REDUCING HEALTH RISKS THROUGH SOUND MANAGEMENT OF PESTICIDES

PROJECT REPORT

WORLD HEALTH ORGANIZATION
CONTROL OF NEGLECTED TROPICAL DISEASES (NTD)
WHO PESTICIDE EVALUATION SCHEME (WHOPES)
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Vector-borne diseases, such as malaria, dengue, leishmaniasis and Chagas disease, continue to inflict a major burden on human populations. The control of malaria has been intensified in the past decade, relying to a substantial degree on the action of chemical pesticides to control vector populations or reduce disease transmission. It is critical that these vector control pesticides are used for their acceptable purpose without causing adverse effects on human and animal health and the environment.

The *International code of conduct on pesticide management*¹ provides voluntary standards for all public and private entities engaged in, or associated with, the distribution and use of pesticides, and serves as a globally-accepted standard for pesticide management.

Countries at risk of malaria and/or other vector-borne diseases, however, face major challenges in managing vector control pesticides and other public health pesticides, which include pesticides for use by households and pest control operators. The challenge is greatest under decentralized health systems.

Many countries, even those with longstanding vector control programmes, lack capacity to regulate the availability and use of pesticides for vector control purposes. Proper management of pesticides throughout their life-cycle – from product development to waste disposal – requires legislation, regulatory control, operational guidelines and procedures, training, informing the public, and evaluation.

The goal of the project *Reducing health risks through sound management of pesticides* was to reduce the health risks of pesticides through their sound management by facilitating the establishment of national regulatory frameworks; optimizing and harmonizing registration procedures; strengthening capacity on post-registration monitoring, evaluation and control of public health pesticides; and reducing trade in substandard pesticide products.

The project’s objectives were:

- To facilitate the establishment of national regulatory frameworks and optimize the registration of public health pesticides;

- To strengthen country capacities on the sound management of pesticides, including their judicious use, and to reduce the health and environmental impacts of pesticide use/application; and

- To reduce trade in substandard pesticide products.

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¹ Available at: http://www.fao.org/agriculture/crops/core-themes/theme/pests/code/en/
The project was implemented over a six-year period (from July 2007 to July 2013) and administered by the WHO Pesticide Evaluation Scheme (WHOPES) of the WHO Department of Control of Neglected Tropical Diseases, in close collaboration with WHO’s regional and country offices and with the Food and Agriculture Organization of the United Nations (FAO). The main achievements of the project are presented in this report under the following themes:

1. **Creating an evidence-base** on global pesticide registration and management practices in countries endemic for, or at risk of, major vector-borne disease, to inform future activities and investments for sound management of public health pesticides;

2. **Enhancing awareness and increased political support** on the judicious use of public health pesticides and the resulting reduction of health risks through information exchange;

3. **Developing peer-reviewed, authoritative guidelines, norms and standards** on different aspects of pesticide registration and management;

4. **Providing technical support and training to priority countries** on public health pesticide registration, regulation and management; and

5. **Facilitating multisectoral approach and collaboration** to pesticide management at international and national levels.
2.1 CREATING AN EVIDENCE-BASE

Strategies to improve pesticide management should be rooted in evidence of the current situation. The evidence base serves as a reference to inform future plans for optimizing and harmonizing public health pesticide registration procedures and post-registration regulation; for developing strategies and action plans for capacity-strengthening of WHO Member States; and for mobilizing required resources. Until recently, the global evidence base on the management and use of public health pesticides has been sketchy. In response, the Project conducted two global surveys among Member States endemic with or at risk of major vector-borne diseases that were unique in scope and number of responding countries: one on the public health pesticide registration and management practices and another one on the use of insecticides for vector-borne disease control.

The results of the survey on public health pesticide registration and management practices (an overall response rate of 80% – 113 out of 142 targeted countries – covering 94% of the population targeted) present a dire picture of the global situation. The shortcomings are evident across the entire spectrum of pesticide management practices and most striking for policy and capacity, quality control and safety. These findings, published in a WHO document and in peer-reviewed journals, as listed below, suggest that the basic standards, rules and practices needed to effectively and safely manage public health pesticides are not in place in a large segment of countries endemic for or at risk of vector-borne diseases, with the African situation below the global average on most of these parameters (Table 1).

- Public health pesticide registration and management practices by WHO Member States. Geneva, World Health Organization, 2011.1


1 Available at: http://whqlibdoc.who.int/publications/2011/9789241501217_eng.pdf
To review global patterns in vector control insecticide use, all countries with vector control programmes in place were requested to provide annual data on insecticide use for vector-borne disease control (excluding long-lasting insecticidal nets, LNs; excluding other types of public health pesticides) for the period 2000–2009. Data received from 125 countries, supplemented by unpublished data previously reported to WHO, are published in WHO and peer-reviewed journals; these data showed a very high global coverage of human populations in the targeted countries. It is noted that the global use of vector control insecticides is increasingly being dominated by pyrethroids (in terms of surface area covered) (Figure 1). This could accelerate the development of resistance to these chemicals, which is a concern because pyrethroids are also used for manufacturing LNs. It is vital that the effectiveness of this important malaria control tool is preserved for as long as possible through insecticide resistance management. Further, it is notable that the global use of DDT did not decline after 2004, when the Stockholm Convention went into effect. These data refer only to vector control insecticides. The total use of public health pesticides will be much higher, particularly due to the use of household pesticides by the general public. Global data on household pesticide use are lacking but require further study. Project publications on use of insecticides for vector-borne disease control are:


Table 1. Summarized results on the global situation (113 countries), and the situation in the WHO African Region (30 countries), on public health pesticide (PHP) management. Data indicate the percentage of countries that responded positively to each item

<table>
<thead>
<tr>
<th>Item</th>
<th>Global</th>
<th>African region</th>
</tr>
</thead>
<tbody>
<tr>
<td>a. Legislation</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Legislation on pesticides in place</td>
<td>84%</td>
<td>73%</td>
</tr>
<tr>
<td>Legislation covers PHPs</td>
<td>89%</td>
<td>82%</td>
</tr>
<tr>
<td>Legislation for labeling</td>
<td>72%</td>
<td>63%</td>
</tr>
<tr>
<td>Legislation for safe storage</td>
<td>72%</td>
<td>60%</td>
</tr>
<tr>
<td>Legislation for safe transport</td>
<td>63%</td>
<td>47%</td>
</tr>
<tr>
<td>Legislation for proper disposal</td>
<td>56%</td>
<td>53%</td>
</tr>
<tr>
<td>b. Registration</td>
<td></td>
<td></td>
</tr>
<tr>
<td>One authority for pesticide registration</td>
<td>71%</td>
<td>82%</td>
</tr>
<tr>
<td>Registration guidelines available for PHPs</td>
<td>61%</td>
<td>45%</td>
</tr>
<tr>
<td>Participation in Reg. registration scheme</td>
<td>48%</td>
<td>77%</td>
</tr>
<tr>
<td>Registration in country of origin required</td>
<td>71%</td>
<td>63%</td>
</tr>
<tr>
<td>Local data required for registration</td>
<td>57%</td>
<td>79%</td>
</tr>
<tr>
<td>Reregistration required</td>
<td>73%</td>
<td>66%</td>
</tr>
<tr>
<td>c. Vector control policy and capacity</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Code of Conduct used</td>
<td>72%</td>
<td>83%</td>
</tr>
<tr>
<td>IVM policy in place</td>
<td>62%</td>
<td>53%</td>
</tr>
<tr>
<td>Vector control unit in place</td>
<td>69%</td>
<td>60%</td>
</tr>
<tr>
<td>All trained on vector control</td>
<td>21%</td>
<td>7%</td>
</tr>
<tr>
<td>All trained on pesticide management</td>
<td>16%</td>
<td>7%</td>
</tr>
<tr>
<td>d. Procurement of vector control insecticides</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guidance document for procurement available</td>
<td>52%</td>
<td>50%</td>
</tr>
<tr>
<td>Procurement through public tenders</td>
<td>76%</td>
<td>86%</td>
</tr>
<tr>
<td>After-sale stewardship required</td>
<td>53%</td>
<td>48%</td>
</tr>
<tr>
<td>e. Quality control</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Pesticide quality control laboratory present</td>
<td>50%</td>
<td>40%</td>
</tr>
<tr>
<td>Pest control operators require certification</td>
<td>70%</td>
<td>77%</td>
</tr>
<tr>
<td>Certification scheme for applicators in place</td>
<td>40%</td>
<td>47%</td>
</tr>
<tr>
<td>Quality control scheme for equipment in place</td>
<td>35%</td>
<td>27%</td>
</tr>
<tr>
<td>f. Safety</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Guidelines for monitoring applicator exposure</td>
<td>43%</td>
<td>33%</td>
</tr>
<tr>
<td>Programme for monitoring applicator exposure</td>
<td>26%</td>
<td>13%</td>
</tr>
<tr>
<td>Safety awareness programme in place</td>
<td>41%</td>
<td>40%</td>
</tr>
<tr>
<td>Regulations on pesticide advertisement</td>
<td>49%</td>
<td>67%</td>
</tr>
<tr>
<td>Regulations on reuse of pesticide containers</td>
<td>50%</td>
<td>41%</td>
</tr>
<tr>
<td>g. Data management</td>
<td></td>
<td></td>
</tr>
<tr>
<td>National statistics on import of PHP</td>
<td>78%</td>
<td>72%</td>
</tr>
<tr>
<td>National statistics on local production of PHY</td>
<td>49%</td>
<td>38%</td>
</tr>
<tr>
<td>Data records on vector control pesticide use</td>
<td>79%</td>
<td>73%</td>
</tr>
</tbody>
</table>

1 Available at: http://whqlibdoc.who.int/publications/2009/9789241598781_eng.pdf
2 Available at: http://whqlibdoc.who.int/publications/2011/9789241502153_eng.pdf
Figure 1. Trends in the global annual use of the four classes of vector control insecticides (metric tonnes of active ingredient).
2.2 ENHANCING AWARENESS AND INCREASED POLITICAL SUPPORT

Published outputs of the global surveys (see Chapter 2) have been used to sensitize policy-makers and programme managers on the critical global situation of public health pesticide management, and encourage them to commit to improving policy support and capacity for sound pesticide management. National policy and associated budget for its implementation should be in place to support the sound management of pesticides.

In workshops held in Nairobi, Kenya (January 2010) and in Rabat, Morocco (November 2010), representatives of pesticide regulatory authorities, national vector control programmes and ministries of agriculture of participating countries (see list in the table below) were invited to participate. Reports of these workshops include status of pesticide management, gaps, opportunities and proposed actions for capacity strengthening of participating countries, and have been published by WHO as they contain a wealth of information and recommendations that are applicable to many developing countries.

<table>
<thead>
<tr>
<th>WHO region</th>
<th>Participating countries</th>
</tr>
</thead>
<tbody>
<tr>
<td>Americas</td>
<td>Ecuador and Guatemala</td>
</tr>
<tr>
<td>African</td>
<td>Cameroon, The Gambia, Kenya, Madagascar, Mozambique, United Republic of Tanzania</td>
</tr>
<tr>
<td>Eastern Mediterranean</td>
<td>Morocco, Oman and Sudan</td>
</tr>
<tr>
<td>South-East Asia</td>
<td>Thailand</td>
</tr>
<tr>
<td>Western Pacific</td>
<td>Cambodia</td>
</tr>
</tbody>
</table>
The reports of the above-mentioned consultations are published and available at:


In addition, three WHO Regional Consultations on sound management of pesticides, with the participation of the majority of Member Countries, were held in 2011 in the Region of the Americas (Antigua, Guatemala), Eastern Mediterranean Region (Muscat, Oman) and in the Western Pacific Region (Kuala Lumpur, Malaysia), where a framework for action on the sound management of pesticides for the respective region was developed, as detailed below.


- **Draft Regional framework for action on the sound management of public health pesticides in the Western Pacific, 2012–2016. In: Meeting report of the Regional consultation on sound management of public health pesticides in the Western Pacific, Kuala Lumpur, Malaysia, 12–14 September 2011.**


The findings of the project in the WHO Eastern Mediterranean Region have been the drive to develop a Regional Resolution on *Managing the use of public health pesticides in the face of the increasing burden of vector-borne diseases* (WHO Regional Committee for the Eastern Mediterranean; Resolution EM/RC58/R.10).

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1 Available at: [http://whqlibdoc.who.int/hq/2010/WHO_HTM_NTD_WHOPES_2010_3_eng.pdf](http://whqlibdoc.who.int/hq/2010/WHO_HTM_NTD_WHOPES_2010_3_eng.pdf)

Access to best practices in registration and life-cycle management of public health pesticides should readily be available to countries in the form of guidelines. Peer-reviewed, authoritative guidelines, norms and standards developed and agreed through international expert consultation are central for harmonizing the procedures, criteria and requirements on pesticide management among countries. The WHO Pesticide Evaluation Scheme (WHOPES), as the international authority on the testing and evaluation of pesticides for public health and the WHO focal point for management of public health pesticides, has taken the lead in developing guidelines on pesticide management, efficacy testing, risk assessment and training aids.

Guidelines on pesticide management

*FAO/WHO Guidelines for the registration of pesticides.* Geneva, World Health Organization 2010


Guidelines on public health pesticide management policy for the WHO Africa Region, 2011

Guidelines on public health pesticide management policy for the WHO South-East Asia Region, 2010

Guidelines for efficacy testing


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5. Available at: [http://www.who.int/whopes/resources/SEA_CD_214.pdf](http://www.who.int/whopes/resources/SEA_CD_214.pdf)
Guidelines for efficacy testing of insecticides for indoor and outdoor ground applied space spray applications. Geneva, World Health Organization. 2009


Models for risk assessment


Training tools on pesticide specifications


Standards for quality control of pesticides

FAO and WHO through the joint panel of experts (FAO/WHO Joint Meeting on Pesticide Specifications, or JMPS) develop pesticide specifications for quality control and international trade. Since 2002, the two organizations have established a new procedure for the development of pesticide specifications, as detailed in the Manual on development and use FAO and WHO specifications for pesticides. In this new procedure,

1 Available at: http://whqlibdoc.who.int/hq/2009/WHO_HTM_NTD_WHOPES_2009.2_eng.pdf
2 Available at: http://www.who.int/iris/bitstream/10665/78142/1/9789241505024_eng.pdf
3 Available at: http://www.who.int/iris/bitstream/10665/80270/1/9789241505277_eng.pdf
4 Available at: http://whqlibdoc.who.int/publications/2011/9789241502177_eng.pdf
5 Available at: http://whqlibdoc.who.int/publications/2011/9789241502184_eng.pdf
6 Available at: http://whqlibdoc.who.int/publications/2011/9789241501682_eng.pdf
7 Available at: http://whqlibdoc.who.int/publications/2012/9789241503419_eng.pdf
8Available at: http://www.who.int/whopes/quality/en/
WHO specifications for technical material do not necessarily apply to nominally similar products of other manufacturer(s), nor to those where the active ingredient is produced by other routes of manufacture. WHO may extend the scope of the specifications to similar products only when it is satisfied that the additional products are equivalent to those that formed the basis of the reference specifications. The International code of conduct on pesticide management ¹ urges pesticide industry to take all necessary steps to ensure that pesticides entering international trade conform to WHO recommended specifications, when available.

During the project period, JMPS reviewed data packages of 44 products from several manufacturers, including 20 for establishing reference profiles and specifications and 24 for extending specifications to generic products, as detailed below:

<table>
<thead>
<tr>
<th></th>
<th>Reference profile/specification</th>
<th>Extension of specifications</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>JMPS 2008, Germany</td>
<td>3</td>
<td>5</td>
<td>8</td>
</tr>
<tr>
<td>JMPS 2009, El Salvador</td>
<td>5</td>
<td>1</td>
<td>6</td>
</tr>
<tr>
<td>JMPS 2010, Slovenia</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>JMPS 2011, China</td>
<td>4</td>
<td>6</td>
<td>10</td>
</tr>
<tr>
<td>JMPS 2012, Ireland</td>
<td>4</td>
<td>3</td>
<td>6</td>
</tr>
<tr>
<td>JMPS 2013, Ukraine</td>
<td>3</td>
<td>7</td>
<td>10</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td><strong>20</strong></td>
<td><strong>24</strong></td>
<td><strong>44</strong></td>
</tr>
</tbody>
</table>

Annual JMPS Open Meetings were also held with industry and other stakeholders, jointly with the Collaborative International Pesticides Analytical Council (CIPAC) during the above-mentioned meetings (report of the JMPS Open Meetings are available on the WHO homepage).² The Second Revision of the first edition of the Manual on development and use of FAO and WHO specifications for pesticides and subsequent amendments were reviewed, finalized and published by FAO and WHO. The WHO specifications for public health pesticides are available on the WHO homepage.³

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¹ Available at: http://www.fao.org/agriculture/crops/core-themes/theme/pests/code/en/
² Available at: http://www.who.int/whopes/quality/fao_who_meetings/en/
³ Available at: http://www.who.int/whopes/quality/newspecif/en/
2.4 PROVIDING TECHNICAL SUPPORT AND TRAINING TO PRIORITY COUNTRIES

Technical support was provided to 12 priority countries in five WHO regions, with priority to the African Region, to assess the situation of pesticide management practices (including legal, institutional, technical and administrative conditions), to determine country-specific needs for their improvement and for development of a National Action Plan.

Technical support in the priority countries also included the assessment of capacity of the pesticide quality control laboratory in terms of its organization and management, staff qualifications and training, facilities, availability of chemicals and equipment, as well as operational procedures for quality control of public health pesticides. The country support also included training of the staff of the pesticide regulatory authority and national staff involved in development of quality standards and control of pesticides on procedures and criteria for development of quality standards for pesticides, including determination of equivalence.

The priority countries were identified in consultation with WHO regional offices and based on a criteria established by the First Project Management Committee Meeting, held in WHO, 12–13 November 2007. This included countries likely to benefit most from the project; countries committed to investing in capacity strengthening on pesticide management; countries where there is strong local WHO support; and other relevant existing initiatives or activities in the country to build upon.

Figure 2. Frequency of key topics occurring in national action plans on public health pesticide management. Per topic, the percentage of countries that has the topic incorporated in their action plan is indicated (n=12 countries).
The available data suggest that in the majority of countries the practice of public health pesticide management is hampered by inadequate capacity and policy support for registration and post-registration monitoring and enforcement of regulations. Figure 2 gives a snapshot of the national action plans on public health pesticide management by participating countries. Topics most commonly selected by countries were: regulatory control, quality control, legislation, disposal of waste, and application and monitoring of pesticide poisoning or exposure.

The assessments also revealed that there were few functional laboratories for quality control of pesticides and that the existing laboratories had various deficiencies, whereas national reference laboratories still needed to be established in many countries. Most of the existing laboratories were capable of performing basic tests on content of active ingredients, but not of performing work on physico-chemical properties or impurities. Considerable investment would be needed in equipment, infrastructure, quality assurance systems and regular training to enable full quality control of pesticides in countries according to FAO/WHO specifications. An additional problem is that in a number of countries, quality control laboratories concentrate on agricultural pesticides and do not include public health pesticides. This problem is compounded by the fact that pesticide legislation in some countries does not include public health pesticides.

At the request of WHO regional offices, specific additional technical support was provided to 6 other countries that were not originally included in the project, as summarized in Table 2.

**Increasing the capacity for pesticide evaluation**

WHOPES, as an international programme coordinating the testing and evaluation of public health pesticides, operates and supervises studies through its global network of WHO Collaborating Centres and other partner institutions. Since 2009, the scheme has carried out a major expansion with the addition of two WHO Collaborating Centres (current total: 6) and nine partner institutions (current total: 13), more than doubling its global network from eight to nineteen institutions since 2009 (Figure 3; Annex 1). The expansion of the network was largely possible from the project, through which several of the institutions received support for capacity building including training on principles of good laboratory practice or other suitable quality schemes. The institutions are expected to serve as national or regional centres of excellence for testing and evaluation of public health pesticides.

**Table 2.** List of countries that received direct technical support to develop national action plans for sound management of public health pesticides and train staff on development of pesticide quality standards.

<table>
<thead>
<tr>
<th>Country</th>
<th>Situation analysis and development of national action plan</th>
<th>Capacity assessment of national pesticide quality control laboratory</th>
<th>Training on development of specifications and determination of equivalence</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cambodia</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Cameroon</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>China</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Gambia</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>India</td>
<td>-</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Kenya</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Madagascar</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Morocco</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Mozambique</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Oman</td>
<td>+</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Sudan</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Tanzania (United Republic of)</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
<tr>
<td>Thailand</td>
<td>+</td>
<td>+</td>
<td>+</td>
</tr>
</tbody>
</table>
Figure 3. Distribution of the WHOPES global network, with designated WHO Collaborating Centres (indicated in light pink), other partner institutions (in dark pink), and additional field site locations (as black dots). Numbers refer to the institutions listed in Annex 1. Institutions numbered 5–6 and 11–19 have been added to the network since 2009 with support from the BMGF project.
Life-cycle management of pesticides demands a multisectoral approach at national and international levels to ensure effective legislation and practices so that the benefits from the necessary and acceptable use of pesticides are achieved without causing significant adverse effects on the human and animal health and the environment.

The experience of the project in establishing national steering committees in participating countries, represented by different sectors including health, agriculture and the environment to plan and oversee the situation analysis, needs assessment and development and implementation of the national action plan, is an outstanding achievement that has to be promoted in all Member States. Such collaboration is also essential to optimize the use of limited available resources in countries.

The multisectoral approach and the international collaboration and information exchange that were foreseen while implementing the project further strengthened collaboration among WHO and United Nations organizations, notably FAO and specifically through the FAO/WHO Joint Meeting on Pesticide Management (JMPM) and FAO/WHO Joint Meeting on Pesticide Specifications, in providing harmonized, coordinated and complementary guidance to national programmes and to other stakeholders at national and international levels for sound management of pesticides. Development of joint guidance documents and norms on different aspects of pesticide management as well as social mobilization and increased political support have been the major outcomes of this collaboration.

Collaboration with pesticide industry as an important stakeholder in sound management of public health pesticides has also been strongly strengthened. This collaboration has been vital in technical information exchange and in developing peer-reviewed authoritative guidelines on different aspects of pesticide management, including norms and standards for quality control of pesticides.
LESSONS LEARNT AND WAY FORWARD

The project has been the first ever global investment dedicated to improving the management of public health pesticides. It has set a strong foundation from which future strategies and actions for improving sound management of these chemicals can be based.

Strengthened collaboration with United Nations organizations, notably FAO, and with industry and research institutions in developing norms, standards and authoritative guidelines on different aspects of pesticide management was a great achievement of the project. In addition, and through the establishment of a National Steering Committee in each of the participating countries, collaboration among different sectors on joint situation analysis, needs assessment and development of national action plans was reasonably successful. The momentum created by the project in some participating countries led to mobilization of additional resources (national or international donor support) for implementation of their national action plans. However, in some other countries mobilization of needed resources has been a significant challenge to overcoming the identified shortcomings.

The publication of the project’s outcome and lessons learnt in peer-reviewed journals and various WHO publications as well as sharing the same in WHO-organized meetings led to sensitizing policy-makers and programme managers in taking actions for sound management of pesticides. This is evident by the development of regional frameworks for action on sound management of pesticides in WHO’s Western Pacific and the Eastern Mediterranean regions as well as by a regional Resolution by the Eastern Mediterranean Region. The findings and results of the project were also shared with relevant WHO advisory committees and used to develop priority actions. This will continue to guide future WHO activities.

The general weakness of pesticide legislation and national policy for management of pesticides including those used in the health sectors was, however, found to be the greatest challenge. To overcome this, WHO in collaboration with FAO and United Nations Environment Programme initiated the revision of the International code of conduct on the distribution and use of pesticides and the development of FAO/WHO Guidelines on pesticide legislation; and published guidance documents on national policy on pesticide management. This finding was also reported to the World Health Assembly in resolution WHA63.26 urging Member States to establish or strengthen their national capacity to regulate pesticides throughout their life-cycle.

Any future investment in sound management of public health pesticides should build on the evidence generated by this project to prioritize development of a comprehensive pesticide policy and legislation and to: (a) streamline sound management of public health pesticides into national health policy; (b) develop comprehensive legislation for the management of pesticides, including public health pesticides, throughout all stages of their life-cycle; (c) establish a national mechanism to ensure intersectoral cooperation for development and effective implementation of pesticide legislation; and (d) allocate sufficient resources for effective implementation of pesticide legislation.

Management of public health pesticides is a neglected area with insufficient resources. The current activities by different international donors and agencies are fragmented and need to be coordinated to ensure an efficient and effective response.
Annex 1. WHOPES global network

The institutions constituting the WHOPES network, indicated as WHO Collaborating Centres, other partner institutions, and field site locations. Designated tasks and recent capacity building by the BMGF Project are outlined for each institution.

<table>
<thead>
<tr>
<th>Name of institution, with field sites</th>
<th>Period</th>
<th>Designated task</th>
<th>Scope</th>
<th>Recent capacity building by BMGF Project</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>A. WHO Collaboration Centres</strong></td>
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<tr>
<td>1 International Pesticide Application Research Centre, Ascot, UK</td>
<td>from 1980</td>
<td>Testing of insecticide application equipment</td>
<td>Global</td>
<td>-</td>
</tr>
<tr>
<td>2 Laboratoire de Lutte Contre les Insectes Nuisibles, Montpellier, France</td>
<td>from 1983</td>
<td>Evaluation of new public health pesticides</td>
<td>Global</td>
<td>Support in site assessment and training for new collaborating institutes</td>
</tr>
<tr>
<td>3 Vector Control Research Centre, Pondicherry, India</td>
<td>from 1985</td>
<td>Research and training in lymphatic filariasis and integrated methods of vector control (including efficacy testing of insecticides)</td>
<td>SE Asia</td>
<td>Preparation of technical service agreement for small scale field studies; assessment of field site in India; preparation of standard manuals for field studies; training of staff; exchange visits</td>
</tr>
<tr>
<td>4 Walloon Agricultural Research Centre, Gembloox, Belgium</td>
<td>from 1998</td>
<td>Quality control of pesticides</td>
<td>Global</td>
<td>Support in site assessment and training for new collaborating institutes</td>
</tr>
<tr>
<td>5 Insecticide and Insecticide Resistance Laboratory, National Institute of Malaria Research, Delhi, India. Field sites since 1999 at: Nadiad (Gujarat state); Panaji (Goa State); Raipur (Chattisgarh State); Rourkela (Orissa State); Jabalpur (Madhya Pradesh State)</td>
<td>from 2012; as partner institution since 1999</td>
<td>Laboratory testing and evaluation of public health pesticides</td>
<td>SE Asia</td>
<td>Preparation of technical service agreement; site assessment; provision of equipment; preparation of standard manuals for laboratory and field studies; training of staff; exchange visits</td>
</tr>
<tr>
<td>6 Department of Vector Biology and Control, Changping, China</td>
<td>from 2012</td>
<td>Vector surveillance and management</td>
<td>China</td>
<td>-</td>
</tr>
<tr>
<td><strong>B. Other partner institutions</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7 Institute of Tropical Medicine, Antwerp, Belgium. Field work in collaboration with: - National Institute for Malariology, Parasitology and Entomology, Hanoi, Viet Nam - National Center for Parasitology, Entomology and Malaria Control, Phnom Penh, Cambodia</td>
<td>Since long</td>
<td>Field studies on vector control products</td>
<td>Global</td>
<td>Preparation of technical service agreement for small scale field studies; assessment of field site in Viet Nam; preparation of standard manuals for field studies; training of staff; exchange visits</td>
</tr>
<tr>
<td>8 London School of Hygiene and Tropical Medicine, UK. Field work in collaboration with: - National Institute of Medical Research, Amani Research Centre, Muheza, Tanzania - Kilimanjaro Christian Medical College of Tumaini University, Moshi, Tanzania</td>
<td>Since long</td>
<td>Field studies on vector control products</td>
<td>Global/ East Africa</td>
<td>Provision of equipment; preparation of standard protocols for field studies; exchange visits</td>
</tr>
<tr>
<td>9 Institut de Recherche pour le Développement, Cotonou, Benin</td>
<td>Since long</td>
<td>Field studies on vector control products</td>
<td>West Africa</td>
<td>Provision of equipment; preparation of standard protocols for field studies; exchange visits</td>
</tr>
</tbody>
</table>


### Annex 1. Continued

<table>
<thead>
<tr>
<th>Name of institution, with field sites</th>
<th>Period</th>
<th>Designated task</th>
<th>Scope</th>
<th>Recent capacity building by BMGF Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Vector Control Research Unit, Penang, Malaysia</td>
<td>Since long</td>
<td>Production of standard tools for laboratory studies on insecticide susceptibility</td>
<td>Global</td>
<td>Preparation of technical service agreement; site assessment and quality control evaluation for the production of test kits; provision of equipment; preparation of standard manuals for laboratory work; training of staff; exchange visits</td>
</tr>
<tr>
<td>Noguchi Memorial Institute for Medical Research, Accra, Ghana</td>
<td>from 2009</td>
<td>Field studies on vector control products</td>
<td>West Africa</td>
<td>Exchange visits; provision of equipment; preparation of standard protocols for field studies.</td>
</tr>
<tr>
<td>University of the Witwatersrand, Johannesburg, South Africa</td>
<td>2010-2012</td>
<td>Field studies on vector control products</td>
<td>South Africa</td>
<td>Provision of equipment/supplies; preparation of standard protocols for field studies.</td>
</tr>
<tr>
<td>Medical Research Council, Fajara Nr Banjul, the Gambia</td>
<td>from 2011</td>
<td>Field studies on vector control products</td>
<td>West Africa</td>
<td>Training of staff; provision of equipment; preparation of standard protocols for field studies; exchange visits</td>
</tr>
<tr>
<td>Manatee County Mosquito Control, Palmetto, Florida, USA</td>
<td>from 2011</td>
<td>Field studies on vector control products</td>
<td>USA</td>
<td>Preparation of standard study protocol.</td>
</tr>
<tr>
<td>Regional Medical Research Centre, Dibrugarh, Assam State, India</td>
<td>2011-2013</td>
<td>Field studies on vector control products</td>
<td>South Africa</td>
<td>Exchange visits; provision of equipment; preparation of standard protocols for field studies.</td>
</tr>
<tr>
<td>Kenya Medical Research Institute, Nairobi, Kenya</td>
<td>from 2012</td>
<td>Field studies on vector control products</td>
<td>West Africa</td>
<td>Provision of equipment; preparation of standard protocols for field studies; exchange visits.</td>
</tr>
<tr>
<td>Centre for Disease Control, Beijing, China</td>
<td>from 2012</td>
<td>Field studies on vector control products</td>
<td>China</td>
<td>Exchange visit, assessment of capacity; preparation of technical service agreement for field studies; preparation of standard protocols for field studies;</td>
</tr>
<tr>
<td>Instituto National de Salud Publica, Tapachula, Mexico</td>
<td>from 2012</td>
<td>Field studies on vector control products</td>
<td>Mexico/Central America</td>
<td>Preparation of standard protocols for field studies; provision of supplies</td>
</tr>
<tr>
<td>CDC, Atlanta, USA</td>
<td>from 2013</td>
<td>Field studies on vector control products; quality control of pesticides</td>
<td>Global</td>
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PROJECT REPORT