Guidelines on public health pesticide management policy for the WHO African Region

World Health Organization

GUIDELINES ON PUBLIC HEALTH PESTICIDE MANAGEMENT POLICY FOR THE WHO AFRICAN REGION

WHO Library Cataloguing-in-Publication Data

Guidelines on public health pesticide management policy for the WHO African region.

1.Pesticides - standards. 2.Pest control, Biological. 3.Environmental pollutants. 4.Guidelines. 5.Africa. I.World Health Organization. II.WHO Pesticide Evaluation Scheme.

ISBN 978 92 4 150123 1 (NLM classification: WA 240)

WHO/HTM/NTD/WHOPES/2011.2

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ACKNOWLEDGEMENTS

This document is a joint publication of the World Health Organization (WHO) Regional Office for Africa and the WHO Department of Control of Neglected Tropical Diseases. These guidelines were originally developed by the Department of Control of Neglected Tropical Diseases and the Department of Communicable Diseases of the WHO Regional Office for South-East Asia, New Delhi, India. WHO wishes to express its sincere thanks and appreciation to Mr Harold van der Valk, Werkendam, the Netherlands, for drafting the document. The Organization also wishes to thank the following individuals for their valuable contribution to the development of this document for the African Region.

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WHO gratefully acknowledges the financial support provided by the Bill & Melinda Gates Foundation.

DEFINITIONS

The definitions given below apply to the terms as used in these guidelines. They may have different meanings in other contexts.

adulterated pesticide
A pesticide any component of which has been substituted wholly or in part, or if any constituent of the pesticide has been wholly or in part abstracted, added or modified in quantity compared with the regulatory specification on record (*18*).

counterfeit pesticide
A pesticide made by someone other than the approved or registered manufacturer, by copying or imitating an original product without authorization or right, with a view to deceive or defraud, and then marketing the copied or forged product as the original (*18*).

decentralized health system
A health system in which responsibility for policy implementation and service provision has been transferred from the central level to local structures, usually districts (10).

household pesticide
A pesticide that is used by the general public in or around the house and is generally available over-the-counter. Such pesticides may include mosquito coils, aerosols spray cans, insect repellents for personal use, rodent poisons, cockroach sprays and baits, flea and tick control products, and pesticide-treated pet collars.

illegal pesticide
A pesticide that is not registered or otherwise authorized for a particular distribution and use, or a pesticide for which no import authorization has been given (if applicable).

integrated vector management (IVM)
A rational decision-making process for the optimal use of resources for vector control. It aims to improve efficacy, cost-effectiveness, ecological soundness and sustainability of vector control interventions for control of vector-borne diseases (*1*, *5*).

life-cycle management – see *Pesticide management*

pest control operator
A professional, often private operator, who carries out control of nuisance pests and other pests of public health importance, at the request of a client, for example in and around houses, offices and hospitals.

pesticide
Any substance, or mixture of substances or microorganisms including viruses, intended for repelling, destroying or controlling any pest, including vectors of human or animal disease, nuisance pests, unwanted species of plants or animals causing harm during

or otherwise interfering with the production, processing, storage, transport or marketing of food, agricultural commodities, wood and wood products or animal feeding stuffs; or which may be administered to animals for the control of insects, arachnids or other pests in or on their bodies. The term includes substances intended for use as insect or plant growth regulators; defoliants; desiccants; agents for setting, thinning or preventing the premature fall of fruit; and substances applied to crops either before or after harvest to protect the commodity from deterioration during storage and transport. The term also includes pesticide synergists and safeners, where they are integral to the satisfactory performance of the pesticide (*36*).

pesticide management
The regulatory control, proper handling, import, supply, transport, storage, use and disposal of pesticide-related waste to minimize adverse environmental effects and human exposure (*10*). The term is sometimes also referred to as *life-cycle management* of pesticides.

pesticide registration
The process whereby the responsible national government or regional authority approves the sale and use of a pesticide following the evaluation of comprehensive scientific data demonstrating that the product is effective for its intended purposes and does not pose an unacceptable risk to human or animal health or to the environment (*9*).

policy
A set of principles that guide decision-making (*12*).

policy instrument
A method, mechanism or measure that can be used by a government to achieve (part of) the objective of a policy.

public health pesticide (PHP)
A pesticide that is used in the control of pests of public health significance. Such pesticides include vector control pesticides, household pesticides and professional pest management pesticides (that is, pesticides used by pest control operators). For the purpose of these guidelines, public health pesticides do not include disinfectants (*10*).

substandard pesticide
A pesticide the physical-chemical properties of which do not meet the minimum quality standard (*18*).

vector
An insect or any living carrier that transports an infectious agent from an infected individual or its wastes to a susceptible individual or its food or immediate surroundings. The organism may or may not pass through a development cycle within the vector (*10*).

1. INTRODUCTION

Vector-borne diseases account for about 17% of the estimated global burden of communicable diseases (*1*). These diseases are among the major causes of human illness and death in the African Region of the World Health Organization (WHO). Vector control plays a key role in prevention and control of major vector-borne diseases such as malaria, dengue, leishmaniasis and chikungunya, and often constitutes the first line of activity in case of epidemics. Pesticide-based vector control is a major component of the malaria control strategy in the region.

Approximately 755 000 kg of active ingredient of DDT, 6400 kg of active ingredient of organophosphates, about 6600 kg of active ingredient of pyrethroids (excluding those used in manufacture of long-lasting insecticidal mosquito nets) and about 6100 kg of active ingredient of carbamates were used annually for control of vector-borne diseases – particularly malaria vectors – in the WHO African Region in 2007 (*2*, *3*). Pesticide use in the region has increased considerably during the past decades (*3*, *4*), and this upward trend is continuing as Member States scale up vector control interventions to achieve universal coverage for impact. For instance, the population protected by indoor residual spraying of insecticides has almost quadrupled over the past decade (*2*). The overall use of pesticides for vector control in the region has increased seven-fold, from about 105 tonnes of active ingredient in the late 1990s to more than 775 tonnes in 2006–2007 (*3*, *4*).

The burden to public health caused by nuisance pests (mostly insects and rodents) is also significant in the region, leading to the use of considerable volumes of pesticides for personal protection. However, comprehensive statistics on pesticides used for such purposes are not available for the African Region.

Given the importance of public health pesticides for the prevention and control of vector-borne diseases in humans, it is essential that they are efficacious, cost-effective, of good quality and operationally acceptable. However, the long-term sustainability of vector-borne disease control in the region is threatened as a result of growing insecticide resistance and the depleting arsenal of less hazardous and cost-effective insecticides.

Furthermore, pesticides are toxic compounds, and their improper use and general mismanagement may pose a risk to human health and the environment. This includes those used in and around homes for vector control and personal protection. It is therefore important that public health pesticides are applied and used in a sound and careful manner, and that their use poses a low risk to human and animal health and to the environment.

Based on such concerns, and with the aim to ensure sustainable and cost-effective vector control, WHO published the *Global strategic framework for*

integrated vector management (IVM) (*5*), and subsequently adopted IVM as its central approach to disease vector management (*6*). The approach aims to improve efficacy, cost-effectiveness, ecological soundness and sustainability of vector control interventions for control of vector-borne diseases, and integrates all available and effective vector control measures, whether chemical, biological or environmental. It also emphasizes intersectoral collaboration and community involvement. In 2002, the regional *Framework for the development and implementation of vector control interventions in the African Region* was adopted by the WHO Regional Office for Africa (*7*), and guidelines were developed by the Office based on this framework (*8*). Subsequently, countries adapted the approach, developed national strategies and initiated implementation of vector control interventions within the context of IVM.

One of the core elements or principles of IVM is judicious use and management of public health pesticides. Sound public health pesticide management covers a broad range of aspects, including (but not limited to) evidence-based decision-making on the need for and type of control, careful selection of the most suitable pesticide, targeting pesticide use effectively and appropriately in time and space, applying resistance control strategies, and safe disposal of pesticide waste and containers. It also involves many stakeholders, asks for long-term vision and requires high-level political support. These guidelines are intended to be used in support of national implementation of vector control strategies in line with the principles of IVM, but also to assist in risk reduction of public health pesticide use, including at the household level.

The formulation of public health pesticide management policy is also intended to contribute to achieving the health-related Millennium Development Goals, in particular: Goal 6: *Combat HIV/AIDS, malaria and other diseases* (target 6C – Have halted by 2015 and begun to reverse the incidence of malaria and other major diseases); and Goal 7: *Ensure environmental sustainability* (target 7A – Integrate the principles of sustainable development into country policies and programmes, and reverse the loss of environmental resources) (*11*).

In view of the above, it was considered opportune and pertinent to elaborate these guidelines in support of formulation or strengthening of specific national policy for the sound management of public health pesticides.

The *International code of conduct on the distribution and use of pesticides* (*9*) is the worldwide guidance document on pesticide management for all public and private entities engaged in, or associated with, the distribution and use of pesticides, including public health pesticides (*10*). The Code is designed to provide standards of conduct and to serve as a point of reference in relation to sound pesticide management practices, in particular for government authorities and the pesticide industry. The principles of the Code have been used in elaborating these policy guidelines.

2. SCOPE OF THE GUIDELINES

These guidelines are intended to provide national policy-makers in the WHO African Region with critical elements to develop and/or strengthen national policy for the management of public health pesticides, such as pesticides used for vector control, household pesticides and pesticides used by pest control operators. Issues and driving forces that may instigate national policy development are discussed, and guidance is provided on the process of policy formulation, implementation, and monitoring and evaluation.

The guidelines focus on development of policy that is formulated by a government and implemented under the overall responsibility of a government. They do not provide specific advice on technical aspects relating to use and management of public health pesticides, for which separate guidance documents exist. However, references to such technical documents are provided.

While it is recognized that most pesticide products used for public health purposes are insecticides, other types of pesticides are also used (e.g. repellents, rodenticides, molluscicides). Therefore, the more generic term "public health pesticide" is used throughout these guidelines, rather than "public health insecticide".

3. OBJECTIVES OF THE GUIDELINES

The objectives of these guidelines are:

- to present issues in life-cycle management of public health pesticides in the WHO African Region, which may require formulation or strengthening of relevant national policy;
- to provide guidance on the process of national policy formulation, implementation, and monitoring and evaluation;
- to present options for policy instruments that may be incorporated into national policy for public health pesticide management.

4. PURPOSE OF POLICY FORMULATION

Policy is a set of principles that guide decision-making. Public policy refers to policy formulated and implemented by a government, and it is the basis for translating the government's political vision into programmes and actions.

Policy defines desired changes, and may be developed in response to recognized problems or constraints, or to prevent problems arising in the future.

Ideally, a policy contains a definition of the problem being addressed, a statement of goals and objectives (the desired state of affairs; targets or outcomes), and at least the broad outline of the instruments (approaches and measures) by which the objectives are to be achieved (*12*).

Policy formulation, if carried out well, can serve a range of purposes, among them:

- to identify issues and problems in public health pesticide management;
- to define structural solutions to problems or options for dealing with identified issues;
- to project outcomes of policy options and evaluate their impact;
- to create a political basis for future plans and actions and ensure commitment from decision-makers;
- to provide a process through which stakeholders can build consensus around preferred policy options;
- to ensure transparency about objectives, targets and means to achieve these targets;
- to provide a framework for national resource allocation and international assistance;
- to provide a framework against which programmes or actions can be tested and progress measured.

The ultimate goal of the formulation of a national public health pesticide management policy is to achieve effective, safe and sustainable management of vector-borne diseases and nuisance pests of public health importance. Key elements of this overall goal are:

- to achieve public health objectives, in particular with respect to lowering the burden of vector-borne diseases;
- to optimize and rationalize the use of resources and tools for nuisance pest and vector control, and where possible reduce reliance on chemical control;
- to ensure regulatory control over the import, distribution, storage and use of public health pesticides, and the disposal of their waste, with the aim to minimize risks to human health and the environment;
- to create an enabling environment for sound public health pesticide management by, among others, awareness building, capacity building and resource mobilization.

The formulation of policy for public health pesticides can be an aim in itself, but it can also be an entry point for the development of general national pesticide management policy, covering all types of pesticides and their uses.

5. MOTIVES AND DRIVING FORCES FOR POLICY FORMULATION

There are many motives or driving forces that justify national policy development for public health pesticide management. Some may be locally identified problems or needs with respect to pesticide use which should be responded to; others are issues which could become constraints for effective pesticide management in the future, and require early measures to be taken.

In this chapter, issues and problems associated with public health pesticide use and management are discussed which may be a motive or a driving force for a national government to develop specific policy (see Box 1). These issues are presented in no specific order, and not all of them may be relevant to each country in the WHO African Region.

Box 1 – Issues and problems associated with management of public health pesticides

- Increasing use of public health pesticides in vector-borne disease control and for personal protection
- Depleting arsenal of less hazardous and cost-effective pesticides
- Human health and environmental risks posed by public health pesticides
- Inadequate regulation of public health pesticides
- Presence of substandard, illegal and counterfeit pesticides in the market
- Challenges associated with management of pesticides in decentralized health systems
- Inadequate national capacity for the judicious use of public health pesticides
- The need for implementation of principles of integrated vector management
- Poorly coordinated local responses to management of pesticides
- Alarmingly low capacity for disposal of pesticides and pesticide-related waste
- Lack of emphasis on public education and awareness on low-risk use of pesticides
- Obligations under international conventions
- Implementation of international policy instruments
- Implementation of relevant regional policies in Africa
- Compliance with national policies and legislation

Increasing use of public health pesticides in vector-borne disease control and for personal protection

Vector control plays a key role in prevention and control of vector-borne diseases. For malaria, vector control is an essential component of the overall disease control strategies in the region. For others, such as dengue and chikungunya, no drug or vaccine exists; vector control is the sole option for transmission control and is also applied to contain epidemics.

Pesticides remain the most important component of integrated approaches to vector management, and their effective use therefore contributes greatly to reducing the burden of vector-borne diseases. In addition, antimalarial multidrug resistance is a serious threat to the efficacy of drug treatments and may increase the relative importance of malaria vector control. Vector control therefore not only enhances disease control efforts but also reduces the amplification of drug resistance.

Climate affects the reproduction and survival rates of both the infectious agents and their vectors. The Intergovernmental Panel on Climate Change (IPCC) has projected that, particularly in Africa, climate change may be associated with geographical expansions of the areas suitable for stable *Plasmodium falciparum* malaria in some regions, and with contractions in other regions (*13*). Projections also suggest that some regions will experience a longer season of transmission, which may be as important as geographical expansion for the attributable disease burden. Furthermore, climate change is likely to expand the geographical distribution of other vector-borne diseases such as dengue, schistosomiasis and leishmaniasis to higher altitudes, and to extend the transmission seasons in some locations (*14*). These developments caused by climate change may in turn lead to an increased need for vector control and, consequently, a further rise of pesticide use.

Depleting arsenal of less hazardous and cost-effective pesticides

The number of less hazardous and cost-effective public health pesticides is limited and decreasing. This is to a large extent a result of the development of resistance of the major vectors and pests of public health importance (e.g. mosquitoes, flies, rodents) to these pesticides.

A review carried out in 2009–2010 concluded that pyrethroid resistance is widespread in malaria vectors across Africa, and has shown dramatic increases in recent years (*15*). However, both indoor residual spraying of insecticides (IRS) and the use of insecticide-treated nets (including long-lasting insecticidal mosquito nets), rely heavily on pyrethroids. Similarly, high prevalence of DDT resistance is reported from several countries where this insecticide is used for IRS (*16*).

The number of new pesticide active ingredients for public health use in the pipeline is very few, which warrants careful management and judicious use of

the existing compounds so as to extend their useful life and avoid failure to provide the intended level of control.

Human health and environmental risks posed by public health pesticides
While public health pesticides are generally chosen to have a low hazard with respect to human and animal health and the environment, all pesticide uses pose an inherent risk that should be reduced as much as possible. “Healthy public policy” also applies to public health pest management.

Pesticide applicators, both in government and the private sector, are often not adequately trained in the effective, judicious and low-risk use of public health pesticides. Their supervision may be insufficient, and spraying equipment is frequently not well maintained or calibrated. These practices can lead to high occupational risks to workers, but may also result in unacceptable risks for inhabitants of pesticide-treated buildings or neighbourhoods.

Household pesticides are mainly used in or around habitations, generally by people who may have not been well informed about the risks of pesticides. Because these products are applied in such close proximity to humans, relatively high exposure may occur from their inappropriate uses. However, in many countries, pesticides for domestic use are not well regulated, and container labelling is often inadequate, sometimes in wording or languages that are not understandable to local people, to inform users about risks.

Furthermore, appropriate storage facilities of public health pesticides, not only in retail establishments and houses but also at the establishment of pest control operators and at government vector control services, are often lacking, leading to increased risk to human health and the environment.

A specific issue is the possible “leakage” of DDT to agriculture. While the use of DDT for anything other than vector control is illegal in all countries of the WHO African Region, shortfalls in management or control of its use may still result in DDT entering agriculture and the food chain. In addition to the environmental and consumer risks that such inappropriate use poses, DDT residues in agricultural commodities may seriously threaten exports and may have economic consequences.

Inadequate regulation of public health pesticides
While most countries in the African Region tend to regulate agricultural pesticides to a greater or lesser extent, important gaps still exist in legislation, registration and enforcement of public health pesticides. Sometimes, legislation for some groups of public health pesticides is entirely lacking. In other cases, legislation and/or registration of public health pesticides is not well coordinated with other groups of pesticides, increasing the possibility of legal loopholes. Furthermore, the regulation of pest control operators is often inadequate, which may lead to inappropriate pesticides or treatments being carried out in or close to homes and other buildings.

Registration procedures for public health pesticides tend to be underdeveloped and uncoordinated compared with those for the agricultural pesticides; in particular, evaluation of pesticide dossiers may require capacity strengthening to ensure that products being authorized are effective and do not pose unacceptable risk to human health and the environment.

In 2010, WHO assessed the state of public health pesticide regulation in its Member States (*17*). The survey showed that 27% of countries of WHO's African Region still do not have legislation for the registration and control of pesticides. In 18–31% of countries, vector control pesticides, household pesticides and pesticides applied directly to humans were not registered by the same executive body responsible for regulating agricultural pesticides. And in about a quarter of countries, pest control operators lacked a licence or certification to spray houses and other buildings with pesticides.

Even where legislation is adequate, compliance monitoring and enforcement is often insufficient. In the WHO African Region, 67% of countries indicated limited enforcement of pesticide regulations in the health sector (*17*). Inspectors responsible for compliance monitoring and enforcement of pesticide-related legislation may be dispersed over the inspectorates of various ministries, leading to lack of efficiency and suboptimal use of resources. Also, inspectors may have been designated for pesticide inspections, but they require specialized training to be able to do so effectively.

Presence of substandard, illegal and counterfeit pesticides in the market

One of the consequences of the inadequate regulation discussed above is the presence of substandard, illegal, adulterated and counterfeit pesticides in the market. The use of substandard pesticide products can result in ineffective pest or vector control operations, and may lead to varying application rates and increasing costs. It may also give rise to the development of pest resistance to pesticides or aggravate any such existing problem. In addition, substandard pesticide products may seriously increase the risk to users and the environment as they may contain impurities or chemicals, which can increase the toxicity of the product to humans and other non-target organisms (*18*).

In 2001, FAO/WHO estimated that around 30% of pesticides marketed in developing countries, with an estimated value of US$ 900 million annually, did not meet internationally accepted quality standards (*19*). When the quality of labelling and packaging is also taken into account, the proportion of poor-quality pesticide products marketed in developing countries may even be higher.

The trade in illegal and counterfeit public health pesticides is also a major concern in the region, which requires adequate legislation and capacity for enforcement as well as intersectoral and cross-border collaboration. More than 80% of the countries surveyed in Africa indicated that they have concerns regarding trade and use of substandard and counterfeit public health pesticides.

Yet only 40% of African countries have national pesticide quality control facilities (*17*).

Generally, quality control of public health pesticides and application equipment is inadequate.

Challenges associated with management of pesticides in decentralized health systems

Over the past decades, many countries have gone through health sector reforms that have posed new challenges in the management of public health pesticides at decentralized levels (e.g. district or below), such as in the selection, purchase, procurement, storage, use and waste disposal of these chemicals, and in monitoring of their application. At the same time, pest control services are being increasingly privatized. These reforms, however, have not adequately included capacity building to address this highly specialized area of work.

Inadequate national capacity for the judicious use of public health pesticides

The technical capacity to ensure effective, judicious and low-risk use of public health pesticides is still limited at various levels of government, but also in the private sector. A recent survey found that in only 7% of African countries, all those in charge of vector control programmes have received certified training in vector control, or were trained in effective, judicious and low-risk use of pesticides, which is well below the global average (*17*). The availability of trained and experienced managers remains critical for proper planning and effective implementation of vector control programmes with good management of pesticides. This includes, among others, pesticide needs assessments, the technical issues of pesticide procurement, storage, distribution transportation, post-importation monitoring, and disposal of pesticide waste and empty containers.

The lack in technical know-how of vector control personnel and other public health staff involved in nuisance pest control at the field level has become a serious concern. As mentioned above, regular training and supervision have become ever more challenging as a result of decentralization.

In addition, there is limited capacity for monitoring and evaluation of vector control interventions, and for operational research to support evidence-based decision-making for judicious use of pesticides in public health. This results in suboptimal use of pesticides in vector control and nuisance pest control, lower efficacy, and increases the risk for resistance development and adverse effects on human health and the environment. It also slows down the development of truly integrated vector management approaches.

The need for implementation of principles of integrated vector management

Integrated vector management, or IVM, uses principles of sound management and allows full consideration of the determinants of disease transmission and control. WHO describes IVM as "A rational decision-making process for the optimal use of resources for vector control". It aims to improve efficacy, cost-effectiveness, ecological soundness and sustainability of vector control interventions for control of vector-borne diseases (*1*, *6*).

IVM is a decision-making process for the management of vector populations, so as to reduce or interrupt transmission of vector-borne diseases. Its characteristic features include:

- selection of methods based on knowledge of local vector biology, disease transmission and morbidity;
- utilization of a range of vector control interventions, often in combination and synergistically;
- collaboration within the health sector, researchers and with other public and private sectors that impact on vector breeding;
- engagement with local communities and other stakeholders;
- existence of a public health regulatory and legislative framework;
- rational use of insecticides;
- application of good management practices.

An IVM approach takes into account the available health infrastructure and resources, and integrates all available and effective vector control measures, whether chemical, biological, or environmental. Judicious use of public health pesticides is thus an essential element of IVM.

About half of African countries have adopted a national IVM policy for vector-borne disease control, slightly below world averages. Of those countries which have such a policy, three-quarters are effectively implementing IVM throughout the country (*17*). This means that in about 60% of African countries, IVM is not yet used as a basis for vector control.

In countries of the WHO African Region, some of the impediments limiting the implementation of IVM are related to problems with sound management of pesticides. These include: illegal import and distribution of cheap pesticides, which may reduce investments in the development of alternative pest and vector control methods; inadequate capacity for the registration of less hazardous (bio-)pesticides which are needed in an IVM programme; inadequate capacity for registration of pesticides following the appropriate procedures; lack of funding for research into effective environmental management options for vector control; lack of evidence-based decision-making for proper pesticide procurement and use; and lack of coordination between the agricultural and health sectors with respect to insecticide use, resulting in vector resistance problems. On the other hand, slow progress in implementation of IVM may lead

to less attention being given to judicious pesticide management. Therefore, the capacity for sound management of pesticides and the capacity for implementing vector control with the IVM approach are interrelated.

WHO/AFRO has developed a *Framework for the development and implementation of vector control interventions in the African Region* (*7*) and associated *Guidelines for integrated vector management* (*8*), to support Member States in actual adoption of the IVM concept, strengthening existing vector control programmes and implementation of vector control interventions within the concept of IVM.

Poorly coordinated local responses to management of pesticides

Local responses to the management of pesticides in public health, agriculture and environment sectors are often poor. A particular example is the development of insecticide resistance in mosquitoes which is caused or exacerbated by use of insecticides with the same mode of action in agriculture. This has been documented in various countries in Africa, such as Burkina Faso (*20*), Benin (*21*) and Cameroon (*22*), but is likely to be much more widespread. The prevention and management of such resistance selection requires routine monitoring of insecticide resistance as well as joint development of a strategy for resistance management between the ministries of Health and Agriculture.

In many countries of the region, coordination and collaboration may not be sufficiently effective between the principal pesticide regulatory authority (generally under the Ministry of Agriculture) and the Ministry of Health, on the evaluation, authorization, monitoring and control of public health pesticides. In many cases, the legislation for pesticides does not address the issues specific to public health pesticides. As a result, not all elements of the pesticide life-cycle may be properly regulated and managed.

Similarly, a lack of coordination tends to be observed between government and other stakeholders, such as the private sector (e.g. manufacturers, importers, retailers, pest control operators), civil society, academia and research institutes. Consequently, problems in pesticide management encountered by stakeholders may not be identified and dealt with at an early stage by governments, or are overlooked entirely. Furthermore, lack of coordination between governments and donors or development partners may lead to donor-driven import and use of inappropriate public health pesticides.

Alarmingly low capacity for disposal of pesticides and pesticide-related waste

The use of public health pesticides generates various types of waste: left-over pesticides which have become obsolete or otherwise unusable, empty pesticide containers and sachets, and used-up or torn long-lasting insecticidal mosquito nets, contaminated personal protective equipment and disused spraying equipment. The disposal of pesticide waste is not well regulated and organized in many countries in the region, and public health pesticide waste is no

exception in that respect. In fact, in about half of African countries, no legislation exists to ensure proper disposal of obsolete public health pesticides (*17*). Such waste is often being deposited in general purpose municipal dumps or is littering nature, which may result in environmental pollution or posing risks to human health.

The prevention of pesticide waste generation, local recycling of empty pesticide containers, and the environmentally sound disposal of left-over waste, all pose great challenges to national governments and require urgent attention.

Lack of emphasis on public education and awareness on low-risk use of pesticides

Household pesticide use and the application of insecticides for personal protection from biting and nuisance insecticides are significantly increasing in the region. The use of pesticide containers for household use also is a common phenomenon in parts of the region. Knowledge and understanding of the risk associated with these practices are low in communities. Educating the public and creating awareness on judicious and low-risk use of pesticides and the potential hazard of their misuse are critical issues in the general sound management of public health pesticides. However, legislation that obligates both the public and the private sectors to systematically incorporate public education and awareness programmes in their service delivery practices in a sustained manner is lacking, and where such legislation exists it is not enforced.

Obligations under international conventions

There are several legally binding international instruments that invite Member States or Parties to ensure sound management of pesticides. The main instruments with respect to public health pesticides are described below.

The *Stockholm Convention on Persistent Organic Pollutants (POPs)*[1] requires Parties to take measures to eliminate or reduce the release of POPs into the environment. With respect to public health, two pesticides – DDT and lindane – are of particular concern. The Convention limits the use of DDT to disease vector control, and Parties using DDT are required to put in place regulatory and other mechanisms to ensure that its use is effectively restricted to disease vector control. They are also required to adopt and implement suitable alternative products, methods and strategies. Furthermore, Parties should also eliminate the production of lindane, with a specific exemption for use as a human health pharmaceutical for control of head lice and scabies as a second-line treatment.

The *Rotterdam Convention on the Prior Informed Consent Procedure for certain Hazardous Chemicals and Pesticides in International Trade*[2] aims to contribute to the environmentally sound use of certain hazardous pesticides, by facilitating

[1] Stockholm Convention web site: http://www.pops.int
[2] Rotterdam Convention web site: http://www.pic.int

information exchange about their characteristics, by providing a national decision-making process on their import and export, and by disseminating these decisions to Parties. Pesticides used for public health purposes that fall under the provisions of the Rotterdam Convention are DDT and lindane, as well as all other pesticides that have been banned or severely restricted by individual Parties.

The *Basel Convention on the control of transboundary movements of hazardous wastes and their disposal*[1] is the global environmental agreement on hazardous and other wastes, including pesticide-related waste. The Convention primarily regulates the transboundary movements of wastes, but it also obliges its Parties to ensure that pesticide wastes are managed and disposed of in an environmentally sound manner. Strong controls have to be applied from the moment of generation of a hazardous waste to its storage, transport, treatment, reuse, recycling, recovery and final disposal. This also applies to public health pesticide wastes.

The development of policy for public health pesticide management should contribute to the implementation of the provisions of these Conventions.

Implementation of international policy instruments

Various voluntary international policy instruments call upon countries to ensure the sound management of pesticides.

The 63rd *World Health Assembly*,[2] held in May 2010, adopted resolution WHA63.26, which urges Member States, inter alia, to establish or strengthen capacity for the regulation and sound management of pesticides and other chemicals throughout their life-cycle, as a preventive measure to avoid accumulation of obsolete chemicals.

Although not legally binding, the *International Code of Conduct on the Distribution and Use of Pesticides*[3] is designed to provide standards of conduct; it serves as a point of reference in relation to sound pesticide management practices, in particular for government authorities and the pesticide industry. The Code can be used as a means to verify the national status of public health pesticide management, and identify gaps and needs.

Adopted by the 1st International Conference on Chemicals Management (ICCM) in 2006, the *Strategic Approach to International Chemicals Management* (SAICM)[4] is a policy framework to foster the sound management of chemicals throughout their life-cycle, by 2020. Pesticides, including those used in public health, fall within the scope of SAICM, and implementing the International Code of Conduct is seen as a major policy tool to achieve its

1 Basel Convention web site: http://www.basel.int
2 World Health Assembly official records web site: http://apps.who.int/gb/or/
3 International Code of Conduct web site: http://www.who.int/whopes/recommendations/en/
4 SAICM web site: http://www.saicm.org

objective. The promotion of IVM is mentioned in the Global Plan of Action for SAICM as an important approach to reduce the risks of pesticide use.

Implementation of relevant regional policies in the WHO African Region

The WHO Regional Office for Africa and Member States in the region have for long realized that the problem of vector-borne disease can effectively be tackled only through a comprehensive approach including environment issues. In order to promote this concept of IVM, policies, strategies and declarations have been put in place to guide national and districts programme managers.

The *Libreville Declaration on Health and Environment in Africa* (*23*) is the key policy which expresses the commitment of African ministers responsible for human health and the environment to implement sustainable development and reduce environmental impact in efforts to achieve economic growth and health security. The Libreville Declaration calls upon African countries, inter alia, to:

- develop or update national, subregional and regional frameworks in order to address more effectively the issue of environmental impacts on health;
- ensure integration of agreed objectives in the areas of health and environment in national poverty reduction strategies;
- build national, subregional and regional capacities to better prevent environment-related health problems;
- establish or strengthen systems for health and environment surveillance to allow measurement of interlinked health and environment impacts and to identify emerging risks, in order to manage them better.

Formulation of policy for public health pesticide management contributes to the Road Map for implementation of the Libreville Declaration (*24*), and can be seen as an element of formalization of the strategic alliance between health and environment sectors, specifically called for by the Declaration. Such policy development could also be part of the Plans of Joint Action, to be developed by countries, and which will be the overarching operational framework that will embed all specific programmes addressing health and environment at the country level.

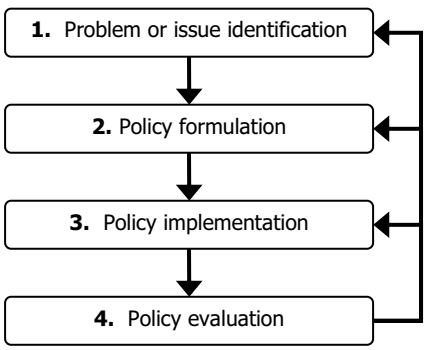
Compliance with national policies and legislation

Member States in the African Region will often have national policies or legislation in the environment, health or commerce sectors which may affect public health pesticide use or management. One can think of general pesticide legislation, which also regulates the distribution and use of public health pesticides; occupational health regulations, which may require policy for vector control staff or pest control operators; environmental legislation, which may affect public health pesticide use and management; or commerce and trade policy, which affects the distribution and sale of public health pesticides. Such national policies and legislation may drive the development of specific policy for public health pesticides.

6. THE POLICY CYCLE

Policy-making is a continuous process with a cyclical nature. Public health pesticide policy is developed with the ultimate aim to solve recognized problems or weaknesses in pesticide use or management, or avoid potential problems occurring. Therefore, as the policy is being implemented, the situation may change (ideally improve); thereby, the prevailing goals will become less relevant. Also, other problems may arise that did not exist earlier, or were not recognized as such. Both policy and the situation it was intended to influence need to be evaluated on a regular basis, and policy should be revised to address the prevailing situations.

The basic policy cycle consists of four steps, as outlined below schematically (*12*).



First, problems or issues that require the development of policy need to be identified. The second step is then to strengthen existing policy or formulate a new one to tackle the identified issue, taking into account the results of existing or past policy. Third, the formulated policy will be implemented. Finally, at some stage the policy being implemented will need to be evaluated to verify whether the intended results were achieved, and new problems or issues were identified. Applying this four-step cycle facilitates organized thinking about policy, but it should be recognized that the actual process may be less orderly, with for instance repeated iterations between steps, before policy can be effectively implemented.

Experience has shown that effective policies can be recognized by a number of general “features”. Adhering to most or all of these features when formulating, implementing and evaluating policy tends to increase the chance of its success (*see* Box 2).

In the following chapters, the four-step policy cycle and the general features of successful policy will be applied to public health pesticide management.

Box 2 – Features of modern policy-making[a]	
Forward looking	
The policy-making process clearly defines the outcomes that the policy is designed to achieve and, where appropriate, takes a long-term view of the likely effect and impact of the policy based on informed predictions of social, political, economic and cultural trends.	The following actions demonstrate a forward looking approach: • preparing, at an early stage, a statement of intended outcomes • including contingency or scenario planning • taking into account the government's long-term strategy
Outward looking	
The policy-making process takes account of factors influencing the national, regional and international situations; draws on experience in other countries; and considers how policy will be communicated with the public.	The following actions demonstrate an outward looking approach: • making use of United Nations and regional mechanisms, etc. • looking at how other countries dealt with the issue • recognizing regional variation within the country • preparing and implementing a communications strategy
Innovative, flexible and creative	
The policy-making process is flexible and innovative, questioning established ways of dealing with things, and encouraging new and creative ideas; where appropriate, it makes established ways work better. Wherever possible, the process is open to comments and suggestions of others. Risks are identified and actively managed, and policy feasibility is explicitly addressed.	The following actions demonstrate an innovative, flexible and creative approach: • using alternatives to the usual ways of working • consciously assessing and managing risks • taking steps to create management structures which promote new ideas and effective team working • bringing in people from outside into policy team or outside the specific field for which the policy is being developed
Evidence-based	
The advice and decisions of policy-makers are based upon the best available evidence from a wide range of sources; all key stakeholders are involved throughout the policy's development. All relevant evidence, including that from specialists, is available in an accessible and meaningful form to policy-makers.	The following actions demonstrate an evidence-based approach: • reviewing existing research • commissioning new research • consulting relevant internal and external experts • considering a range of properly costed and appraised options

Box 2 (continued) – Features of modern policy-making	
Inclusive	
The policy-making process takes account of the impact on and/or meets the needs of all people directly or indirectly affected by the policy; it involves key stakeholders directly.	The following actions demonstrate an inclusive approach: • consulting those responsible for implementation of the policy • consulting those at the receiving end or otherwise affected by the policy • carrying out an impact assessment before implementing the policy • seeking feedback on policy from recipients and front-line deliverers
Joined-up	
The process takes a holistic view; looking beyond institutional boundaries to the government's strategic objectives, and seeks to establish the ethical, moral and legal base for policy. There is consideration of the appropriate management and organizational structures needed to deliver cross-cutting objectives.	The following actions demonstrate a joined-up approach: • defining cross-cutting objectives clearly at the outset • clearly defining and understanding joint working arrangements with other government entities • identifying barriers to effective collaboration and a strategy to overcome them
Learning lessons	
Established policy is constantly reviewed to ensure it is really dealing with problems. Learns from experience of what works and what does not.	The following actions demonstrate a learning approach: • putting in place an ongoing review programme with a range of meaningful performance measures • disseminating information on lessons learnt and good practice • making available an account of what was done by policy-makers as a result of lessons learnt • amending or scrapping redundant or failing policies
Source: adapted from (*25*)	

7. IDENTIFICATION OF PROBLEMS OR ISSUES

The first step in formulation of public health pesticide management policy is the clear definition of problems that need to be solved, or issues that require attention. While the main reason why policy is being developed is often a recognized problem with pesticide management, policy should be forward looking (see Box 2), and should also focus on the prevention of potential new problems occurring. A good example is the elaboration of an insecticide resistance management strategy which aims to prevent or slow down development of resistance in vectors.

A thorough situation analysis may help to better understand the strengths and weaknesses of (or gaps in) public health pesticide management, opportunities and threats that may exist for its improvement, and identify key problems or issues that require policy formulation. As such, the situation analysis provides the evidence underpinning policy formulation.

The management of public health pesticides cuts across various sectors, requiring close collaboration and concerted action by the different ministries, notably those responsible for health, agriculture, the environment, and commerce and trade. Other stakeholders, such as the private sector and civil society, also need to be involved from the start, to get a broad and objective assessment of the situation.

A good national situation analysis will cover many elements, including, but not limited to:

- assessment of the importance and spread of disease vectors and nuisance pests, and the needs for their control;
- current public health pest management practices in vector control and nuisance pest control by households; control options available; the extent to which non-chemical approaches are used optimally or could be developed more intensively; pesticide selection and procurement procedures; and pesticide storage:
- expected future trends in control of vector-borne diseases and nuisance pests;
- adverse effects of public health pesticide use: for example, pesticide resistance, human–animal health effects, environmental impact, and residues in agricultural commodities and their economic consequences;
- legal framework (including international obligations and policies) and its enforcement;
- economic and fiscal practices, impacting on the availability and use of public health pesticides;
- awareness, information and education with respect to pesticide use and management;

- activities carried out by research institutions, the private sector and civil society that are relevant to public health pesticide management: for example, pesticide efficacy evaluation, use of vector control measures such as indoor residual spraying, use of insecticide-treated nets, larviciding, biological control and environmental management, and monitoring and management of insecticide resistance;
- human and financial resources available and required for public health pesticide management;
- donor policies and requirements with respect to disease vector control, including selection and use of insecticides;
- existence and status of any collaboration and coordination between relevant ministries in pesticide management.

The situation analysis should also include the evaluation of any existing or past policy implemented to strengthen public health pesticide management and to assess whether previously proposed measures have been effective. An important aspect of a situation analysis is that it is not limited to a mere description of the situation, but provides a true analysis of strengths, weaknesses and what needs to be done to fill identified gaps. The WHO *Guidelines on situation analysis for public health pesticide management* (26) provide further information on this topic. A situation analysis should ideally be carried out on a regular basis, and can also be part of the policy evaluation step (see Chapter 10).

The situation analysis will likely identify a large number of problems, weaknesses or issues that, according to one or more stakeholders, require attention. Some of these may be more important than others; some are based on better evidence than others; some are better tackled under existing national policy; some may be conflicting with each other; and some are beyond the control of the policy-maker. Since it may not be feasible to address all problems within the proposed time-frame of the policy, key problems or issues that require most urgent attention may need to be identified at this stage.

It is also very important that the problem(s) or issue(s) for which policy needs to be developed are clearly defined. The definition of the problem will be the foundation of any policy development. Before immediately starting to address solutions to a problem, it is essential to step back and invest time and effort to improve the understanding of it. This will result in better-tailored solutions and a more solid justification of the policy that is being developed. Note that ill-defined problems lead to ill-defined solutions.[1]

[1] Simple tools and strategies that may help to better define problems or issues can be found elsewhere (see, for example, (27–29)).

8. POLICY FORMULATION

After problems or potential future problems with public health pesticide management have been identified and clearly defined, policy can be formulated with the aim to solve or prevent them.

As mentioned earlier, ideally, a policy contains a definition of the problem being addressed, a statement of goals (the desired state of affairs) and at least the broad outline of the instruments (approaches and activities) by which the goals are to be achieved.

The following steps in policy formulation can be recognized:

- Set goals, objectives and time-frame
- Set criteria or targets for success
- Identify and select policy instruments
- Draft alternative policy options
- Project outcomes of alternative policy options and assess their impact
- Compare alternative policy options
- Build consensus towards a “best” policy
- Decide the best policy
- Define policy review methods
- Obtain formal endorsement of the policy

In practice, some of these steps may be carried out repeatedly, or simultaneously, before a best policy can be decided upon. Throughout the policy formulation process, the features of modern policy-making (Box 2) should be checked and followed, where feasible.

Set goals, objectives and time-frame
A first step in policy formulation is the definition of the goals, objectives and time-frame of the policy.

Goals are long-term aims that a government wishes to accomplish with respect to public health pest and pesticide management; they are general intentions which often cannot be directly validated. Objectives, on the other hand, describe the more detailed achievements that the policy is designed to attain, under the umbrella of the overall goal. Objectives are frequently written to meet the so-called SMART rules: **S**pecific, **M**easurable, **A**chievable, **R**elevant and **T**ime defined. It is important to set a time-frame for the implementation of the policy. It is worthwhile to try to define goals and objectives in a clear and “eye-catching” manner, so that they are appealing to decision-makers and stakeholders.

Obviously, goals and objectives of the policy should aim to solve the problems and address the issues that were identified under the previous identification

step in the policy cycle (see Chapter 7). Care should also be taken that goals and objectives which are defined for a public health pesticide management policy are in concordance with, or at least do not contradict, more general national policy with respect to vector-borne disease control, or nuisance pest management, chemicals or pesticide management, and public health and environmental regulations.

Set criteria or targets for success

Together with the definition of policy goals and objectives, criteria or targets should be identified that can be used to assess whether the policy eventually results in meeting its objectives. Such criteria are preferably quantitative, for example, a reduction in the number of cases of pesticide poisoning; a reduction in substandard, illegal and counterfeit products in the market; and increased cost-effectiveness of vector-control interventions, but may also be (semi-) qualitative, for example, improved pesticide storage practices; strengthened legal basis for management of public health pesticides; and improved pest and vector control services.

Criteria for success will not only be used to evaluate policy implementation, but can already also be applied in the policy formulation process when different policy alternatives are compared and their impact assessed (see below).

Identify and select policy instruments

A large number of instruments, tools and approaches exist that can be used to build a policy. These fall into four broad categories (*30*, *31*):

- **Suasive approaches:** policy tools that encourage changes in behaviour towards sound management of pesticides through the provision of information, such as via general education programmes, guidelines and codes of practice, training programmes, extension services, and research and development.
- **Regulatory approaches:** require changes in behaviour by introducing penalties for parties who do not comply with the regulatory provisions. Types of regulatory instruments include standards (including planning instruments), licensing, mandatory management plans and covenants.
- **Market-based instruments:** policy tools that encourage behavioural change through market signals rather than through explicit directives. There are a range of types of market-based instruments, including trading schemes, subsidies and grants, accreditation systems, stewardship payments and taxes.
- **Public provision of services:** often used where the management solution has the characteristics of a “public good” which make it difficult for the service to be provided by the private sector.

Box 3 provides some examples of policy instruments that can be used to promote sound public health pesticide management. References to relevant

background information on such policy instruments available from other sources are also provided.

When identifying and selecting policy instruments that could be included in a public health pesticide management policy, it is important to assess whether the instrument can be realistically applied in the country. On the other hand, policy development can also be used to introduce innovative approaches, and doubts regarding present feasibility should not necessarily preclude introduction of a new approach (see Box 3).

Generally, a public health pesticide management policy contains a mix of policy instruments. This is because many pesticide management problems are multi-faceted and relate to various sectors (e.g. illegal pesticide sales may have its origins in regulatory, economic or awareness aspects). Also, certain policy instruments can mutually strengthen each other (e.g. collection of sales statistics, information provision to retailers and enforcement may mutually strengthen good pesticide sales practices). Sometimes, such mixes can also enhance enforcement possibilities or reduce administrative costs.

However, when applying several policy instruments in a mix, care has to be taken that one instrument will not unnecessarily hamper the flexibility of finding low-cost solutions to a problem that another instrument could have offered if it had been used on its own. In other cases, some of the instruments in a mix are simply redundant, contributing only to increase total administrative costs.

Draft alternative policy options

It may be good practice to develop a number of alternative policy options to address the same problem or issue. There are generally many different ways of dealing with a pesticide management problem, and it tends to be very helpful to make different policy options explicit by writing them up. This will allow a more transparent and objective comparison between policy options, and choosing the most appropriate one for the country.

As a minimum, two policy alternatives should always be compared: the new policy and the “do nothing” option.

Project outcomes of alternative policy options and assess their impact

An important step in policy evaluation is the projection of the outcomes of each of the alternative policy options. These are, as much as possible, quantified predictions of the results that the option is likely to have. As a minimum, it should be assessed to what extent the criteria for success that were identified in an earlier step in the policy formulation process have been satisfied by each of the alternative policy options.

In addition, an impact assessment should be made, which outlines the expected impact each policy option will have on the various stakeholders. These include the private sector, the general public and government institutions.

Prediction of policy outcomes and impacts is unfortunately often not a very precise science, and generally a high level of uncertainty will be unavoidable. However, as this uncertainty will often apply to all policy alternatives in the same manner, comparisons between them can still provide very useful information.

Box 3 – Selected policy instruments that can be incorporated into a national public health pesticide management policy				
Examples of intended outcomes of a public health pesticide (PHP) management policy (not exhaustive)	**Examples of policy instruments, according to the type of approach** (not exhaustive)			
	Suasive approaches (policy tools that encourage changes in behaviour through the provision of information)	**Regulatory approaches** (require changes in behaviour by introducing penalties for parties who do not comply with the regulatory provisions)	**Market-based instruments** (policy tools that encourage behavioural change through market signals rather than through explicit directives)	**Public provision of services** (often used where the management solution has the characteristics of a "public good" which make it difficult for the service to be provided by the private sector)
Strengthened legal basis for management of PHPs	Advocacy and awareness building for political commitment	Establish comprehensive pesticide legislation (*32*, *33*)		
Reduced illegal imports of PHPs	Build awareness on risks of using illegal PHPs	Establish licensing scheme for PHP distribution and sales Increase fines for illegal imports		Build effective compliance monitoring and enforcement (*34*)
Reduced presence of substandard PHPs	Build awareness on risks of using substandard PHPs	Set quality standards for PHPs Use WHO pesticide quality specifications where available (*36*)		Establish effective national pesticide quality control system (*18*, *35*)
Increased cost-effectiveness of vector control	Promote IVM (*8*) Train vector control staff (*37*, *38*)		Register more products for the same use (increased competition)	Establish IVM projects

Box 3 – Selected policy instruments that can be incorporated into a national public health pesticide management policy

Examples of intended outcomes of a public health pesticide (PHP) management policy (not exhaustive)	**Examples of policy instruments, according to the type of approach** (not exhaustive)			
	Suasive approaches (policy tools that encourage changes in behaviour through the provision of information)	**Regulatory approaches** (require changes in behaviour by introducing penalties for parties who do not comply with the regulatory provisions)	**Market-based instruments** (policy tools that encourage behavioural change through market signals rather than through explicit directives)	**Public provision of services** (often used where the management solution has the characteristics of a "public good" which make it difficult for the service to be provided by the private sector)
Insecticide resistance development prevented or slowed down	Promote IVM (*8*) Train vector control staff (*37*, *38*) Promote insecticide resistance monitoring and management	Restrict registration according to mode of action	Reduce registration fees for insecticides with new modes of action	Develop a resistance management strategy, in collaboration with ministry of agriculture and other stakeholders (*39*)
Reduced risks of vector control for human health and the environment	Promote IVM (*8*) Build awareness on using ITNs/LNs Establish pesticide risk reduction targets or schemes (voluntary)	Register low-risk insecticides (*33*) Restrict moderate/high-risk insecticides in vector control Establish pesticide risk reduction targets or schemes (legally binding)	Subsidize LNs	Establish IVM projects Fund public research in biological control and environmental management

Box 3 – Selected policy instruments that can be incorporated into a national public health pesticide management policy				
Examples of intended outcomes of a public health pesticide (PHP) management policy (not exhaustive)	**Examples of policy instruments, according to the type of approach** (not exhaustive)			
	Suasive approaches (policy tools that encourage changes in behaviour through the provision of information)	**Regulatory approaches** (require changes in behaviour by introducing penalties for parties who do not comply with the regulatory provisions)	**Market-based instruments** (policy tools that encourage behavioural change through market signals rather than through explicit directives)	**Public provision of services** (often used where the management solution has the characteristics of a "public good" which make it difficult for the service to be provided by the private sector)
Reduced incidence of pesticide poisoning by household pesticides	Build awareness on risks of household pesticides Create awareness on low-risk use of pesticides	Only register of low-risk household insecticides (*33*) Prescribe comprehensible pesticide labelling (*40*) Ensure public and private entities incorporate public education in their PHP delivery services	Reduce registration fees for low-risk pesticides as incentive to industry to bring low/risk products on the market Ensure agreed % of revenue to be used for public education	Strengthen compliance monitoring and enforcement in supermarkets and retail shops
Improved pest and vector control services	Train vector control staff (*37*, *38*) Train private pest control operators (*38*)	Establish certification scheme for vector control staff Establish licensing scheme for private pest control operators	Establish association of private pest control operators	Elaborate technical guidelines
Sustainable funding for pesticide management available.	Advocacy and awareness building for political commitment	Include cost/recovery mechanisms in pesticide legislation	Introduce import/sales taxes on pesticides	Allocate adequate human and financial resources

Box 3 – Selected policy instruments that can be incorporated into a national public health pesticide management policy

Examples of intended outcomes of a public health pesticide (PHP) management policy (not exhaustive)	**Examples of policy instruments, according to the type of approach** (not exhaustive)			
	Suasive approaches (policy tools that encourage changes in behaviour through the provision of information)	**Regulatory approaches** (require changes in behaviour by introducing penalties for parties who do not comply with the regulatory provisions)	**Market-based instruments** (policy tools that encourage behavioural change through market signals rather than through explicit directives)	**Public provision of services** (often used where the management solution has the characteristics of a "public good" which make it difficult for the service to be provided by the private sector)
Accumulation of obsolete pesticide stocks avoided.	Train vector control managers on PHP needs assessments and procurement (*41*, *42*)	Centralize PHP procurement	Include provisions in tender documents for return of substandard PHPs by the supplier at their own cost (*41*, *42*)	

ITN = insecticide-treated net; IVM = integrated vector management; LN = long-lasting insecticidal mosquito net; PHP = public health pesticide

Further information on policy instruments that may be relevant to pesticide management is provided by, for instance, FAO (*31*), OECD (*43*) or MBI (*30*).

Compare alternative policy options
When the outcomes and impact of the alternative policy options have been assessed, it is possible to compare them in a relatively objective manner. Comparisons can be made between evaluation criteria based on outcomes, impact and degree of success.

A relatively simple way of summarizing different policies is in a comparative matrix, with the alternatives along one axis and the evaluation criteria on the other. This also allows quantitative and qualitative information to be combined.

Build consensus towards a "best" policy
Rarely will there be only one acceptable or appropriate alternative policy. In some cases, two alternatives may have roughly similar results. More often, different stakeholders will have preferences for different policy options, based on their specific interests (e.g. while stricter enforcement of regulations may appeal to the Ministry of Health, awareness building and self-regulation may be preferred by the pesticide industry). Furthermore, none of the alternatives is likely to be perfect, in that the policy completely resolves all identified problems.

Therefore, consensus needs to be sought among the stakeholders as to what is the most appropriate and most effective policy to be adopted to strengthen public health pesticide management. Consensus-building often takes the form of intersectoral meetings, one-on-one discussions, and information and awareness activities.

It may well be that to achieve consensus, a best policy is crafted based on elements from different alternatives. In such a case, it is wise to re-assess impact and expected outcomes of the new consensus policy.

Decide the best policy
As public health pesticide management policy is in the end a public affair, the government will have to make a final decision on the best policy to be implemented. Whenever possible, such a decision should be made on the basis of consensus among the major stakeholders. However, in many cases, complete consensus may not be reached, and the government has the last word. Decision-making will then often be guided by more overarching national policies with respect to public health, environment, agriculture or commerce/trade (e.g. the protection of human health may take precedence over economic costs; or reduction of vector-borne disease levels may take precedence over environmental protection).

Define monitoring and evaluation methods
Systematic monitoring and evaluation should be built into the policy, to ensure that it is really dealing with the problems it was designed to solve, and to assess its effectiveness in doing so. Meaningful performance indicators should be defined at this stage. Both internal monitoring and evaluation methods (by the

implementing entity) and external ones (either by independent evaluators or by those affected by the policy) should ideally be defined (see Chapter 10).

Obtain formal endorsement of the policy
For a public health pesticide management policy to be implemented effectively, it is essential that high-level endorsement is given to the policy. Since pesticide management is a multi-sectoral and multi-stakeholder activity, endorsement at the level of the Council of Ministers (or similar) is recommended. In some countries, the policy may be published in the official government gazette.

In addition, formal endorsement by nongovernmental stakeholders, in particular the pesticide industry, consumer groups and other civil society organizations and pest control operators, greatly strengthens and facilitates implementation of the policy. Whenever possible, such endorsement should also be sought.

To ensure sustainability of the policy, it may be important to incorporate its main goal and objectives in the general national development or health policies/strategies (sometimes referred to as “mainstreaming” of the policy). This also tends to facilitate future mobilization of resources.

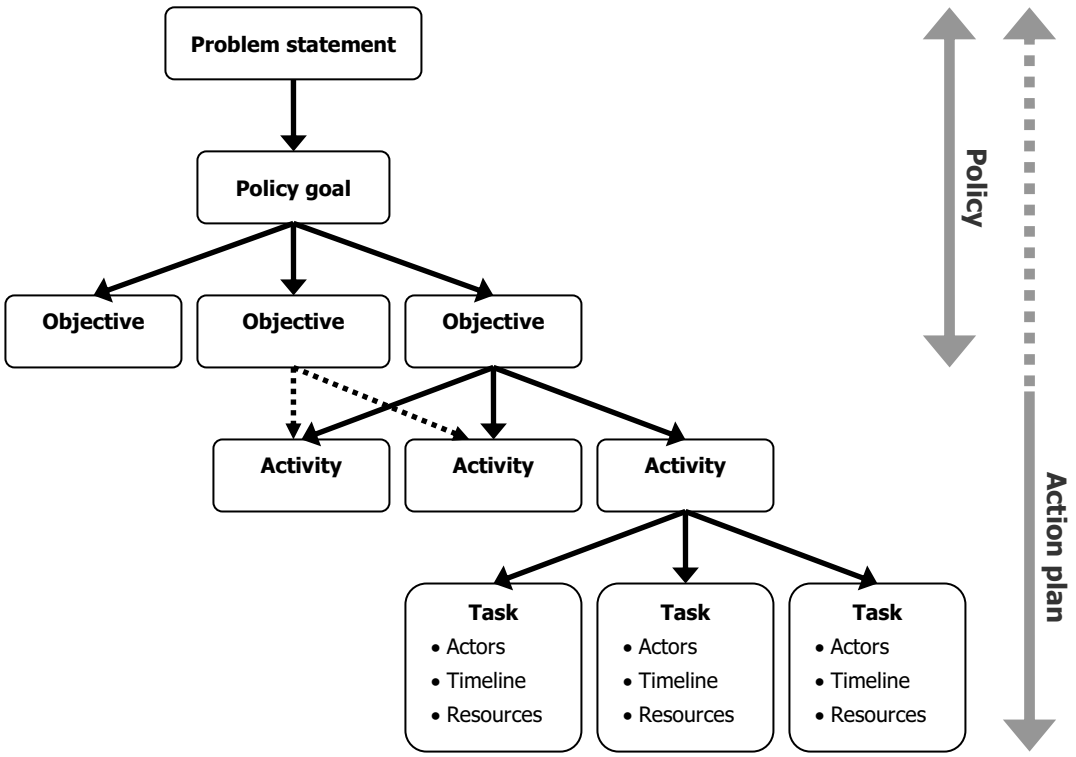
9. POLICY IMPLEMENTATION

9.1 Action plan

Elaborating one or more policy action (or implementation) plans is the next step in the policy cycle. An action plan is the detailed description of what exactly needs to be done to achieve one or more objectives, who is going to carry out the activities, when these need to be done and what resources are required.

If the objectives of the public health pesticide management policy cover a wide range of very different topics, it may be practical to elaborate more than one action plan. This can sometimes facilitate the execution and allocation of resources. However, if more action plans are elaborated, care should be taken to ensure that they are complementary to each other and effectively coordinated.

Policy action plans come in many types and formats. Generally, the action plan summarizes the problem statement, policy goals and objectives as outlined in the policy, and then describes in more detail the required activities and tasks needed to achieve those objectives. The hierarchical relationship between policy and action plan is schematically shown below (*44*).



Define activities

Activities are the highest level of action in an action plan and can be defined as an element of work performed during the course of a project. An activity has an expected duration, cost and resource requirements. In some cases, activities will only address one objective, while in other cases they will help to deliver multiple objectives.

One approach to identifying and selecting activities for implementing an action plan begins with a brainstorming session. Participants can identify any activities that they believe will help to reach the objective(s). These suggestions can be collected and compared, providing a comprehensive list which can then be assessed in order to develop an effective and logical set of activities.

Break down activities into tasks

Since the activities are typically large elements, they will need to be broken down into more manageable tasks. Activities should only be broken down to a level which enables effective estimation of time and resource requirements, and provides enough information for those responsible for the particular activity or task. Breaking down activities into too much detail overemphasizes the role of planning and makes it difficult to easily obtain an overview.

Consider order of activities and tasks
After a comprehensive list of activities and tasks has been established, it is important to assess how they relate to each other in order to determine the necessary sequence of implementation and identify any dependencies. In other words, which activities/tasks can begin immediately? Which activities/tasks need to be completed before others can begin? Do some activities/tasks need to start at the same time?

Estimate realistic activity time-frames
Estimating how much time each activity/task will likely require to be completed is essential to developing an effective action plan. While the duration of each task, at this stage, can only be an estimate (be prepared to adjust the action plan during its implementation), the durations should be carefully estimated to ensure that the action plan is as accurate as possible.

If funds are in place for the implementation plan, it would already be possible to set the specific start and finish dates for each activity/task. Where this is not possible, a format independent of specific dates can be used, such as “month 1, month 2”, etc.

If human or financial resources are (likely to be) limited, it may be better to choose for a phased implementation of the action plan, based on priorities and logical order of activities.

Develop project milestones
Project milestones are reference points that mark clearly distinguishable events in the plan that can be used to monitor whether their implementation is on track as planned. Milestones are often intermediate targets that must be successfully achieved before further activities can be initiated.

Define required resources
A range of resources are typically required to implement an action plan. These may include infrastructure, human resources, facilities, equipment, materials, travel and training. It is important to be as accurate as possible when estimating resource requirements at this stage, since the more accurate the estimates are, the less likely that the plan will run into problems during implementation (and require requests for additional funds).

Identify actors and allocate responsibilities
This step helps to determine, in a preliminary manner, which actors (e.g. specific ministries/departments, local governments, private sector associations, nongovernmental organizations, civil society organization, research institutions) should be involved in carrying out each activity and task. It is useful to be as specific as possible as to the identified actors (e.g. the vector control programme of the Ministry of Health rather than the Ministry of Health in general). If more actors are involved in carrying out an activity or task, as will

often be the case, one should be assigned as a “lead actor” and take final responsibility for the activity/task.

Further detailed guidance on action plan development is provided elsewhere (*44*).

9.2 Implementation process

Based on the action plan that has been elaborated, various elements should be taken into account with the aim to facilitate policy implementation.

Allocation of resources
Allocation of adequate human and financial resources is crucial to successful policy implementation.

The public health pesticide management policy in itself can be used to mobilize resources. In particular when the policy is subsequently mainstreamed in general governmental development, health or environmental policies or strategies, both governments and donors may allocate resources more easily. Certain elements of a public health pesticide management action policy can, or should, also be funded by the private sector.

Country representations of relevant United Nations organizations, such as WHO, FAO and UNEP, can also be contacted to assist in resource mobilization, in particular across sectors.

Coordination
To ensure effective execution of the identified policy activities, it is generally recommended that one government entity (often the Ministry of Health) will oversee policy implementation. However, since the implementation of a public health pesticide management policy is by definition multi-sectoral, continuous and effective coordination both within government and among stakeholders is very important. Coordination at the national level is important to exchange information, strengthen collaboration, ensure complementarity and avoid duplication, step up advocacy to raise awareness and to enhance stakeholder involvement.

Examples of coordination mechanisms at the national level are:

- inter-ministerial pesticide registration board;
- inter-ministerial integrated vector management committee;
- inter-ministerial working group on pesticide risk reduction;
- advisory groups on pesticide management, involving both relevant ministries and other nongovernmental stakeholders;
- national workshops on public health pesticide management, implicating a broad audience.

International or regional coordination and information exchange may also be needed, in particular for activities that address transboundary problems, or when greater efficiency can be achieved by regional or international collaboration. Examples are pesticide registration, efficacy testing of vector control insecticides, pesticide risk assessment and control of illegal pesticide trade or of counterfeit products.

Information and awareness of stakeholders
Awareness building and information provision about the public health pesticide management policy, and the reasons why a government has adopted it, are crucial to obtain support for the policy's implementation from decentralized government entities, nongovernmental stakeholders and the general public.

Also, during policy implementation, stakeholders should be kept informed about progress, achievements and possible constraints. Transparency and public access are important elements.

Phased implementation
In some cases, it may not be possible to implement the entire policy action plan at once, for instance when human or financial resources are limited. In such cases, phased implementation of the plan can be considered. Various options can be chosen for phased implementation, such as starting with activities that are considered to be high priority or with activities which come early in the timeline of the action plan. Care should be taken, however, that if for any reason no further resources for implementation would become available, the chosen activities lead to results that independently achieve a part of the policy objectives.

Another option for phased implementation is to initiate the action plan in a restricted geographical area, for example in one or several provinces/districts. This may be particularly useful if innovative policy instruments or approaches have been chosen that require further validation and evaluation in the field. Based on lessons learnt in a limited area, the policy can then be widened subsequently.

10. POLICY MONITORING AND EVALUATION

As outlined in Chapter 7, policy-making is a continuous process with a cyclical nature. Regular monitoring of the policy and its implementation are important to ensure that it solves the problems it was designed to address. Systematic evaluation of the effectiveness of the policy assesses its actual results and impact. Lessons learnt can then be used to improve implementation of the existing plan, identify other problems or constraints and formulated new or updated policy (*45*, *46*).

Monitoring can be defined as the ongoing process by which stakeholders obtain regular feedback on the progress being made in implementing activities towards achieving the goals and objectives of the policy. Monitoring is primarily done by using process indicators. However, monitoring should ideally not be limited only to asking the question “are we taking the actions we said we would take?” (i.e. the process) but also “are we making progress on achieving the results that we said we wanted to achieve?” (i.e. the results). Monitoring of the performance of public health pesticide management policy, and its action plan(s), should be carried out regularly during its implementation, at least by the implementing agency itself (generally the Ministry of Health).

Evaluation is a more rigorous and independent assessment of either a completed or an ongoing policy to measure outcomes and impact in order to determine the extent to which it is achieving its stated objectives. To be able to properly evaluate the success of a public health management policy, data need to be analysed on pesticide use, efficacy, costs, human and environment impact, etc. Such data may not be systematically available in a country, in which case the collection of relevant data should be an integral part of the policy implementation plan.

The key distinction between monitoring and evaluation is that the latter is done independently to provide managers and staff with an objective assessment of whether or not the performance is on track and expected outcomes could be achieved within the time-frame set. Evaluation also tends to be more rigorous in its procedures, design and methodology, and generally involves more extensive analysis. Policy evaluation should at least be done at the end of the policy time-frame, but also on a more periodic basis if appropriate. However, the aims of both monitoring and evaluation are very similar: to provide information that can help inform decisions, improve performance and achieve planned results.

Box 4 provides some selected indicators that may be used to assess performance of implementation and evaluate effectiveness of a public health pesticide management policy.

The table distinguishes between process, output and impact indicators. For the purpose of these guidelines, process indicators tend to focus on resources, and measure ways in which services and goods are provided, including resources devoted to a particular activity (e.g. time, money, staff, materials, infrastructure). Output indicators focus on activities, and measure the quantity of goods and services produced and the efficiency of production. Impact indicators focus on the policy goal and measure the degree to which the policy objectives have been attained.

It should be stressed that this list is not exhaustive, and appropriate indicators should be defined at the national level, based on the exact contents of the policy and its implementation plan.

Box 4 – Selected indicators to monitor and evaluate the performance and impact of a public health pesticide management policy

Intended outcome of policy (not exhaustive)	**Indicator** (not exhaustive)	**Type**			**Limitations of the indicator for monitoring and evaluation**	**Data needed to measure the indicator**
		Process	Outcome	Impact		
Reduced risks of vector control for human health and the environment	Registration procedure or criteria amended to limit the authorization of hazardous PHPs	x			Does not mean that fraction of registered low hazard PHPs has increased	
	Number of trained staff in sound PHP application and disposal	x			Does not necessarily indicate quality or technical capacity of staff	Training statistics
	Number of IVM projects	x			Does not necessarily result in effective implementation of IVM	Project data from different stakeholders
	% of registered PHPs which are low hazard[1]		x		Does not indicate trends in actual use	List of registered PHPs
	% of volume of PHPs used which are low hazard		x		Indicates trends in use, but not necessarily in risk	PHP use statistics
	Quantity of toxic units[2] of PHPs used		x		Indicates trends in hazard, but not necessarily in risk	PHP use statistics Basic toxicity data (e.g. LD_{50}, NOAEL) for each PHP
	Coverage/use rate of LNs		x		Achieves risk reduction only if LN use replaces or reduces IRS applications and/or ITNs	LN distribution and use statistics

[1] Low-hazard pesticides may, for instance, be defined as those pesticide products that are "unlikely to present any acute hazard in normal use", according to the *WHO Classification of pesticide by hazard* (*47*).

[2] A "toxic unit" may, for instance, be defined as the total volume of PHPs used during a given time period and in a determined geographical area divided by a relevant toxicity endpoint (e.g. acute LD_{50}, chronic NOAEL) (*48*, *49*).

Box 4 – Selected indicators to monitor and evaluate the performance and impact of a public health pesticide management policy

Intended outcome of policy (not exhaustive)	**Indicator** (not exhaustive)	**Type**			**Limitations of the indicator for monitoring and evaluation**	**Data needed to measure the indicator**
		Process	Outcome	Impact		
	Number of poisoning cases caused by PHPs (per population)			x	Results may not be directly linked to regular practices of PHP use	Representative and sufficiently detailed poisoning statistics PHP use statistics
	Quantity of toxic units of PHPs used per prevented disease case			x	Indicates trends in hazard, but not necessarily in risk	PHP use statistics Basic toxicity data (e.g. LD_{50}, NOAEL) for each PHP Coverage of PHP applications Disease statistics (e.g. DALYs)
Improved pest and vector control services	Good practice guidelines published	x			Does not mean that good practices are followed	
	Number of staff trained in good PHP management and/or IVM	x			Does not necessarily indicate quality or technical capacity of staff	Training statistics
	Certification scheme and/or certified training for vector control staff established and operational	x			Does not necessarily indicate quality or technical capacity of staff	
	Licensing scheme for PCOs established and operational	x			Does not necessarily indicate quality or technical capacity of PCOs	
	% of national vector control staff trained in good PHP management and/or IVM		x		Does not necessarily indicate quality or technical capacity of staff	Training statistics National staff statistics

Box 4 – Selected indicators to monitor and evaluate the performance and impact of a public health pesticide management policy						
Intended outcome of policy (not exhaustive)	**Indicator** (not exhaustive)	**Type**			**Limitations of the indicator for monitoring and evaluation**	**Data needed to measure the indicator**
		Process	Outcome	Impact		
	% of vector control operators that has been certified or trained		x		Does not necessarily indicate quality or technical capacity of staff	Certification statistics Vector control staff statistics
	Increased cost-effectiveness of vector control			x		*(see separate policy outcome for details)*
Reduced presence of substandard PHPs	National PHP quality standards established	x			Does not necessarily mean that standards are followed	
	Pesticide quality control system established and operational	x			Does not necessarily mean that quality is acceptable	
	Number of samples analysed	x			Does not necessarily mean that quality is acceptable	Analysis statistics from quality control laboratories
	% of PHPs on the market that are substandard		x		Does not necessarily represent the volume of substandard PHPs on the market	Quality control data for a representative sample of products
	Reduced risks of vector control for human health and the environment			x		*(see separate policy outcome for details)*
	Increased cost-effectiveness of vector control			x		*(see separate policy outcome for details)*

Box 4 – Selected indicators to monitor and evaluate the performance and impact of a public health pesticide management policy

Intended outcome of policy (not exhaustive)	**Indicator** (not exhaustive)	**Type**			**Limitations of the indicator for monitoring and evaluation**	**Data needed to measure the indicator**
		Process	Outcome	Impact		
Insecticide resistance development prevented or slowed down	National resistance management strategy developed and adopted	x			Does not mean that the strategy is effective in reducing resistance development	Data on resistance development in the country
	Number of staff trained in resistance management	x			Does not necessarily indicate quality or technical capacity of staff	Training statistics
	Number of staff trained in resistance monitoring	x			Does not necessarily indicate quality or technical capacity of staff	Training statistics
	Number of foci where resistance is monitored	x			Does not mean that resistance management measures have been taken	Resistance monitoring statistics
	% of national vector control staff trained in resistance monitoring or management		x		Does not necessarily indicate quality or technical capacity of staff	Training statistics National staff statistics
	% of monitoring foci in which insecticide resistance is observed		x		May not indicate the actual importance of resistance	Resistance monitoring statistics
Increased cost-effectiveness of vector control	Per capita cost of insecticide applied per year (including operational costs)	x			Does not include effectiveness	Insecticide and operational costs Intervention coverage rate
	Studies of insecticide efficacy completed according to WHO protocol	x			Does not include costs	Records of the national malaria control programme or research institutes

Box 4 – Selected indicators to monitor and evaluate the performance and impact of a public health pesticide management policy

Intended outcome of policy (not exhaustive)	**Indicator** (not exhaustive)	**Type**			**Limitations of the indicator for monitoring and evaluation**	**Data needed to measure the indicator**
		Process	Outcome	Impact		
	Cost of vector control per disease case averted per capita per year			x		Incidence/parasite rate Insecticide and operational costs Intervention coverage rate

DALY = disability-adjusted life-year; IRS = indoor residual spraying of insecticides; IVM = integrated vector management; LD_{50} = median lethal dose; LN = long-lasting insecticidal mosquito net; NOAEL = no observed adverse effect level; PCO = pest control operator; PHP = public health pesticide

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