older, smaller transformers used on poles in the distribution system. These are not regularly serviced and usually remain in place until they malfunction and are replaced by newer ones, which would be PCB free. The status of these is not known, but it is likely that, given the extensive damage to the distribution system during Hurricanes Luis and Georges in 1995 and 1998, many of the older transformers would have been replaced during this time. However, the fate of the oils they contained is not well documented. Many would likely have spilt most of their oil where the poles fell. If there are oil cooled transformers in private use, these have not been identified or monitored. For small transformers at various locations around the country that are removed from service, the current practice is to dispose of the oil on site.

As shown in Table 2.3, the assessment also visited transformer storage sites, both presently existing and discontinued. For the small transformers at the Cassada Gardens transmission site, the waste oil is placed initially in a concrete pit from which it is removed periodically by an environmental waste disposal agency. However, their final method of disposal was not ascertained by the study. In the case of large transformers the oil was formerly collected, taken to Crabbs, combined with heavy fuel and used to power the generators. This practice, however, can only be considered safe if the oil is devoid of PCBs. More recently, spent transformer oils as well as waste fuel oil are sent to the West Indies Oil Company where they are disposed of at a cost, using a soil biodegradation disposal technique. The oil is placed directly onto the soil at a special, protected disposal site, designed to avoid surface and ground water contamination, which can be monitored. The soil is then tilled, incorporating added organic matter, which facilitates the decomposition of the oil.

In Barbuda, waste oil from APUA generators is placed into empty drums until sufficient for a shipment has accumulated and the drums are then shipped to Antigua for disposal at the West Indies Oil disposal centre.

2.3.2. Waste Disposal and Unintentional Releases of POPs

Several POPs are of importance as pollutants that are released into the environment from several anthropogenic and natural sources. These POPs are listed in Annex C of the Convention and include the following groups or individual chemicals:

- Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/PCDFs)
- Hexachlorobenzene (HCB)
- Polychlorinated biphenyls (PCB)

These chemicals have been found to be produced during the chemical combustion of many types of organic fuel especially when it contains chlorine. Dioxins are extremely stable compounds and are toxic at very low levels in the environment.

Important sources of these toxins are the burning of municipal waste, especially in open fires where temperatures are low and there is no control of emissions. Animal carcasses, crematoria, forest and bush fires also provide significant sources of PCDDs, PCDFs, HCB and PCBs most of which are released into the atmosphere. The ash from these fires also contains residues of

these toxins. Burning of fossil fuels such as bunker oil, diesel, petroleum and natural gas in boilers and internal combustion engines produces lesser amounts of dioxins and PCBs.

In order to produce a more comprehensive assessment of POPs releases in Antigua and Barbuda, the consultant also visited the main sites for disposal of solid waste in Antigua and Barbuda to determine POPs hazards.

2.3.2.1. Cooks Waste Disposal Site

The main waste disposal site for Antigua is located at Cooks and is operated by the National Solid Waste Management Authority (NSWMA). All kinds of waste are currently disposed of at this site. Municipal waste is currently disposed of in a landfill, where waste is compacted and covered by soil to reduce odour and access to flies and vermin. As there is no national programme to support sorting of waste at source nor any sorting facilities at the site, organic materials are mixed with plastics, paper/cardboard materials as well as glass and metals.

Due to periodic shortages of soil for covering the refuse, and lack of adequate security, the disposal site is visited by roaming livestock from time to time looking for food. Also, occasionally, fires breakout at the dump site and may continue for some weeks before being brought under control. These fires are often attributed to spontaneous combustion of the gases (mostly methane) produced by anaerobic decomposition of the waste. Considerable smoke is produced from this low-temperature, oxygen-starved fires, and this has affected several nearby communities and hotels from time to time. These fires are also likely to be important sources of particulates and toxic organic pollutants including dioxins and furans.

A newly constructed, sanitary landfill, with lined basin, properly secured perimeter, weigh bridge and entrance checks for record keeping purposes has been constructed and is awaiting commissioning since 2006. There are difficulties, apparently, regarding the setting and payment of fees for commercial use of this landfill. However, when the landfill is in operation, a much more secure disposal of municipal waste can be effected, with greatly reduced dangers of leaching of contaminants and nutrients from the site to the nearby estuary and coastal waters. As long as adequate supplies of soil for covering the refuse are maintained, problems of vermin, insects and fires should be minimised and the fencing in place should reduce the danger of foraging livestock entering the site.

There is a separate site for building refuse, but considerable amounts of plant material and building refuse is brought in mixed with municipal garbage which is added to the main dump. Tyres are collected separately, but there are no facilities for chipping or grinding these objects.

Facilities for the environmentally safe disposal of toxic chemicals do not yet exist at the Cooks disposal site, or anywhere else in Antigua. Only small amounts of toxic materials can be stored separately. These are being kept until proper arrangements can be made for their incineration. At the moment there is considerable risk, that in the absence of adequate availability and awareness regarding toxic wastes, they are being disposed of in the municipal waste stream. While there is a low probability that any POPs materials are now being disposed of in this way, other PTCs, toxic metals and metal organics are being incorporated in municipal garbage. As

long as there are no proper facilities for such substances, it will be difficult to enforce any effective control on toxic waste streams.

2.3.2.2. The Burma Waste Disposal Site

An additional waste disposal site is found at Burma. This site was originally used for general waste disposal but this was stopped in the early 1990s. Presently the site is used for disposal of special wastes including asbestos, condemned foods, expired pharmaceuticals, syringes and sharps (from Holberton Hospital) and confidential papers. With the exception of the paper, all other waste is buried. Paper items are destroyed by burning. The frequency of burning is approximately four times annually, and the average mass of material burnt at each burning is approximately one ton. The site is fenced and stray animals are excluded. There are no facilities for monitoring runoff or leaching from the site. This is especially important considering its proximity to the Fitches Creek wetland area and Parham sound.

2.3.2.3. Waste Disposal in Barbuda

In Barbuda, municipal waste is disposed of at an open dump about 2-3 kilometers south east of Codrington, the main township. There is no burying, compacting or covering of this waste. The waste is subject to open burning which is allowed to continue unchecked as a means of reducing volume and incidence of vermin and flies. No special facilities exist for disposal of special wastes such as toxic chemicals. The site is not secured and livestock are able to roam freely through the garbage. No precautions are in place regarding leaching of contaminants into the water table, which in most of Barbuda is very close to the surface.

From the mix of combustible materials being burnt, there is little doubt that this site is the source of serious pollution, including POPs such as dioxins and furans.

This situation is likely to improve soon when the sanitary landfill facility, which has been constructed nearby, is commissioned. This landfill is similar to the new facility at Cooks, with proper sealing of the catchment basin to prevent leaching, containment barriers to collect runoff and a secure perimeter fence and gates to exclude livestock.

2.3.3. Estimates of Releases of Unintentionally Produced POPs

2.3.3.1. Sources of POPs releases

The burning of municipal garbage has already been alluded to as a potential source of POPs emissions. Other organic materials when burned also produce toxic substances including the highly toxic dioxins and furans and PCBs. Common types of organic materials that are regularly burnt as a means of disposal are the carcasses of diseased or injured animals which have died in the field. These include cattle, goats and sheep. Numbers or weights of animals being disposed of in this way are difficult to estimate, since no records of such disposal by farmers are routinely collected. A common practice is to surround the dead animal with a pile of used tyres and to set these alight. This usually provides sufficient fuel to burn or at least char the animal body. In the process, considerable smoke is produced as well as combustion

gasses. Typically, significant quantities of PCDDs and PCDFs are produced. The alternative way to dispose of diseased carcasses is to bury them using a backhoe (tracscavator). This eliminates the generation of POP substances.

Other organic substances such as fossil fuels will also produce POPs during normal burning in boilers, internal combustion engines, heating devices and electrical generators.

2.3.3.2. Estimating the toxic equivalents of unintentionally produced POPs

A wide range of pollutants is produced during burning of even simple fuels. The toxicity of these chemicals is also quite wide. A system of averaging these components and combining their toxicity so as to produce a standard factor for use in estimations has been devised. These are called Toxic Equivalents (TEQ).

Various PCDDs and PCDFs possess different degrees of toxicity. Toxic Equivalency Factors (TEFs) allow the concentrations of less toxic compounds to be expressed as an overall equivalent concentration of the most toxic dioxin, 2,3,7,8-TCDD. These toxicity-weighted concentrations are then summed to give a single concentration expressed as a Toxic Equivalent (TEQ). The system of TEFs used in a number of countries is that set by the World Health Organization (WHO), and the resulting overall concentrations are referred to as WHO-TEQs or I-TEQs. For atmospheric emissions, toxicity is usually expressed as microgrammes TEQ per Normal cubic metre of air (μg I-TEQ/Nm^3). Normal air is air at a standard temperature of 0^oC and 101.3 kPa pressure.

Estimates of dioxin releases were calculated for the various processes of combustion taking place in Antigua and Barbuda for estimated quantities of the various fuels and conditions.

A summary of these is provided in Table 2.5 below.

2.3.4. Monitoring for POPs contamination in the environment

The above assessment of the POPs use and storage situation in Antigua and Barbuda indicated that, except for PCB use in transformer oils, no significant known sources of POPs remain following discontinuation of POPs pesticides in the early 1980s. The fate of POPs pesticides applied during the time of their use can only be determined by sampling of the environment to see whether any residual levels of concern may still exist. In addition, not all possible sites of use or disposal may have been identified. Environmental monitoring is therefore a very important check on the actual levels existing in the environment.

It should be pointed out that no regular environmental monitoring for pesticides or other toxic chemicals is carried out in either Antigua or Barbuda. Although the CBH does carry out a programme of water testing around the coastal areas of Antigua for microbial populations indicative of faecal contamination, these tests do not include assessment of toxic chemicals. Similarly the Pesticides Control Board is not required nor provided with the resources to monitor pesticide levels in soils, water or food on a routine basis and there has never been any systematic monitoring of either island for toxic chemicals in the environment.

Table 2.5 Estimates of POPs releases from unintentional sources

A. Releases from burning of waste materials				
	Medium	**Activity Statistic (t/a)**	[4]**Default Emission (µg TEQ/t)**	**Potential Emissions Using Default Factors (mg TEQ/a)**
Barbuda	Air	15 000	3500	**52500**
	Bottom Ash	15 000	75	**1100**
Burma	Air	5	3500	**18**
	Bottom Ash	5	75	**0.38**
Animal Carcasses	Air	15	500	**7.5**
B. Potential emissions from fossil fuel based power generation and domestic cooking				
	Medium	**Activity Statistic (TJ/a)**	**[4] Default Emission (µg TEQ/TJ of fossil fuel)**	**Potential Emissions Using Default Factors (mg TEQ/a)**
Heavy fuel powered engines (APUA)	Air	2.6×10^3	2.5	**6.5**
Natural gas fired stoves	Air	4.1×10^2	1.5	**0.62**
C. Potential emissions from vehicular transportation				
	Medium	**Activity Statistic (t/a)**	**[4] Default Emission (µg TEQ/t)**	**Potential Emissions Using Default Factors (mg TEQ/a)**
4-Stroke engines	Air	48300	2.5	**120**
Diesel engines	Air	51240	0.5	**26**

Source: Slightly reworked from POPs Profile Report-2, Environment Division

2.3.4.1. Preliminary POPs Monitoring Programme – Description

For the reasons given above and the need for clear evidence regarding the POPs status in the country, a preliminary monitoring programme was carried out by the Environment Division in 2004-2005.

The report on the monitoring programme did not provide any details regarding the methodology followed for site selection, sampling methods or details of the analysis procedures. Sites sampled were only identified by a code. However, 111 soil samples from 31 sites in Antigua and Barbuda which were identified as potential sites for contamination by POPs pesticides were tested and a further 16 soil samples from 5 sites were tested for PCB contamination. In addition, 10 water samples from 7 sites were tested for polyaromatic hydrocarbon levels in Barbuda.

2.3.4.2. Preliminary POPs Monitoring Programme - Results

A summary of the results are shown below. More detailed results are contained in a report *"Monitoring Data Sets"* at the Environment Division.

POPS Pesticides

Levels found in soil – Antigua: Ninety samples were taken from 22 sites where in the past POPs pesticides had been used or stored. A summary of results obtained is provided in Table 2.6 below.

Table 2.6 Residual levels of POPs pesticides in soil - Antigua

POP	Method Detection Limit (MDL)/ μg g^{-1}	Percent of 90 samples > MDL	Percent of 22 sites > MDL	Max. detected Levels μg g^{-1}
Chlordane	0.002	8.8	27.2	0.01
Endrin	0.002	8.8	31.8	0.39
DDT	0.005	22.2	36.4	1.4
Dieldrin	0.003	2.2	4.5	0.14
Toxaphene	0.010	27.8	66.7	1674

Levels found in soil – Barbuda: Twenty-one (21) soil samples were taken from nine (9) sites where in the past POPs pesticides were reported to have been used or stored. A summary of results obtained is provided in Table 2.7 below.

Table 2.7 Residual levels of POPs pesticides in soil - Barbuda

POP	**Method Detection Limit (MDL)/ μg g^{-1}**	**Percent of 21 samples >MDL**	**Percent of 9 sites >MDL**	Max. detected Levels **μg g^{-1}**
Chlordane	0.002	100	100	0.009
Endrin	0.002	71.4	77.8	0.005
DDT	0.005	90.5	100	0.029
Dieldrin	0.003	9.5	22.2	0.004
Toxaphene	0.010	4.8	11.1	0.017

Summary of Residual Pesticide Levels Observed

Toxaphene and DDT were the two POPs found in greatest frequency at concentrations above the detection limit. In Antigua only one site returned a DDT soil concentration in excess of 1 μg g^{-1} and this was in the Belmont area. However a number of sites showed toxaphene at well above the detection level and at Paynters a level of 1674 μg g^{-1} was found. A summary is provided in Table 2.xx The Paynters sample is of considerable concern and the Belmont samples are all quite elevated. Without knowledge of the sampling procedures used it is difficult to assess the possible extent of contamination. In Barbuda DDT and Toxaphene were again at higher levels than other pesticides but were only slightly above detection limits, except for a DDT level of 0.03 μg g^{-1}.

Table 2.8. Summary of sites with residual toxaphene concentrations in excess of 1 µg g^{-1}

Site	No. of samples tested	No of samples with toxaphene concentration in excess of method detection limit	Toxaphene concentration in soil (µg g^{-1})
Belmont	8	3	260,151 and 206
Brookes	4	1	1.40
Montpellier	4	1	23.6
Olivers	3	1	4.15
OrangeValley	3	3	106, 30.5 and 24.2
Piccadilly	8	1	2.53
Paynters	4	1	1674

Polychlorinated Biphenyls

Residual PCBs in soil from sites where transformers were used or disposed of in Antigua

In Antigua, 12 samples from 3 sites were tested. One particular site revealed a concentration of 241.2µg g^{-1}. Seventy-five percent of all samples had concentrations above the method detection limit.

Table 2.9 Residual levels of PCB in soil at transformer sites - Antigua

POP	Method Detection Limit (MDL)/µg g^{-1}	Percent of 12 samples > MDL	Percent of 3 sites > MDL	Max. detected Levels µg g^{-1}
PCBs	0.001	75.0	100	241.2

In Barbuda, four samples from 2 sites were tested. One sample revealed a concentration of 0.30µg g^{-1}. Three samples had concentrations above the method detection limit of 0.001 µg g^{-1}.

Table 2.10 Residual levels of PCB in soil at transformer sites - Barbuda

POP	Method Detection Limit (MDL)/ µg g^{-1}	Percent of 4 Samples > MDL	Percent of 2 sites >MDL	Max. detected Levels µg g^{-1}
PCBs	0.001	75.0	50	0.3

Aromatic Hydrocarbons residues (PAH) in Water Samples

Ten water samples were taken in Barbuda and tested for the presence of polynuclear aromatic hydrocarbons (PAHs). A summary of the results are provided in Table 2.11. Only one sample taken from the Coco Point area was found to be above the detection limit for the analysis.

Table 2.11 Levels of PAHs in water samples from Barbuda

POPs	**Method Detection Limit (MDL)/ µg g^{-1}**	**Percent of 10 samples >MDL**	Max. detected Levels **µg g^{-1}**
PAH	0.05	10.0	0.55

Summary of Residual PCB and PAH Levels Observed

Coolidge returned values of 241.2, 35.8, 12.1 and 8.14 out of 4 sites tested while Cable and Wireless (Clare Hall) returned a value of 22.1 of three sites tested. In Barbuda, several samples tested positive for PCBs with sample BBU-24 returning the highest value of 0.3 µg g^{-1}**.** Only one sample, BCPIII, taken from the Coco Point area in Barbuda, returned a polynuclear aromatic hydrocarbon (PAH) value in excess of the detection limit.

2.3.4.3. Conclusions from the Preliminary Monitoring Programme

Pesticides: It is clear that even two decades after POPs pesticides were prohibited from use in Antigua and Barbuda, traces of their previous use are still to be found. While in most cases levels of POPs pesticides were only slightly elevated above the detection limit of the analysis, there is some concern regarding the levels of toxaphene at some sites and it is clear that additional testing should be carried out in order to determine the areas that remain contaminated and to facilitate assessment of decontamination options.

Polychlorinated Biphenyls: The results from this part of the programme must be considered rather preliminary as only three sites were sampled. Even so, some PCB contaminated soils were found to be at levels of concern and where possible remediation may be required. Again, lack of detail regarding sampling procedures makes assessment of the data difficult.

Polyaromatic Hydrocarbons: Again a very small number of samples was involved, the extent of which is not clear and no sampling was carried out in Antigua. Much more testing needs to be done.

Future Methodology: The above results provide a very useful start to a more comprehensive toxics monitoring programme that is clearly needed. Soil sampling gives a snapshot of concentrations existing in specific locations. One of the characteristics of POPs is their ability to accumulate in living tissues and to reveal the exposure of an animal or plant over a long period to these chemicals in its environment or food chain.

Future sampling should place more focus on biological sampling of tissues that may reveal accumulation of POPs over time from a much wider area than can be covered by soil sampling. Likewise, sampling of sediments in lagoons or mangrove areas that have accumulated downstream from agricultural or industrial activity can reveal sources upstream that may not be otherwise identified. Similarly coastal zone monitoring can alert authorities to on land sources that may not have been recognised.

3. The Stockholm Convention on Persistent Organic Pollutants and Antigua and Barbuda's Obligations to the Convention

This section attempts to identify the important aspects of the Convention that relate to Antigua and Barbuda's obligations and administrative arrangements in dealing with the requirements of the Convention.

As outlined in Section 1.4, the Stockholm Convention on Persistent Organic Pollutants is a global, legally binding instrument designed to reduce the risks to human health and the environment from the release of 12 organic chemicals into the environment. These 12 chemicals are considered the most serious examples of what are now commonly known as Persistent Organic Pollutants or POPs. Persistent organic pollutants are toxic organic chemicals that resist degradation and travel easily through air currents, water, and the food chain. They tend to accumulate in fatty tissues of organisms at the end of food chains (known a bioaccumulation) and pose a particular danger to children and pregnant women, especially in developing countries, which often lack the technical or financial means to monitor their presence or to dispose of them safely. Their effects are varied but usually not dramatic and often only appear some distance in space or time from the original source. They can cause cancer, malformation of embryos and disrupt the functioning of the endocrine system such that those exposed become more susceptible to disease or infection. Once released, POPs can stay around in the environment for hundreds of years – such is their resistance to chemical or bacterial breakdown.

Recognising the continuing danger posed by these substances, the United Nations Environment Programme (UNEP) began in 1966 a process of consultation to develop an international agreement on the manufacture and management of these substances. A series of international meetings was held to develop an agreement that would be broadly acceptable to UN member nations. This convention was finally adopted and opened for signature at a conference held in Stockholm in May of 2001. It was signed by 92 States and the European Union. Antigua and Barbuda was one of the initial 92 countries which signed the convention in Stockholm. It entered into force on May 17, 2004, having been ratified by 50 countries.

3.1.1. Objectives of the Convention

The objective of the Convention is briefly stated in Article 1 of the Convention. It reads:

Mindful of the precautionary approach as set forth in Principle 15 of the Rio Declaration on Environment and Development, the objective of this Convention is to protect human health and the environment from persistent organic pollutants.

It is clear from this definition that the focus of the Convention is on both human health and the environment. The precautionary approach mentioned in the statement refers to the principle that in matters of human health and environmental risk – because frequently our information, knowledge and understanding is still very limited – we should adopt a cautious approach to the

release of "foreign" or unknown substances into the environment, especially when it may be difficult or even impossible to retrieve them from the environment, should they prove to be deleterious. This is often called the "Precautionary Principle".

3.1.2. General Obligations of Parties

The Convention lays out a number of obligations which member countries will be required to abide by. These obligations will affect the way member countries will manage their POPs and the kind of reports they will be required to submit to the Convention in order to demonstrate their compliance with its requirements.

3.1.2.1. Article 3: Intentionally Produced POPs

Under Article 3 each Party will be required to prohibit and/or take legal and administrative steps to eliminate the production and use of all the intentionally produced POPs listed in Annex A. These include the organochlorine pesticides Aldrin, Chlordane, Dieldrin, Endrin, Heptachlor, Mirex, and Toxaphene. Import and export of these chemicals is also proscribed, with certain exceptions, such as for environmentally safe disposal.

DDT, which is listed in Annex B is treated differently. The Convention recognises that some member states still depend on the use of DDT, primarily for public health purposes (control of malaria) and any sudden cutting off of supplies could pose a serious health risk. Part II of Annex B states that production and use of DDT is also to be eliminated, but States may notify the Secretariat of their intention to produce or use it for the purposes of disease vector control. Each Party seeking to produce or use DDT shall restrict its use for such purpose in accordance with WHO recommendations and guidelines and when other alternatives are not safe, effective and affordable.

Each Party using DDT is required every three years to provide the Secretariat and the WHO details on the quantities and circumstances pertaining to the use of DDT and its relevance to that Party's disease management strategy.

With the objective of eventually eliminating DDT use altogether, Parties using DDT are encouraged to develop an action plan that (i) provides regulatory mechanisms to restrict DDT use to disease vector control; (ii) implements measures to provide alternatives and (iii) measures to strengthen health care and reduce disease incidence.

All parties are encouraged to promote research and development of safe, effective alternatives to the use of DDT. Every three years the Conference of Parties will evaluate, in consultation with the WHO, the need for continued use of DDT and the capacity of countries to transfer reliance on available alternatives.

3.1.2.2. Article 5: Unintentionally produced POPs

Article 5 deals with the obligations of each Party to reduce the total releases of certain POPs derived as by-products from human activity of various sorts. These POPs are listed in Annex C and include the following groups or individual chemicals:

- Polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/PCDFs)
- Hexachlorobenzene (HCB)
- Polychlorinated biphenyls (PCB)

These chemicals have been found to be produced during the chemical combustion of many types of organic fuel especially when it contains chlorine. Dioxins are extremely stable compounds and are toxic at very low levels in the environment.

The Convention requires each Party to develop an action plan, or where appropriate, a regional or sub-regional action plan, to identify, characterise and address the release of chemicals listed in Annex C.

The plan should evaluate current and projected releases, develop source inventories and release estimates. It should also evaluate the efficacy of laws and policies of the Party relating to management of such releases. The Plan is also intended to (i) promote practical measures that can expeditiously achieve a significant reduction of these releases; (ii) promote and/or require use of substitute materials or processes to prevent the formation of these chemicals and (iii) promote and implement use of best available techniques and best environmental practices for new and existing sources of chemicals as listed in Part II of Annex C.

3.1.2.3. Article 6: Releases from Stockpiles and Wastes

Article 6 of the Convention addresses the management of stockpiles containing chemicals listed in either Annexes A or B and of wastes containing or contaminated with any of the listed POPs (Annexes A,B or C). Such stockpiles or wastes are to be managed in such a way as to protect human health and the environment.

Each party shall develop strategies for identifying stockpiles and products or wastes containing or contaminated with the listed POPs. The stockpiles and wastes so identified are to be managed in a safe, efficient and environmentally sound manner. Stockpiles of chemicals which are no longer allowed to be used under the convention shall be considered as wastes.

Such wastes shall be disposed of so that the persistent organic pollutants are destroyed or irreversibly transformed so that they do not exhibit the characteristics of persistent organic pollutants or otherwise disposed of where destruction or transformation does not represent the environmentally sound option.

Disposal shall not lead to recovery or reclamation for direct reuse or alternative uses. Wastes containing or contaminated with POPs shall not be transported across international boundaries without taking into consideration international rules and standards.

Efforts shall be made to identify sites that are contaminated with chemicals listed in Annexes A, B or C.

The Conference of Parties shall work closely with appropriate bodies of the Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal to establish norms and standards for safe disposal.

3.1.2.4. Article 7: Implementation Plans

Each Party is required under Article 7 of the Convention to develop and endeavour to implement a plan for meeting its obligations under the Convention. This plan shall be communicated to the Conference of Parties within two years of the Convention coming into force. The plan shall be reviewed and updated where appropriate on a periodic basis. The Parties may cooperate directly or through global, regional or sub-regional organisations and consult their national stakeholders including women's groups and those involved with the health of children, in order to facilitate the development, implementation and updating of their implementation plans.

The Parties shall endeavour to utilize and, where necessary, establish the means to integrate national implementation plans for persistent organic pollutants in their sustainable development strategies where appropriate.

3.1.2.5. Article 9: Information exchange

Under Article 9, each Party is required to facilitate or undertake the exchange of information relevant to:

(a) The reduction or elimination of the production, use and release of persistent organic pollutants; and

(b) Alternatives to persistent organic pollutants, including information relating to their risks as well as to their economic and social costs.

In addition the Parties shall exchange such information directly or through the Secretariat.

Each Party shall designate a national focal point for the exchange of such information.

The Secretariat shall serve as a clearing-house mechanism for information on persistent organic pollutants, including information provided by Parties, intergovernmental organizations and nongovernmental organizations.

3.1.2.6. Article 10: Public information, awareness and education

Article 10 of the Convention requires each Party to undertake a programme of public awareness and information as described below:

1. Each Party shall facilitate or undertake the exchange of information relevant to:

   (a) The reduction or elimination of the production, use and release of persistent organic pollutants; and

   (b) Alternatives to persistent organic pollutants, including information relating to their risks as well as to their economic and social costs.

2. The Parties shall exchange the information referred to in paragraph 1 directly or through the Secretariat.

3. Each Party shall designate a national focal point for the exchange of such information.

4. The Secretariat shall serve as a clearing-house mechanism for information on persistent organic pollutants, including information provided by Parties, intergovernmental organizations and nongovernmental organizations.

5. For the purposes of this Convention, information on health and safety of humans and the environment shall not be regarded as confidential. Parties that exchange other information pursuant to this Convention shall protect any confidential information as mutually agreed.

3.1.2.7. Article 11: Research, Development and Monitoring

Article 11 of the Convention requires each Party to undertake a programme of monitoring and research to identify new candidate chemicals and to develop alternatives. These responsibilities are described below:

1. The Parties shall, within their capabilities, at the national and international levels, encourage and/or undertake appropriate research, development, monitoring and cooperation pertaining to persistent organic pollutants and, where relevant, to their alternatives and to candidate persistent organic pollutants, including on their:

   (a) Sources and releases into the environment;

   (b) Presence, levels and trends in humans and the environment;

   (c) Environmental transport, fate and transformation;

   (d) Effects on human health and the environment;

   (e) Socio-economic and cultural impacts;

   (f) Release reduction and/or elimination; and

(g) Harmonized methodologies for making inventories of generating sources and analytical techniques for the measurement of releases.

2. In undertaking action under paragraph 1, the Parties shall, within their capabilities:

(a) Support and further develop, as appropriate, international programmes, networks and organizations aimed at defining, conducting, assessing and financing research, data collection and monitoring, taking into account the need to minimize duplication of effort;

(b) Support national and international efforts to strengthen national scientific and technical research capabilities, particularly in developing countries and countries with economies in transition, and to promote access to, and the exchange of, data and analyses;

(c) Take into account the concerns and needs, particularly in the field of financial and technical resources, of developing countries and countries with economies in transition and cooperate in improving their capability to participate in the efforts referred to in subparagraphs (a) and (b);

(d) Undertake research work geared towards alleviating the effects of persistent organic pollutants on reproductive health;

(e) Make the results of their research, development and monitoring activities referred to in this paragraph accessible to the public on a timely and regular basis; and

(f) Encourage and/or undertake cooperation with regard to storage and maintenance of information generated from research, development and monitoring.

3.1.2.8. Article 13: Financial resources and mechanisms

Article 13 of the Convention requires each Party to provide financial support and incentives for carrying out the national implementation programme in support of the Convention's objectives.

Developed countries are expected to provide new and additional resources to enable developing country Parties and Parties with economies in transition to meet the agreed full incremental costs of implementing measures which fulfil their obligations under this Convention. This funding should be made available on a timely and sustainable basis.

The Convention provides for setting up a financial mechanism for the provision of adequate and sustainable financial resources to developing country Parties and Parties with economies in transition on a grant or concessional basis to assist in their implementation of the Convention. Article 14 provides for the Global Environmental Facility (GEF) to be the principle entity entrusted in the interim period with the operation of this financial mechanism. The first meeting of the Conference of the Parties will decide on a more permanent arrangement.

3.1.2.9. Article 15: Reporting

An important requirement for each Party is the reporting of that Party's actions and status with respect to the implementation of its national implementation plan. In this regard, Article 15 of the Convention requires that:

1. Each Party shall report to the Conference of the Parties on the measures it has taken to implement the provisions of this Convention and on the effectiveness of such measures in meeting the objectives of the Convention.
2. Each Party shall provide to the Secretariat:

   (a) Statistical data on its total quantities of production, import and export of each of the chemicals listed in Annex A and Annex B or a reasonable estimate of such data; and

   (b) To the extent practicable, a list of the States from which it has imported each such substance and the States to which it has exported each such substance.

3. Such reporting shall be at periodic intervals and in a format to be decided by the Conference of the Parties at its first meeting.

3.1.3. Administration and Management of the Convention

3.1.3.1. Article 19: Conference of Parties

Broad direction and policy for the administration and implementation of the Convention will be determined, as set out in Article 19, by the Conference of Parties. This body, consisting of representatives of all the countries that have ratified the Convention, will have its first meeting within one year of the entry into force of the Convention. It will meet thereafter at regular intervals to be decided by the Conference.

The Conference of Parties is required to keep under continuous review and evaluation, the implementation of the Convention. It shall perform the functions assigned to it by the Convention and, to this end, shall:

(a) Establish such subsidiary bodies as it considers necessary for the implementation of the Convention;

(b) Cooperate, where appropriate, with competent international organizations and intergovernmental and non-governmental bodies; and

(c) Regularly review all information made available to the Parties pursuant to Article 15, including consideration of the effectiveness of paragraph 2 (b) (iii) of Article 3;

(d) Consider and undertake any additional action that may be required for the achievement of the objectives of the Convention.

The Conference is required at its first meeting to establish a subsidiary body to be called the Persistent Organic Pollutants Review Committee. In this regard:

(a) The members of the Persistent Organic Pollutants Review Committee shall be appointed by the Conference of the Parties. Membership of the Committee shall consist of government-designated experts in chemical assessment or management. The members of the Committee shall be appointed on the basis of equitable geographical distribution;

(b) The Conference of the Parties shall decide on the terms of reference, organization and operation of the Committee; and

(c) The Committee shall make every effort to adopt its recommendations by consensus. If all efforts at consensus have been exhausted, and no consensus reached, such recommendation shall as a last resort be adopted by a two-thirds majority vote of the members present and voting.

3.1.3.2. Article 20: Secretariat

Article 20 provides for the establishment of a Secretariat, whose functions are described as follows:

(a) To make arrangements for meetings of the Conference of the Parties and its subsidiary bodies and to provide them with services as required;

(b) To facilitate assistance to the Parties, particularly developing country Parties and Parties with economies in transition, on request, in the implementation of this Convention;

(c) To ensure the necessary coordination with the secretariats of other relevant international bodies;

(d) To prepare and make available to the Parties periodic reports based on information received pursuant to Article 15 and other available information;

(e) To enter, under the overall guidance of the Conference of the Parties, into such administrative and contractual arrangements as may be required for the effective discharge of its functions; and

(f) To perform the other secretariat functions specified in this Convention and such other functions as may be determined by the Conference of the Parties.

The secretariat functions for the Convention are to be performed by the Executive Director of the United Nations Environment Programme, unless the Conference of the Parties decides, by a three-fourths majority of the Parties present and voting, to entrust the secretariat functions to one or more other international organizations.

3.1.3.3. Article 22: Adoption and amendment of annexes

Article 22 of the Convention allows Parties to opt out of additional annexes that may be added in the future to the Convention. The article lays down the procedure by which this shall be effected. These measures shall apply also to any amendments to the chemicals listed in Annexes A, B and C..

3.1.3.4. Article 25: Ratification, acceptance, approval and accession

Under Article 25, the Convention is subject to ratification, acceptance or approval by States and by regional economic integration organizations. Instruments of ratification, acceptance, approval or accession are to be deposited with the depositary.

In its instrument of ratification, acceptance, approval or accession, any Party may declare that, with respect to it, any amendment to Annex A, B or C shall enter into force only upon the deposit of its instrument of ratification, acceptance, approval or accession with respect thereto.

3.1.3.5. Administration at the National Level

Each country Party to the Convention is required to establish a National Focal Point (NFP). The NFP is intended to act as the representative agency in the country with respect to the Convention. As laid out in Article 9, which deals with Information Exchange, the national focal point is responsible for the exchange of information relating to:

> (a) The reduction or elimination of the production, use and release of persistent organic pollutants; and
>
> (b) Alternatives to persistent organic pollutants, including information relating to their risks as well as to their economic and social costs.

4. The National Implementation Plan

4. THE NATIONAL IMPLEMENTATION PLAN

Article 7 requires that parties prepare a National Implementation Plan to show how they plan to implement the various articles of the convention. This provision of the convention recognized each country is unique in their capability to respond to the convention as well as to the national circumstances. There are countries that range from those that still manufacture and use POPs to those that have banned the use of POPs altogether.

This national implementation plan for the Stockholm Convention contains action plans and strategies for the implementation of the conventions obligations in Antigua and Barbuda. The NIP was developed with extensive national consultation with government agencies and and NGO community. The program outlined in the NIP takes into consideration that although Antigua and Barbuda has already banned the importation of POPs into the country, there are areas where POPs have lingered in the environment. It also recognized that Antigua and Barbuda imports most of its food and consumer items and this provides an opportunity for the POPs to enter the country.

The NIP is designed for a five year period and will come up for reviewed in 2013. The activities are summarized in Annex ? with detailed information provided below. Each of the activities identified has a cost associated with it. The strategy has recognized that it is unlikely that Antigua and Barbuda can in fact implement this program alone and will require a regional and International effort to provide technical and even financial assistance.

4.1 General Considerations

4.1.1. Institutional Framework

The Implementation of the Action plan will require that the current institutional framework to be reviewed. There are current limitations and gaps (identified earlier) including the involvement of the international community as well as local farmers and other private sector. The need for wide-ranging commitment to and participation in Convention implementation has been acknowledged during the process of plan development. One of the ways forward was that it is important that Antigua and Barbuda's NIP takes a comprehensive approach to the management of not only POPs but all chemicals. The NIP takes into consideration the implementation of the all chemicals related convention that Antigua and Barbuda is a party and het design of the Institutional and legal framework will reflect this approach.

In addition to being Party to the Stockholm Convention, Antigua and Barbuda is Party to the Basel and Vienna Conventions, and signatory and soon to be Party to the Rotterdam Convention. These MEAs collectively cover a range of objectives and activities related to the chemicals safety and the environmentally sound management of chemicals and hazardous materials. In an effort to efficiently implement the Country's commitment to these convention, and taking into consideration that as a SIDS Antigua and Barbuda must approach chemicals management keeping in mind limited financial and technical resources this NIP

has been drafted as a national Chemicals implementation policy that can be used by all these convention. This approach to chemical management has been endorsed and promoted by the UNEP Governing Council as well as well as the SAICM process.

Institutional Framework

One of the main weaknesses of the current institutional framework for POPS and chemicals Management in Antigua and Barbuda is that in the case of pesticide related POPs and chemicals the Government is one of the largest users and importers of these chemicals. The institutional framework will therefore utilize the concept of the Public Right to Know. This concept of access to information and right to know the status of the environmental conditions is one tool that can be used to promote transparency and accountability in the management of POPs and toxic Chemicals by the Government.

The Government will therefore entrust the role of POPs and Chemicals management to the Pesticide Control Board. The Monitoring of POPs and toxic chemicals in the environment as well as providing public access to information should be managed by the Environment Division. NGOs should also be given the opportunity to improve their capacity to access information on the regulation and the use of chemicals in Antigua and Barbuda.

The Ministry of Foreign Affairs will need to coordinate the national and regional responses to the conventions in the area of negotiations, project development and donor funding. The Ministry will continue to use the National Coordinating Mechanism to communicate updates in negotiations and project development

These changes in the current institutional arrangements will be supported by the review of the EMB and the Pesticide and Toxic Chemical Bill (PTCB). Within the PTCB there is a need to have the following representatives on the Board:

- Environment Division
- Department of Agriculture
- Government Analytical Services
- Ministry of Health
- Labour Department
- Customs and Excise Department
- Representative of the Workers Union
- Representative of from the Ministry of Education;
- Representative from the private sector

The role of the Board as outlined in the draft Bill is to oversee the implementation of the provisions of the Act when it is passed and the related regulations. The

4.1.2. Regulatory and Policy Framework

Antigua and Barbuda is on the brink of overcoming one of its major constraints for the management of chemicals, this is the fragmentation of legislation and the existence of major gaps in chemicals management. There is no one piece of legislation that controls the import,

export, production, sale, transport, storage, use and disposal of toxic chemicals as well as pesticides. As indicated earlier this legislation is still in the stage of a Bill and is expected to be review and submitted to the Parliament within the next two years.

As mentioned earlier there are however some gaps in the new Bill and these will be address prior to taking the Bill to the Parliament. While these are being refined, the Cabinet has taken some interim measures to ensure that the Pesticide Board can continue to implement some of the provisions of the draft Bill using administrative measures.

The legislative priorities during this period will focus on general chemicals management and the improvement of the infrastructure and institutions to address this in general. The priorities are:

- Review of the Pesticide and Toxic Chemicals Bill to reflect the commitments of the various chemical conventions;
- Review and lobby for the passage of the Environmental Management Bill;
- Passage of the PTCB within the next two years;

Provide new legislation for the regulation and promotion of improved management of hazardous materials.

Key elements of this activity are consultation and public awareness. The effectiveness of the legislation is dependent on the raising of awareness among stakeholders about the regulatory requirements and ensuring that the necessary supporting infrastructure and capacity is in place to implement and enforce the regulatory provisions.

4.1.3. Technical and Financial Assistance

Antigua and Barbuda has demonstrated its commitment to and have sought to implement its obligations to the Stockholm Convention. The country has provided financial resources for the implementation of projects and the development of programs for the country. With the eventually passage of the legislation the country will allocated funds from the national budget to ensure maximum compliance. These efforts however will not be enough since the actions outlined in the NIP will require technical and even financial assistance from the international community.

Areas of limited financial and technical capacity include the management and disposal of POPs stockpiles and wastes, the promotion of BAT and BEP, and training and capacity building for persons and agencies involved in the management and regulation of POPs. In Articles 12 and 13, the Stockholm Convention recognizes the particular needs of developing countries and countries with economies in transition in relation to availability of and access to technical and financial resources. Article 12 recognizes that rendering timely and appropriate technical assistance in response to requests from developing countries and countries with economies in transition is essential to the Convention's success and obliges Parties to cooperate to provide such assistance and to promote the transfer of technology to help those countries build the capacity necessary to implement the Stockholm Convention. Article 13 requires each Party to provide, within its capabilities, financial support for national

activities and strategies intended to achieve the objective of the Convention. It also obliges developed country Parties to provide new and additional financial sources to enable developing country Parties and Parties with economies in transition to meet the agreed full incremental costs of implementing the Stockholm Convention, and makes provisions for the establishment of a financial mechanism to achieve this end. The GEF is the interim financial mechanism for the Convention. Parties may also provide, and developing countries avail themselves of, financial resources to assist in Convention implementation through other sources and channels, be they bilateral, regional or multilateral.

In this regard, Antigua and Barbuda will be strengthening the GEF unit within the Ministry of Foreign Affairs with the aim of increasing access to funds from not only the GEF but other funding agencies. It is expected that Antigua and Barbuda will be participating in regional GEF and bilateral projects and the building of capacity in the GEF Unit will assist with not only access to funds but the management and implementation of projects.

Some of the priority areas identified for international funding are:

- Capacity building of the analytical services. This included the purchase of equipment for the Lab that wills serve to conduct testing of local produced and imported items. It will also provide for the routine testing of previous agricultural sites prior to conversion to housing or any other activity.
- Training of staff to post graduate levels;
- To assist the ministry of education to include the issues of pops and toxic chemicals at the A-level institutions;
- The provision of training to and certification of pest control and chemicals handlers;

The extent to which the developing country Parties will effectively implement their commitments under this Convention will depend on the effective implementation by developed country Parties of their commitments under this Convention relating to financial resources, technical assistance and technology transfer.

4.2 Priorities and Actions

Chapter 2 of this document describes the national POPs situation as it relates to POPs pesticides, PCBs, and dioxins and furans. The national POPs management priorities in respect of these groups of chemicals are summarized below:

- To dispose of existing POPs pesticide waste;
- To raise awareness of POPs pesticides and the need for their safe
- management and disposal;
- To take appropriate steps to respond to the addition of new chemicals to the
- list of POPs in the Convention;
- To maintain and update national inventories of POPs pesticides;
- To establish administrative procedures by which the importation of PCBs can
- be controlled/regulated;
- To conclusively ascertain the presence of PCBs in equipment that has been

- identified as potentially PCB-containing;
- For PCB-containing equipment no longer in use, to undertake its disposal in
- an environmentally sound manner;
- For PCB-containing equipment still in use, to commence development of
- plans for phase-out and disposal;
- To maintain and update national inventories of PCBs;
- To promote the use of BAT and BEP to reduce emissions of dioxins and
- furans from waste incinerators;
- To require the use of BAT and BEP at new facilities likely to generate dioxins and furans;
- To improve the quality of data on emissions of dioxins and furans;
- To maintain and update national inventories of dioxins and furans.

The actions identified in the NIP were formulated based on extensive national consultations as well as the assessment of relevant priority tasks listed in the Stockholm Convention Impact Appraisal that are within the means of the Country to implement. The Appraisal identified 15 priority tasks necessary to meet the obligation of the convention and the key articles that are of most importance and relevance to Antigua and Barbuda. These are:

- *Article 3*: Measures to Reduce or Eliminate Releases from Intentional Production and Use;
- *Article 5*: Measures to reduce or eliminate releases from unintentional
- production
- *Article 6*: Measures to Reduce or Eliminate Releases from Stockpiles and
- Wastes
- *Article 7*: Implementation Plans
- *Article 10:* Public Information, Awareness and Education
- *Article 15*: Reporting

The estimated total capital and recurrent expenditure are $450,000.00USD and $200,000.00USD respectively.

4.2.1. Measures to Reduce or Eliminate Releases from Intentional Production and Use (Article 3)

Article 3 of the Stockholm Convention requires Parties to take legal and administrative measures to regulate, with the goal of eliminating, the production, use, import and export of the chemicals listed in Annexes A and B of the Convention. In addition to exercising regulatory control over import, export, production and use, Parties with regulatory and assessment schemes for new or existing pesticides or industrial chemicals are required to include in these schemes consideration of a number of screening criteria listed in Annex D of the Convention.

Keeping the above in mind the national priorities established in relation to achieving compliance with Article 3 of the Stockholm Convention are to:

- Take legal measures to prohibit the production, use, import and export of POPs pesticides, with the exception of export for environmentally sound disposal; and
- Take administrative measures to prohibit the import and export of PCBs and PCB-containing equipment.

4.2.1.1. Take legal measures to prohibit the production, use, import and export of POPs pesticides, with the exception of export for environmentally sound disposal

Currently there are no been issued for the import, use or sale of any of the nine POPs pesticides, this does not mean however that their importation has been banned. The new draft Pesticide and Toxic Chemical Bill has included these chemicals on the list of banned substances. The draft Bill does not however recognize the Convention and the possibility of new chemicals being added.

In order to meet these goals, the necessary interventions are required:

1. Submission of a recommendation to the Chair of the Pesticides Control Board as well as the Ministry of Legal Affairs that, based on the associated human and health hazards, all chemicals currently of the Annex A or B of the Convention.
2. Request that the national Focal Point for the POPs Convention become a member of the Pesticide Control Board (in some capacity).
3. For each new POPs pesticide added to Annexes A or B, submission to the Chair of the Pesticides Control Board copies of the proposal, risk profile and risk management profile prepared in respect of that chemical, along with a copy of the decision of the Conference of Parties to include it in the Convention, and a recommendation that the chemical should be formally banned, if such action has not already been taken.
4. Circulation to members of the Board of relevant information documents about POPs pesticides, followed by action by the Pesticides Control Board to ban/severely restrict the chemical(s) in question.
5. Issuance of public notices that the chemical/pesticides in question have been banned/severely restricted.

There is no cost associated with the implementation of these measures.

4.2.1.2. Take administrative measures to prohibit the import and export of PCBs and PCB-containing equipment

There is no overall national policy that addresses the issue of Chemicals management. There is a need for the development of such a policy. This may be a little late however since there has since been the development of a Pesticide and Toxic chemical Bill drafted. It was made clear from the review of the draft that although there can be some improvement, the Bill provides a good basis for the development of a policy. However, there is currently no

regulatory scheme in place in Antigua and Barbuda to control the production, import, export and use of industrial chemicals such as PCBs.

Necessary interventions are outlined below.

- Preparation of a submission to the Prices and Consumer Affairs Department as well as the proposing that PCBs should be put on license and presenting the reasons why import and export of these substances should be prohibited, with specific reference to the associated human and
- Environmental health considerations and the requirements of the Stockholm Convention.

- Preparation and submission of a Paper to Cabinet for a decision on whether or not PCBs should be added to the list of commodities on license.

- Requirement, for all PCBs exported for disposal, that notification in writing be submitted regarding the exportation, transportation and environmentally sound disposal of the wastes, as required by the Basel Convention.

Cost Associated are capital and recurrent respectively: $50,000.00USD; $5,000.00USD

4.2.2. Measures to reduce or eliminate releases from unintentional production (Article 5)

Under Article 5 Parties are required to undertake measures to reduce releases from anthropogenic sources of the chemicals listed in Annex C of the Convention, with the goal of continuing minimization and, where possible, elimination. These are the POPs produced unintentionally, most frequently as the result of some type of combustion process and include the polychlorinated dibenzo-p-dioxins and dibenzofurans (PCDDs/PCDFs), hexachlorobenzene (HCB) and polychlorinated biphenyls (PCBs).

To assist with the implementation of Article 5, draft *Guidelines on best available techniques and provisional guidance on best environmental practices relevant to Article 5 and Annex C of the Stockholm Convention on Persistent Organic Pollutants* have been prepared by an Expert Group on Best Available Techniques and Best Environmental Practices, appointed by the Stockholm Convention Secretariat. These guidelines were adopted by Antigua and Barbuda and used to assess the quantities of unintentional POPs.

The release of POPs from the burning of municipal waste was identified by the POPs inventory as the most significant likely source of these highly toxic chemicals in Antigua and Barbuda. Unfortunately, but perhaps not surprisingly, the awareness of these pollutants is quite low since they are not handled, seen or smelled. The extreme toxicity of some of these POPs means that concentrations so low as to be very difficult to detect can be toxic or lead to accumulation in tissues to become toxic in the future. As they are produced in normal

everyday activities, this also makes their recognition problematic. Changing these everyday activities to reduce these emissions will require much public understanding and support.

Government policy for the prevention of the release of these chemicals should focus on the raising of awareness about the nature and effects of these chemicals, and it also needs to support development of practical alternative practices that result in reduced production of these harmful POPs.

Waste management, and in particular the burning of municipal and household wastes, are key target areas for reduction of these emissions. Estimates of POPs emissions from the municipal dump in Barbuda far outweighed the emissions from all other sources estimated. These emissions can be drastically reduced by the commissioning of the sanitary landfill. However, in the longer term, policies for waste management directed at recycling items that can eventually produce dioxins and furans. The NSWMA has made some effort in this direction, but stronger government support is needed if changes are to take place.

The recycling initiative mounted by the Rotary Club Sundown to begin recycling some kinds of plastic and metals is an important development because it is demonstrating the possible role of the private sector in waste reduction. However, the necessary support for this initiative has not yet reached the level needed to make the venture viable, the issue being the provision of financial support from the revenue derived from the environmental tax on beverage bottles and cans.

Based on the outcome to this exercise the national priorities for achieving compliance with Article 5 of the Stockholm Convention are to:

1. Promote the use of BAT and BEP for the national dump;
2. Require the use of BAT and BEP for existing and new facilities that can potentially be a source of POPs;
3. Maintain source inventories and release estimates; and
4. Review the effectiveness of the measures taken to reduce releases of these POPs.

4.2.2.2. Require the use of BAT and BEP for new source facilities

The Stockholm Convention requires each Party to phase in, within 4 years of the entry into force of the Convention for that Party, requirements for BAT to be used for new sources. The primary avenue for the control of environmental impacts of new developments is the Development Control Authority (DCA) which is the Country's physical Planning Department. Certain projects submitted to the Department, are required by law to be subjected to an EIA. Incinerators are one such facility listed within the Schedule 3 of the Act as requiring an EIA. Consequently, it is proposed that provisions be made to require the use of BAT and BEP should be incorporated into the existing development approval framework by means of the following interventions:

- Liaison with the DCA regarding the inclusion of BAT and BEP considerations in the approval process for new developments in the above and other relevant source categories.

- Incorporation of BAT and BEP considerations in the Terms of Reference for EIAs for new developments in the relevant source categories.

- Submission of a proposal for the formal inclusion, via the National Physical Development Plan at its next update, of BAT and BEP considerations as a standard part of the EIA process for proposed new facilities in the relevant source categories.

There is no cost associated with the implementation of these measures.

4.2.2.3. Develop and maintain source inventories and release estimates

To meet the requirements of Article 5, Antigua and Barbuda is required to identify and characterize releases of uPOPs and, correspondingly, to develop and maintain source inventories and release estimates. Such inventories would inform the development of national priorities and strategies to address these releases, and would allow assessment of the success of the strategies.

The national inventory of dioxins and furans carried out for the year 2004 was the first of its kind, and the action plan to reduce releases of dioxins and furans was formulated based on the results of that inventory. The process of preparing the inventory was helpful in not only identifying information gaps but also significant institutional and legislative hurdles. These challenges had a significant impact on the accuracy of the final release estimates.

There is a need to institutionalize the preparation of an inventory as well as to ensure that the quality of data is assured. Further the information must be made available to the public and as well as Government department. To this end the following interventions have been identified:

- Identify, in conjunction with stakeholders particularly the National Solid Waste Management Authority, measures to address data gaps;

- Development of a monitoring program for the dioxins and furans. This program will include relevant agencies, budget and period of inventory;
- Establishment of a air quality monitoring Unit within the Environment Division;

There are very limited resources in the area of air quality monitoring and this will require considerable resources. These are estimated at capital and recurrent respectively: 150,000.00USD and 50,000.00USD

4.2.2.4. Review of the effectiveness of the measures taken to reduce releases of uPOPs

Article 5 specifically requires that strategies to reduce uPOPs releases should be reviewed, and their success evaluated, every five years. The results of such reviews are to be included in reports submitted in fulfillment of the requirements in Article 15 of the Convention. The specific reporting requirement for this Article is;

- Review of the measures for reducing uPOPs releases. The first such review is scheduled to take place in the year 2012, as part of the overall review and updating of this NIP and subsequent reviews will take place every four years, following the updating of the inventories.

- Reporting to the Conference of Parties on the reviews and the success of measures taken to reduce releases of POPs. This activity will be incorporated into the overall process of preparing and submitting national POPs reports, as described in Section 4.2.6.1.

The recurrent costs associated to this activity is 2000.00USD

4.2.3. Measures to Reduce or Eliminate Releases from Stockpiles and Wastes (Article 6)

Article 6 of the Stockholm Convention is concerned with the sound management of POPs stockpiles and POPs wastes. A stockpile may be defined as a stock of POPs chemicals or equipment or materials containing or contaminated with POPs for which there are still permitted uses in a country according to the register of specific exemptions and the list of acceptable purposes in Annexes A and B of the Convention. If the stock in question no longer has a permissible use under the terms of Annex A or B, it is considered to be a waste.

Parties are required to develop and implement strategies to identify (i) stockpiles consisting of or containing Annex A or B chemicals and (ii)_wastes consisting of, containing or contaminated by chemicals listed in Annex A, B,or C. Stockpiles, when identified, should be managed in a safe, efficient and environmentally sound manner. Wastes should be handled, collected, transported and disposed of in an environmentally sound manner. No recovery, recycling reclamation or reuse of POPs waste is permitted. Wastes should not be transported across international boundaries without taking into account relevant international rules, standards and guidelines, such as those of the Basel Convention.

The inventory process for Antigua and Barbuda found some obsolete pesticides but these were in small quantities. The PCBs identified are being handled by the APUA in conjuction with the US manufacturer of the product.

The following priorities have been identified as being important for achieving compliance with Article 6 of the Stockholm Convention.

Obsolete Pesticides

- To ensure that they are all collected, labeled and stored in one place until appropriate measures can be taken to have them destroyed;

- To identify potential options for the destruction of the chemicals and to initiate steps to have this exercise completed;

4.2.3.1. To take measures so that wastes are disposed of in an environmentally sound manner

Inventories of Annex A and B chemicals were carried out in 2004 and small amounts of wastes potentially containing, or contaminated by, POPs were identified. In several cases, poor management and storage of these wastes presents environmental and human health hazards. One of the priorities identified by stakeholders during the Convention impact appraisal was that these wastes should be disposed of safely at the earliest possible opportunity. However, Antigua and Barbuda has neither the infrastructure nor the capacity to dispose of POPs waste, or other hazardous waste, in an environmentally sound manner. As a result, hazardous waste is shipped overseas for disposal using the services of a waste disposal contractor.

To do this however the Country will take into consideration the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal requires Parties to the Basel Convention to ensure that hazardous waste, or other waste, that are exported are packaged, labeled and transported appropriately, and that they are managed and disposed of in an environmentally sound manner in the country of import. Notification procedures outlined in the Basel Convention must be followed, and hazardous wastes are not to be exported to non-Party states. In addition, efforts should be made to adhere to guidance presented in the various technical documents issued by the Basel Convention Secretariat.

The following interventions are necessary to achieve the goal set for this priority.

- Screening of potentially PCB-containing equipment to determine the presence and concentration of PCBs.
- Analysis of pesticides waste identified during the national pesticides inventory to confirm its preliminary identification as endrin.
- Environmentally sound disposal of POPs pesticides waste.
- confirm all PCB-containing equipment.

The cost of these activities is estimated at $250,000. It will be necessary to obtain technical and financial assistance to carry out these interventions.

4.2.3.2. To identify stockpiles, products and articles in use and waste consisting of, containing or contaminated by POPs chemicals

As previously noted, inventories of POPs pesticides and PCBs were carried out in 2004. Although these inventories provided a good initial basis for POPs management planning decisions, there were still some constrains to access to data. It will there fore need to have a general look at some of the sites where access was limited e.g. private farms. In the case of

POPs like substances there was very limited information collected on these. There is therefore a need for a new targeted (as oppose to an inventory) data collection exercise.

In order to address this priority, the following interventions are required.

1. Updating of inventories every five years. The next inventory of POPs pesticides and industrial chemicals should take place in 2012.
2. Including pesticides storage and stock management provisions within the draft for the Pesticides and toxic Chemical Bill.
3. Training for agricultural workers, pest control operators as well as hotel grounds keepers in good pesticides stock management, including safe storage, record-keeping and stock taking, and the use of adequate personal safety measures. Technical assistance to support this action may be solicited from the FAO and the Inter-American Institute for Cooperation on Agriculture.

4. Encouragement, via public awareness campaigns, of voluntary reporting of POPs products, stockpiles and wastes.

The cost of these activities is estimated at $75,000USD.

4.2.3.3. To ensure that stockpiles and products and articles in use are managed in an environmentally sound manner

Part II of Annex A of the Stockholm Convention requires Parties to promote measures to reduce exposure and risk associated with the use of PCBs, including ensuring that equipment is intact and not leaking, that measures are taken to protect against electrical failures that could result in fire, and that regular inspections are carried out.

In this regard the following interventions are necessary.

- Request that the APUA development and maintain guidelines for the management of PCB containing equipment, including equipment that has been removed from use, taking into account current international guidance and best practice standards.
- Formulation and implementation of a routine equipment inspection program.
- Encouragement of voluntary reporting regarding PCB management activities, including maintenance, filling/retro-filling, and removal from service.

The cost of these activities is estimated at approximately $35,000.

4.2.4. Implementation Plans (Article 7)

Article 7 of the Stockholm Convention requires each Party to develop and endeavour to implement a plan for the implementation of its obligations under the Convention, and to review and update that plan as appropriate.

Stakeholder consultation is considered an essential component of the development, implementation and updating of such plans, and Parties are encouraged to integrate NIPs for persistent organic pollutants into their sustainable development strategies as appropriate.

At the first meeting of the Conference of Parties, Decision SC-1/12 on national implementation plans was adopted. The annex to this decision provides initial guidance on the review and updating of NIPs. It outlines a number of factors, both internal and external, that could trigger a review and updating of a Party's NIP, including:

- Amendments to the Convention or its annexes;
- Adoption of guidance/guidelines on implementation of the Convention's requirements;
- Changes in national priorities and/or circumstances; and
- Updating of POPs inventories and subsequent indications of a change in the scope of the national POPs problem such as the addition of new chemicals to the list of POPs.

In the case of a change in obligations due to the amendment of the Convention or its annexes, Parties are required to review and update the NIP and transmit the updated Plan to the Conference of Parties within two years of entry into force of the amendment. Otherwise, the scheduling and manner of review and update has been left to each Party's discretion, with the requirement that the Party should notify other Parties via the clearing-house mechanism, of its intent to review and update the Plan.

This NIP covers the period 2008 to 2012 fulfills the initial obligation to develop, in consultation with stakeholders, a plan for the implementation of the Convention. Having therefore satisfied the requirement to develop a national plan, and to integrate related provisions in the national Environment Management Strategy, the primary priorities for Article 7 relate to the review and updating of the plan, as follows.

- To review and update the NIP in the year 2012; and
- To review and update the NIP in response to changes in Antigua and Barbuda' obligations under the Stockholm Convention as a result of amendments to the Convention or its Annexes.

The estimated cost of this activity, including printing and distribution of the revised NIP, is $45,000.

4.2.5. Public Information, Awareness and Education (Article 10)

The Stockholm Convention requires in Article 10 the promotion and facilitation of awareness, information dissemination, and training among various groups, including workers, scientists, educators, technical and managerial personnel, women, youth and the public. As mentioned earlier this NIP addresses more than just POPs but toxic chemicals as well. This broadening of the NIP is particularly true for this section of the action plan.

Parties are also requested to encourage stakeholders, such as industry and professional users, to promote and facilitate the provision of information on POPs.

During the development of the NIP there was a general view that there were limited knowledge of the convention and the impact of POPs. Based on this it was recommended that awareness programs should be developed to target specific audiences, including:

- Customs officers;
- Agricultural workers, small farmers, and household users of pesticides;
- Owners, managers and operators of facilities identified as releasing dioxins and furans; and
- Owners, operators, engineers and maintenance technicians working with PCB equipment.
- Workers unions;

It was also recommended that other governmental and non-governmental organizations, for example the Ministry of Agriculture, Lands, Marine Resources and Agro Industries and the Labour Department, should be closely involved in the delivery of such awareness programs.

The issues related to POPs should also be integrated to the formal school system and there is a need for the provision of culture specific text to assist in this activity.

- Development and implementation of educational and public awareness programs on persistent organic pesticides, their health and environmental impacts and their alternatives; and
- Development and implementation of training and certification programs for technical officer officers as well as the private sector personnel.

4.2.5.1. Development and implementation of training and certification program

Since POPs have not been allowed to enter into Antigua and Barbuda for over 25 years the issue of POPs was not high on the agenda for the population. After the inventory however it is clear that POPs is an issue that needs to be considered be all in decision making at the country and household levels. Observations during the development of the NIP are that many workers at the highest risk of exposure to Chemicals do not take the necessary precautions to protect themselves. At the level of the households many citizens are not aware of the health impacts of household chemicals. Simple issues such as ingestion of household chemicals by children are still not being addressed.

There is a clear need to educate the public about the hazards associated with POPs pesticides, and with the inappropriate use of pesticides in general. Necessary interventions include the following:

- Integration of POPs information into the formal education system;

- Development and delivery of a sustained public awareness on POPs and other toxic chemicals. This campaign will be extended to include all pesticides whose use in Antigua and Barbuda is banned or severely restricted.

The cost of these measures is estimated at approximately $50,000.

4.2.6. Reporting (Article 15)

Under Article 15 of the Convention each Party is required to report to the Conference of Parties on measures taken to implement the Convention's provisions, and on the effectiveness of such measures. Parties are specifically obliged to submit to the Secretariat

1. statistical data on total production, import and export of the chemicals listed in Annexes A and B of the Convention, or reasonable estimates of such data;

2. a list of States from which such substances have been imported and to which they have been exported.

The Environment Division is responsible for the preparation of the necessary reports to the Conference of Parties. The report will actually be prepared by the Pesticide Control Board for submission to the Secretariat. The priority that has been set in relation to these two articles of the Convention is regular reporting on activities and measures undertaken to achieve compliance with the Convention.

The estimated cost of this exercise is a recurrent expenditure of $1000.00USD

5. REFERENCES

- Basel Convention on the Control of Transboundary Movement of Hazardous Wastes and their Disposal, Text and Annexes.
- Expert Group on Best Available Techniques and Best Environmental Practices, 2004.
- *Guidelines on best available techniques and provisional guidance on best environmental*
- *practices relevant to Article 5 and Annex C of the Stockholm Convention on Persistent*
- *Organic Pollutants (DRAFT).*
- Rae, I. D., 2001. *Framework for the Management of PCBs*. Intergovernmental Forum on Chemical Safety.
- Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade, Text and Annexes.
- Stockholm Convention on Persistent Organic Pollutants, Text and Annexes.

- United Nations Environment Programme, 2002. *Ridding the World of POPs: a Guide to theStockholm Convention on Persistent Organic Pollutants*.
- UNEP Chemicals, 2003. *Standardized Toolkit for Identification and Quantification of Dioxinand Furan Releases*. Inter-Organization Programme for the Sound Management of Chemicals.
- UNEP Chemicals, 2004. *Interim guidance for developing a National Implementation Plan for the Stockholm Convention*.
- United Nations Institute for Training and Research, 1997. *Designing the Key Features of a National PRTR System*. Inter-Organization Programme for the Sound Management of Chemicals.
- United Nations Institute for Training and Research, 1997. *Implementing a National PRTR Design Projec : A Guidance Document*. Inter-Organization Programme for the Sound Management of Chemicals.
- United Nations Institute for Training and Research, 1997. *Preparing a National PRTR Infrastructure Assessment*. Inter-Organization Programme for the Sound Management of Chemicals.
- United Nations Institute for Training and Research, 1997. *Structuring a National PRTR Proposal*. Inter-Organization Programme for the Sound Management of Chemicals.
- United Nations Institute for Training and Research, 2005. *Pollutant Release and TransferRegister (PRTR) – What is a PRTR?* [online]

ANNEX I.

List of Multilateral Environmental Instruments and Environmental Conventions

Table A

No.	***Instrument & Title***	***Place & Date of Signature***	***Ratification / Accession***
1	Basel Convention on the Transboundary Movement of Hazardous Wastes and its Disposal and its protocols.	March 22nd 1989 Basel	April 5th 1993 Accession
2	United Nations Framework Convention on Climate Change and its protocols.	March 21st 1994 (entry into force)	February 2nd 1993
3	Kyoto Protocol to the UN Framework Convention on Climate Change	December 11th 1997 Kyoto	October 28th 1998
4	UN Convention to Combat Desertification In Those Countries Experiencing Serious Droughts and/or Desertification Particularly Africa and its protocols.	October 14th 1994 Paris	June 6th 1997
5	UN Convention on Biological Diversity and its protocols.	June 5th 1992 Rio de Janeiro	March 9th 1993
6	Cartagena Protocol on Biosafety to the Convention on Biological Diversity	January 29th 2000 Montreal	May 24th 2000
7	Protocol Concerning Pollution From Land Based Sources And Activities in the Wider Caribbean Region (Protocol to the Catagena Convention)	October 6th 1999 Aruba	
8	Protocol Concerning Specially Protected Areas and Wildlife	January 18th 1990 Jamaica	January 18th 1990

	(SPAW Protocol to the Catagena Convention)		
9	Convention on International Trade in Endangered Species (CITES) and its protocols.		October 6th 1997
10	Vienna Convention for Protection of the Ozone Layer and its protocols.	December 3rd 1992	December 3rd 1992
11	Montreal Protocol on Substances that Deplete the Ozone Layer and its protocols.	September 16th 1987 Montreal	March 12th 1992
12	Amendment to the Montreal Protocol on Substances That Deplete the Ozone Layer	29th June 1990 London	February 23rd 1993
14	Amendment to the Montreal Protocol On Substances That Deplete the Ozone Layer	December 25th 1992 Copenhagen	July 19th 1993
15	Amendment to the Montreal Protocol on Substances That Deplete the Ozone Layer adopted by the 9th meeting of the Parties	September 17th 1997 Montreal	February 10th 2000
16	The Stockholm Convention on Persistent Organic Pollutants		February 2004

Table B

Instrument & Title	***Place & Date of Signature***	***Ratification /Accession***
Basel Convention on the Transboundary Movement of Hazardous Wastes and its Disposal and its protocols.	March 22nd 1989 Basel	April 5th 1993
The Stockholm Convention on Persistent Organic Pollutants and its protocols.	23rd May 2001 Stockholm, Sweden	February 2004
The Rotterdam Convention on the trade of hazardous substances and its protocols.		

ANNEX II. PROJECT CONCEPTS

Project 1: Follow-up Residual POPS Monitoring Programme for Antigua and Barbuda

Introduction/Justification

The project will carry out additional surveys and sampling for residual POPs and other PTCs based on the results of the preliminary survey carried out in 2004 as part of the POPs-NIP enabling activities. The preliminary POPs profile confirmed that, in general there were unlikely to be major stocks of POPs still in existence, but did confirm that a few sites had residual levels of Toxaphene and PCBs well above ambient. Traces of DDT were found in some cases also. In addition there were several potential sites that were not surveyed or sampled. Only a few samples of ground water or surface stored water were taken and there was no sampling of any sediments or drainage waters from sensitive sites. Thirdly, disposal of oils from transformers that may have been PCB contaminated and disposal of solvents containing PERC were not properly accounted for.

It is suggested that additional sampling and analysis in selected areas and sites would provide a more comprehensive view of the residual POPs and PTCs situation which could provide a sound basis for toxic chemicals management and assess the need for any site reclamation. It is important that the methodology used for sampling and analysis be described and that sites should be clearly described preferably by GPS coordinates, so that any re-sampling can be done easily.

It is also felt that a greater effort is needed to upgrade the national laboratory facilities to a point where the simpler analyses can be carried out locally with some external quality control. This will facilitate continued monitoring of toxic substances in the environment.

Objectives

1. Obtain a more comprehensive report on the residue levels of POPs and PTCs in the Antigua and Barbuda environment.
2. Ascertain any significant sources of POPs/PTCs leaching into groundwater or drainage systems.
3. Identify any areas that may need reclamation or removal of contaminants.
4. Upgrade laboratory facilities so significant portion of samples can be analysed in Antigua.

Outcomes

1. Public awareness of POPs and PTCs improved.
2. Confidence in the safety of food, air and water as far as PTCs is concerned.
3. Better understanding of POPs behaviour in Antigua and Barbuda's environment obtained.
4. Better recommendations for management and disposal developed.

Activities

1. Sampling of additional sites and materials of potential significance regarding contamination, accumulation or providing tell-tale evidence of environmental contamination with POPs or PTCs.
2. Re-sampling in detail, those areas that showed evidence of elevated levels of POPs to determine more closely the level and extent of contamination.
3. Purchase of analytical equipment and supplies, including service contracts, to enable the Government Chemistry Laboratory to undertake analysis of samples obtained in 1 and 2 above.
4. Submission of samples for analysis to external laboratories where capability is not available locally and/or for quality control.
5. Publishing of the detailed findings of the monitoring programme and public dissemination of the information.

Methodology and Project Management

Training Activities for sampling crews
Accurate recording of sampling procedures and positions
Soil depth, use of augur etc.
Use of composite samples?
Training/familiarisation for laboratory staff on new equipment

Approximate Cost of Project

Cost Centres

Sampling of soils, sediments, ground water, lagoon water, estuarine water
Analytical equipment for laboratory
Supplies for lab
Analysis service for samples not processed at the Dunbars lab
Production of report and public information material

Approximate Cost: US$ 400,000

Project 2: Assessment of Integrated Vector Management options for Antigua and Barbuda

Introduction/Justification

Antigua and Barbuda experiences outbreaks of Dengue fever every few years and the mosquito vector, *Aedes egypti*, is endemic on both Antigua and Barbuda. This vector is one of the many vectors that are also responsible for the transmission of West Nile virus. Since the arrival and spread of West Nile fever in the United States, it has become a threat to the Caribbean, given the heavy human traffic between the Caribbean and North America as well as the possibility of spread through the movement of migratory birds between the two regions.

Currently, the main approach to managing *Aedes* populations is by use of ground-based fogging of urban areas with a malathion/diesel mixture. There is spasmodic involvement of the public in reduction of breeding areas, particularly concentrating on reduction of clean water bodies around domestic premises. There has been little focus on other mosquito species, although WNV is transmitted by a wide variety of mosquitoes.

Generally Antigua and Barbuda both have semi-arid climates and for several months in the year most natural bodies of water are dry. Annual potential evapotranspiration exceeds average precipitation by over 700mm and there are no permanent rivers or streams. However, there are cycles of wet years when it is considerably wetter and stagnant water has a much longer life. Due to poor land use planning and lack of effective control, housing has been established in areas where drainage is poor and there have been complaints of high mosquito populations in some communities.

There have been some suggestions that Antigua and Barbuda should request an exemption under Article IV (Register of Specific Exemptions) of the Convention to reserve the right for possible use of DDT should there be an outbreak of Dengue fever or West Nile fever and a major vector control programme is needed. Such an action might set an unfortunate precedent and would reverse a situation where DDT and other POPs pesticide use has been avoided for nearly 25 years.

It would seem much more preferable and would assist in furthering Antigua and Barbuda's development in a sustainable direction, if a more holistic approach were to be taken with regard to vector management in the light of the situation described above. An integrated approach to insect management has been pursued in agriculture for at least a couple of decades. Integrated vector management (IVM) takes the same approach with respect to pests of public health importance. The objective is to achieve effective management of vector populations using all available means of control, including reduction of reproduction efficiency through such techniques as removal of suitable breeding environments, sterile male releases, pheromone disruption etc. Natural controls by predators and parasites may also be enhanced by environmental or technological interventions as well as enhancing competition from other species. Pesticides may also be used, but where possible in a more

targeted and specific way, with due regard to their role in the overall biology of the management programme. This approach, of course, requires a more thorough knowledge of the biology and dynamics of the insect populations being managed. It also requires a higher level of training for those involved in its planning and implementation. Research may also be required to provide necessary data for development of the programme.

It is proposed that this project should provide a basis for assessing the need for and possible effectiveness of an IVM approach to disease vector management in Antigua and Barbuda with the objective of improving the general health of the population as well as the effective containment of any vector borne disease outbreak.

Objectives

Outcomes

1. Improved management of insect vectors in Antigua and Barbuda.
2. Greater public understanding of insect vector issues and involvement in their management.
3. Better collaboration between government services whose activities and decisions affect either directly or indirectly the management of insect vector populations.
4. Fewer outbreaks of vector borne diseases and greater security from threats posed by their introduction in the future.

Activities

1. Nation-wide survey of mosquito populations, with particular focus on species of vector importance.
2. Evaluation of the data and identification of key "hot spots" of infestation.
3. Study of the causes for the high populations in these areas and identification of practical measures needed to reduce those populations.
4. Development of an integrated vector management programme using a small number of these areas as validation and hopefully as demonstration sites for the programme.

Methodology and Project Management

This project could easily be approached as a PhD or Masters degree research project. Funding could be obtained to provide a scholarship or stipend and research expenses to the student chosen,

A multi disciplinary technical team should provide overall supervision of the work as it will likely cut across several disciplines public health, drainage, land use planning and zoning, agriculture, water resources and waste management authorities. NGOs and Community groups should be encouraged to participate in collection of vectors, reporting of potential breeding sites etc.

Approximate Cost of Project

Cost Centres
Training and hiring of additional staff for vector survey
Data handling and analysis
Research on environmental factors influencing vector populations
Mapping of data and environmental features
Estimated Cost US$ 350,000

Project 3: Strengthening Public Awareness about Persistent Organic Pollutants And Persistent Toxic Chemicals in the Environment

Introduction/Justification

While considerable progress has been made in raising public awareness about POPs and other toxic chemicals, there is still much work needed to provide specific target groups with the information and training that they need to be able to make good management decisions with respect toxic substances. There is also a general lack of understanding about the issues of accumulation and chronic exposure to low levels of persistent substances. The medical profession and public health services have had to focus on more acute problems of public health and there have been scarce resources available for assessment of environmental public health issues.

There is also the problem of enabling understanding about toxins that are not intentionally produced or used but arise from common daily activities and which can have effects at concentrations where they are virtually undetectable except by very sophisticated methods and procedures.

Objectives

Outcomes

1. General public better informed about threats to human health and the environment from exposure to toxic chemicals especially at levels that are not perceived to cause any immediate effect.
2. Special interest groups advised and more aware of need to manage toxic chemicals with particular care. Groups to include protective services especially fire services, disaster preparedness services, medical profession, waste management operatives, pest control operators, utilities companies, farmers and agricultural supply houses.
3. Greater knowledge of and support for the POPs National Implementation Plan and the reasons for its implementation.

Activities

1. Awareness meetings and discussion groups with special interest groups
2. Production of informational material for special interest groups
3. Production of informational material for general public using varied media

Methodology and Project Management

Approximate Cost of Project

Estimated Cost US$ 80,000

Project 4: Building Capacity within the Pesticides and Toxic chemicals Board for Effective management of Toxic Chemicals

Introduction/Justification

The new Pesticides and Toxic Chemicals Board will have considerably more responsibilities under the new Pesticides and Toxic Chemicals Act when this new legislation comes into force. The Board will be responsible for the registration of all toxic chemicals and for developing a database to provide information to the public and those involved with their use. In addition, pest control operators will be required to register their businesses and to obtain permission to import toxic chemicals. They will have more responsibilities to report to the Board regarding their importation and stocks of toxic substances.

All of this will mean that the Board will have to operate efficiently so that the processes of registration and database management work smoothly and do not consume an unsupportable amount of additional human and financial resources. Computerisation of operations will be a key to making sure that efficient systems are put into operation. Board staff will need some assistance in developing these systems and in their operation. There are also issues with design of a fee structure that will help the Board become, at least partially, self-financing. Considerable collaboration with industry users of the system will be required for optimum compliance and participation.

It is envisaged that this project will provide some technical expertise to assist the Board in meeting these needs.

Objectives

Outcomes

1. Well designed and efficient operational systems in place and management of toxic substances proceeding smoothly.
2. Agreed system of fees for registration and approvals providing some income for the Board.
3. Industry taking more responsibility for the provision of information required for fulfilling reporting requirements of the Stockholm and other conventions concerned with toxic chemicals.
4. Information on registered chemicals and procedures for registration and application easily available to industry stakeholders and the general public.
5. Information on importation and use of toxic chemicals reported on at regular intervals by the PTCC Board in compliance with Stockholm Convention requirements.

Activities

1. Design and testing of computerised systems for the PTCC Board. These will include registration systems (procedures and proformas), pesticides database to provide information of the registered chemicals as well as other general information relating to use, safety, health risks, symptoms of poisoning and emergency treatment, etc.
2. Training of Board members and hired staff regarding operation of the registration and approval systems.
3. Setting up of efficient database of toxic chemicals and persons trained to operate and maintain it.

Methodology and Project Management

Approximate Cost of Project

Estimated Cost: US$ 125,000

Project 5.

General Concept for the Construction of a Central Analytical Laboratory in Antigua and Barbuda

Introduction

The demands of globalisation impact developing states on many levels. The impact on human health and safety is perhaps the most significant, given the implications of free trade. A critical aspect of the trans-boundary movement of products is a mechanism for the assurance of quality of such products for human use. Antigua and Barbuda, like many developing countries, is challenged in its capacity to allocate the resources required for laboratory infrastructural development which is a fundamental aspect of any quality assurance system. The existing Government's analytical laboratory (the Department of Analytical Services), built in the early 1980s has undergone no significant changes since its inception and is in dire need of improvement. One can scarcely imagine that such an aging facility would be satisfactory for conducting analyses under the strict conditions necessary for assuring the quality and confidence of the results generated. Further, the current Laboratory lacks the appropriate facilities to adequately support other Government departments such as the Veterinary Division, the Fisheries Division, the Environment Division, the Ministry of Health, the Plant Protection Unit and Law enforcement, all of which have specific diagnostic requirements.

Further, it would not be feasible for each of these Departments to have a dedicated laboratory. As such, strong recommendations are being made herein for the upgrade of the existing facility to a central laboratory facility capable of providing quality analytical services in support of all branches of the Civil Service and to fulfil the requirements for international trade.

Such a facility would be invaluable to Antigua and Barbuda and would be demonstrative of the willingness of this country to protect its citizens and visitors alike. Improved analytical capability would be essential in ensuring that the requirements of Good Agricultural Practices (GAPs) are being met and that all goods for human consumption are scrutinised in an effort to ensure the safety of all. Moreover, with a strong reliance on imported goods, Antigua and Barbuda must be vigilant in policing goods that enter its shores. Recent health risks associated with products manufactured in the United States underscores the need for a robust surveillance system. However, such a system is predicated upon the relevant infrastructural development. Regarding international trade, compliance testing of products for export would ensure that Antigua and Barbuda would not be at a disadvantage as it pertains to Technical Barriers to Trade (TBTs). Further, importers of commodities from Antigua and Barbuda would be confident that compliance testing is carried out congruent with internationally accepted standards.

Centralised testing and certification would also be beneficial to exporters as it would represent a single facility capable of meeting all of their analytical needs. It is foreseeable that a modern analytical facility would improve the capacity for scientific research. Data emanating from surveillance programmes would undoubtedly be beneficial not only to the citizens of this country, but to the international community. International bodies such as Codex Alimentarius Commission sponsor representative from this region to attend various meetings regarding the safety of products for human consumption. It would speak great volumes for the people of this region if we would possess the capability to contribute meaningful research data to such organisations in an effort to further the understanding of the many areas affecting human health. The development of science hinges greatly

upon research and any infrastructural development that enhances research capability would undeniably spur scientific advancement.

The issue of sustainability arises with regard to an improved analytical laboratory, as to whether cost recovery mechanisms would be in place to justify the existence of such a facility. However, a mechanism for sustainability is inherent and the construction of such a facility is completely justifiable. Revenue generation would be enhanced in several ways. First, the cost of testing imported commodities would be borne by the distributor, representing direct revenue for the laboratory. Second, the increased capacity for surveillance of local establishments such as hotels, restaurants and bottled water producers would represents a constant stream of revenue. With the necessary legislative instruments, this laboratory would be the sole authority for public health testing thereby solidifying its revenue base. Third, the possibility exists that with increased development of the analytical capacity, requests for laboratory analyses from neighbouring countries may also represent additional sources of revenue. Finally, improved research capacity improves the ability to attract research funding. Such funding would be beneficial to the sustainable development of the facility allowing greater self-sufficiency, relying to lesser extent on Government funding. The proposed central laboratory facility is envisioned as a centre of excellence for diagnostic services and research in the biological and chemical sciences. As part and parcel of this vision is the establishment of a foundation for the advancement of applied sciences in an effort to improve the quality of life of residents and visitors.

Objectives

The major objective of this initiative would be to design and construct a central analytical facility. Special emphasis will be placed on the improvement of the diagnostic capacity to provide assistance to the Plant Protection Unit and the Veterinary Services Division. The Establishment of a National Foundation for the Applied Sciences with one of its instruments being a quarterly publication updating the people of Antigua and Barbuda.

Beneficiaries

- The major beneficiary is the people of Antigua and Barbuda and the visitors to our shores. Analyses geared towards assurance of public health would be the major focus of this facility.
- The Ministry of Trade and its Departments such as the Antigua and Barbuda Bureau of
- Standards.
- The Ministry of Agriculture, Lands, Marine Resources and Agro-Industry and its
- Departments such as the Plant Protection Unit, the Veterinary Division and the Fisheries Division are key beneficiaries.
- The Ministry of Health would benefit greatly as the laboratory would provide support for the various surveillance programmes required to monitor risks to human health.
- The Ministry of Tourism and its Departments such as the Environment Division are also key beneficiaries. Environmental health and its impact on human health and safety are of great importance. Additionally, the hotel and tourism industry in keeping with international trends require laboratory testing to ensure the safety of tourists.
- Law enforcement agencies such at the royal Police force of Antigua and Barbuda and the Office of National Drug Control Policy (ONDCP) often require analyses to assist in the prosecution of drug offenders.
- Non-Governmental Organisations such as the National Solid Waste Management Authority require analytical services to ensure best practice is being observed in their operation of the Sanitary Landfill.

Proposal

The construction of a 9000 sqft building at the current site of the Dunbars Lab. The basic design features will include safety considerations such as fire extinguishers, eye wash stations, emergency showers and emergency exits. Basic security features such as secure access doors (by pass key or pass code) to the laboratory are being proposed in an effort to guard against security breaches. To enhance security, Chemistry and Microbiology Labs as well as Chemical stores should be located on upper floors, accessible only through secure entrance. Also, Ethernet access points should be present in each room to provide the basic networking infrastructure.

The total estimated cost for the structure is 3.5MECD for the building with 1M ECD for equipment.