Global vector control response 2017–2030

Third draft (Version 3.1) for online consultation
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The preparation of the response was coordinated by a Steering Committee chaired by Ana Carolina Silva Santelli and Thomas Scott. Others included Kalpana Baruah, Daniel Boakye, Tom Burkot, Maureen Coetzee, Steven Lindsay, Qi Yong Liu, Elfatih Mohamed Malik, Alan Schapira, Willem Takken, Madeleine Thompson and Graham White.

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Foreword

Every year, insects and other vectors transmit infectious pathogens to more than one billion people, resulting in over 700 000 deaths worldwide. Rapid unplanned urbanization, other environmental changes and increased global travel and trade have set the stage for the intensification or emergence of these diseases, as demonstrated in 2016 by explosive outbreaks of urban yellow fever and Zika virus disease. Vector-borne diseases, including malaria, dengue, leishmaniasis and lymphatic filariasis, thrive in conditions of poverty and often exact their heaviest toll on poor populations.

The World Health Organization’s draft global vector control response 2017–2030 aims to help countries mount coherent and coordinated efforts to counter the increasing burden and threat of vector-borne diseases. Scheduled for consideration by the Seventieth World Health Assembly in May 2017, this response provides strategic guidance to countries and development partners for urgently strengthening vector control as a fundamental component of disease control strategies to save lives and avert suffering.

By adopting this response, WHO Member States endorse a bold vision of a world free of human suffering from vector-borne diseases and set ambitious targets for improved systems, policies and capacity to enable effective vector control delivery. The intention is to elevate vector control as a key public health service, requiring enhancement and re-alignment of national programmes supported by increased technical capacity, strengthened monitoring and surveillance systems and improved infrastructure. A major boost to vector control systems will enable the achievement of disease-specific goals and will not only help countries reach the health-related targets for 2030 but also contribute to poverty reduction and, more broadly, to the United Nations Sustainable Development Goals.

Over the next 2 years, we will develop and roll out implementation plans in all WHO regions and support countries in updating and harmonizing their national vector-borne disease strategic plans. We stand ready to expand our reach and increase our support to all countries irrespective of the burden and risk of vector-borne diseases. This response will require strong political commitment and expanded financing.

We should act with resolve, and remain focused on our shared goal: to create a world in which no one is afflicted by deadly or debilitating vector-borne diseases. I remain confident that if we act with urgency and determination, we can overcome vector-borne diseases once and for all.
Draft global vector control response at a glance

Vision: A world free of human suffering from vector-borne diseases.

Aim: Reduce the burden and threat of vector-borne diseases through effective locally-adaptive and sustainable vector control.

Goals:

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<th>Goals</th>
<th>Milestones</th>
<th>Targets</th>
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<tr>
<td>Reduce mortality due to vector-borne diseases globally compared to 2016</td>
<td>At least 30%</td>
<td>At least 50%</td>
</tr>
<tr>
<td>Prevent global epidemics of vector-borne diseases</td>
<td></td>
<td>All countries</td>
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</table>

Rationale:

- Major vector-borne diseases account for an estimated 17% of the global burden of all infectious diseases, and disproportionately affect poor populations.
- These diseases impede economic development through direct medical costs and indirect costs such as loss of productivity and tourism.
- Social, demographic and environmental factors have caused increases in many vector-borne diseases in recent years, with major outbreaks of dengue, malaria, chikungunya, yellow fever and Zika virus disease since 2014.
- Most vector-borne diseases are preventable by vector control if well implemented. Strong political commitment and massive investments have led to major reductions in malaria, onchocerciasis and Chagas disease.
- The full impact of vector control has yet to be achieved owing to inadequate delivery of interventions and limited investments resulting from a dire lack of public health entomology capacity, poor coordination within and between sectors, weak or non-existent monitoring systems and few proven interventions.
- Flexible vector control delivery and monitoring systems that support approaches tailored to local contexts are urgently needed along with new tools and approaches. This will necessitate re-alignment of national programmes as well as enhanced capacity and funding.
Response framework:

**Enabling factors:** (1) Country leadership, (2) Advocacy, resource mobilization and partner coordination, (3) Regulatory, policy and normative support.

**Priority activities for 2017-2022:**

- National and regional vector control strategic plans developed/adapted to align with draft *global vector control response*
  1. National inter-ministerial task force for multi-sectoral engagement in vector control established and functioning
  2. National vector control needs assessment conducted or updated
  3. National entomological surveillance systems strengthened and integrated with health information systems to guide vector control
  4. National targets for protection of at-risk populations with appropriate vector control aligned across vector-borne diseases
  5. National plan for effective community mobilization and sustained ownership developed
  6. National entomology and vector control workforce established and maintained to meet identified requirements across all relevant sectors
  7. National and regional institutional networks to support training/education in public health entomology established and functioning
  8. Relevant staff from Ministries of Health and/or their supporting institutions trained in public health entomology
  9. National and regional registries of appropriate experts to support entomological surveillance and vector control established and up-to-date
  10. National agenda for basic and applied research on entomology and vector control established and/or progress reviewed
Background

Vector-borne diseases are a major threat to the health of societies around the world. They are caused by parasites, viruses and bacteria transmitted to humans by mosquitoes, blackflies, sandflies, tsetse flies, triatomine bugs, ticks, mites and lice.¹ The global vector-borne diseases of importance to humans include malaria, dengue, lymphatic filariasis, chikungunya, onchocerciasis, leishmaniasis, Chagas disease, Zika virus disease, yellow fever and Japanese encephalitis. Other diseases transmitted by vectors are of local importance in specific areas or populations, such as Lyme disease or the clinical complications caused by Zika virus disease.

The major vector-borne diseases together account for around 17% of the estimated global burden of infectious diseases and claim more than 700,000 lives every year (Annex 1). The burden is highest in tropical and sub-tropical areas. More than 80% of the global population lives in areas at risk from at least one of these diseases, with over half are at risk from two or more diseases (Figure 2). Risk is particularly high in towns and cities where vectors proliferate due to favourable habitats and contact with humans is high. Morbidity and mortality are often disproportionately high in poorer populations.²,³ Those who survive can be left permanently disabled or disfigured. Vector-borne diseases exact an immense toll on economies and restrict both rural and urban development (Box 1).

Figure 2. Combined global distribution of malaria, dengue, lymphatic filariasis, leishmaniasis, Japanese encephalitis, yellow fever and Chagas disease transmission, 2015⁴

¹ These vectors and other arthropods can also transmit pathogens to animals or to intermediate hosts which may also impact human health, such as by compromising food security. This response is limited to vectors of human pathogens and therefore does not include diseases such as schistosomiasis.
Box 1. Economic cost of vector-borne diseases

Vector-borne diseases impose a significant economic burden on afflicted societies. Direct microeconomic costs include expenditures on treatment-seeking while major indirect costs are related to reduced productivity and foregone income due to illness or caregiving to sick household members. Macroeconomic effects result from stagnated economic development, declines in travel and trade, and reduced tourism. Available information indicates that:

- Malaria has been found to be associated with slower economic development. From 1965 to 1990, the economies of countries with malaria grew 0.25–1.3% less per capita per year than countries without malaria (1).
- Over a period of 25 years, gross domestic product per capita growth in countries not affected by malaria was more than five times higher than in countries affected by a heavy malaria burden (2).
- In 2014, a total of US$ 2.5 billion was invested in malaria control activities alone. Treatment-seeking for malaria costs households an average of nearly US$ 3 per case (3), far exceeding the international minimum level of income of US$ 1.90 that is the benchmark for extreme poverty met by 750 million people worldwide (4).
- The global cost of Chagas disease was estimated to be about US$ 7 billion per year in 2013, including lost productivity (5). The cost of treatment ranges from less than US$ 200 to more than US$ 30,000 per person per year in endemic countries, and exceeds US$ 40,000 in the United States (6).
- Human African trypanosomiasis in the Democratic Republic of Congo costs affected households in a typical rural community more than 40% of their annual household income (6).
- In Bangladesh, India, Nepal and Sudan, 25–75% of households affected by visceral leishmaniasis experience some type of financial catastrophe in obtaining diagnosis and treatment, even when tests and medicines are provided free of charge (7–11).
- For dengue, it was estimated that the aggregated global cost of illness for 2013 alone was US$ 8.9 billion (12).

While impressive gains have been made against malaria, onchocerciasis, lymphatic filariasis and Chagas disease, the burden of many other vector-borne diseases has increased in recent years. Since 2014, major outbreaks of dengue, malaria, chikungunya and yellow fever have afflicted populations, claimed lives and overwhelmed health systems in many countries. Zika virus and its complications have directly impacted individuals and families, and caused social and economic disruption.

Social, demographic and environmental factors have altered transmission patterns and intensified the geographical spread, re-emergence or extension of transmission seasons. In particular, unplanned urbanization and lack of regular water supply or solid waste disposal can render large populations in towns and cities at risk of viral diseases spread by mosquitoes. Enhanced global travel and trade, combined with environmental factors such as altered land use patterns and climate change, may also have an effect. Together such factors influence the reach of vector populations and the transmission patterns of the disease-causing pathogens.

The dynamic and complex nature of vector-borne pathogens complicates predictions of the impact on human health of existing, re-emerging or new diseases. Despite this unpredictability, it is reasonable to expect emergence of new vector-borne diseases and further intensification of some, particularly those viral diseases transmitted by Aedes mosquitoes that are closely associated with urbanization. Also of concern are pathogens that may be transmitted by Culex mosquito species and other arthropods. This complexity and unpredictability underscores the critical need for adaptive and sustained approaches to prevent and reduce pathogen transmission to reduce disease burden.

Targeting the vectors that transmit disease-causing pathogens is an effective preventive approach against most major and locally-important vector-borne diseases. Interventions that reduce human–vector contact and vector survival can suppress and even halt transmission. History provides clear examples of rigorous vector control significantly reducing the disease burden (Annex 2). Major reductions in malaria, onchocerciasis and Chagas disease have resulted largely from strong political commitment and massive investments in vector control. Malaria reductions and elimination from some areas was achieved through intensive spraying with DDT in the 1950s and 1960s and, more recently, through the massive scaling up of insecticide-treated mosquito nets and indoor residual spraying (Figure 3). Large-scale use of larvicides aimed at reducing populations of vectors of human onchocerciasis along with community-directed treatment with ivermectin have contributed to substantial reductions in disease. For Chagas disease, elimination of domestic vectors by indoor residual spraying together with improved blood screening of donors and supportive treatment for those infected has been successful in southern countries of South America. Vector control was applied effectively against dengue and yellow fever in the Americas (1950s–1960s), and has been effective against dengue for decades in Singapore (since 1970) and Cuba (since 1981).

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Figure 3. Predicted cumulative number of malaria cases averted by interventions in sub-Saharan Africa, 2000–2015; adapted from Cibulskis et al. 2016

ACT, artemisinin-based combination therapy; IRS, indoor residual spraying; ITN, insecticide-treated mosquito net

Vector control interventions have one of the highest returns on investment in public health. Effective vector control programmes that reduce disease can advance human and economic development. Aside from direct health benefits, reductions in vector-borne diseases from strengthened vector control will yield greater productivity and growth, reduce household poverty, increase equity and women’s empowerment, and strengthen health systems (Box 2). Optimal impact is predicated on high-quality implementation requiring appropriate deployment, coverage, uptake and use.

Many countries continue to experience a high burden or risk of vector-borne diseases owing to ongoing inadequate delivery of vector control interventions resulting from limited investments. The lack of sustainable and streamlined financing has been underpinned by many factors: a dire lack of public health entomology capacity, poor coordination within and between sectors, weak or non-existent monitoring systems, and limited availability of proven approaches or tools for use against certain vectors and situations in order to address emerging challenges such as vector resistance to insecticides commonly used in core interventions. The result is that the full impact of vector control has not yet been achieved even though this is often the best-proven or the only preventive measure against most vector-borne diseases.

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Box 2. Economic benefits of vector control

Increased coverage of insecticide-treated nets in Africa has been reported as the most important driver of the decline in malaria prevalence between 2000 and 2015, accounting for an estimated 68% of the 663 million clinical cases averted since 2000 (1). The overall reduction in malaria case incidence has been estimated to have saved a total of US$ 900 million on the malaria case management costs to governments in sub-Saharan Africa, of which nets alone contributed to a total saving of US$ 610 million (2). It is anticipated that achieving the goals in WHO’s Global Technical Strategy for Malaria 2016–2030, which relies heavily on effective vector control, would save 10 million lives and generate more than US$ 4 trillion of additional economic output with a global return on investment of 40:1 and for sub-Saharan Africa of 60:1 (3). Insecticide-treated nets and indoor residual spraying against malaria are affordable, with estimates of US$ 2.20 and US$ 6.70 per person protected per year, respectively, and are highly cost–effective (4). In Zambia, vector control via environmental management, screening of housing and DDT spraying accompanied by weekly entomological and epidemiological surveillance led to a 89% reduction in mortality, with a cost per death averted of US$ 858 and a cost per symptomatic case averted of US$ 22.10 (5). The cost–effectiveness of vector control against Chagas disease in the Argentinean Chaco region has been estimated to range between US$ 45 and US$ 132 per human case averted depending on the strategy chosen (6). For dengue, initial estimates put the cost per DALY averted by vector control at US$ 1992–US$ 3139 (7); new studies have indicated lower cost–effectiveness ratios, ranging from a 2012 cost equivalent of US$ 334 per DALY averted by larval control in Cambodia to US$ 779–US$ 1604 per DALY averted by adult mosquito control in Brazil (8–9). Environmental change, including urbanization and climate change, strengthen the investment case for sustained vector control, which is cost–effective and should be part of a resilient strategy to address the above challenges.


Need for a global vector control response

Never has the need for a comprehensive approach to vector control to counter the impact of vector-borne diseases been more urgent. The unprecedented global spread of dengue and chikungunya viruses and the outbreaks of Zika virus disease and yellow fever in 2015–2016 clearly highlight the challenges faced by Member States. Transmission and risk of vector-borne diseases are rapidly changing due to unplanned urbanization, increased movement of people and goods, environmental changes and biological challenges, such as vectors resistant to insecticides and evolving strains of pathogens. Rapid, unplanned urbanization in tropical and sub-tropical towns and cities renders large populations at risk of emergence and expansion of arboviral diseases spread by mosquitoes.

Many countries are at present unprepared to address these looming challenges. The strong influence of social and environmental factors on vector-borne pathogen transmission underscores the critical importance of flexible vector control delivery and monitoring systems that support approaches tailored to local conditions. Re-alignment of national programmes to optimize implementation of interventions against multiple vectors and diseases will maximize the impact of available resources. Health systems must be prepared to detect and respond quickly and effectively to changes. This response requires not only the availability of effective control tools but also of well-trained government staff who can build resilient and sustainable systems for their evidence-based delivery. Reforms to vector control programmatic structures are urgently needed.

Vector-borne diseases are everyone’s problem, not just the health sector. Achievement of Sustainable Development Goal 3 to ensure good health and well-being relies on effective vector control; initiatives for clean water and sanitation (Goal 6), sustainable cities and communities (Goal 11) and climate action (Goal 13) among others will further contribute. Intersectoral collaboration at the national level that engages local authority actors and communities will help improve vector control delivery. Multiple approaches (including environmental management) that are implemented by different sectors will be required for control and elimination. Intersectoral and decentralized involvement will support the tailoring of interventions to specific scenarios, informed by local entomological and epidemiological surveillance, and monitoring and evaluation. Resilient and sustainable control programmes can be achieved only by engaging and collaborating with local communities.

Never has there been a better time to reinvigorate vector control with modern advances in new vector control tools and surveillance. To be effective, strong political commitment and long-term investment that yield significant impact are needed. This response seeks neither to replace or override existing disease-specific strategies nor to shift the focus from other essential interventions such as vaccines against yellow fever, Japanese encephalitis and tick-borne encephalitis; mass administration of medicines against lymphatic filariasis and human onchocerciasis; and artemisinin-based combination therapies against malaria. Rather, it aims to help countries mount coherent and coordinated efforts to address the increasing burden and threat of vector-borne diseases.

This response provides strategic guidance to countries and development partners to urgently strengthen vector control as a fundamental approach to preventing disease and responding to outbreaks. This calls for critical enhancement of vector control programming, supported by increased technical capacity, strengthened monitoring and surveillance systems, and improved
infrastructure. Ultimately this will support the implementation of a comprehensive approach to vector control that will enable the achievement of disease-specific national and global goals and contribute towards attaining the Sustainable Development Goals.

**Beyond integrated vector management**

WHO published a global strategic framework in 2004 and a position statement in 2008 on integrated vector management. These sought to provide a basis for strengthening vector control in a manner compatible with national health systems. Given the recent alarming increases in vector-borne diseases, notably the ongoing outbreaks of dengue, malaria, chikungunya, Zika virus disease and yellow fever, and the serious threat that vector-borne diseases pose to economic development, this response aims to reposition vector control as a key approach to preventing vector-borne diseases. It builds on the key concepts of integrated vector management with a renewed focus on improved national and subnational capacity and strengthened systems and infrastructure to maximize the impact of vector control. Critical attention is given to current opportunities available for leverage as well as challenges to be addressed in order to enable effective and sustainable vector control adapted to local contexts.

**Opportunities**

Numerous opportunities exist for enhancing the impact of vector control.

1. **Development.** Environmentally sustainable and resilient development in urban centres that reduces poverty and improves living standards will reduce transmission of vector-borne pathogens. Achievement of Sustainable Development Goal 3 to ensure good health and well-being relies on effective vector control; initiatives for clean water and sanitation (Goal 6), sustainable cities and communities (Goal 11) and climate action (Goal 13) among others will further contribute.

2. **Recognition.** Existing global and regional strategies against vector-borne diseases indicate their importance in the global health agenda and represent high-level commitment for their reduction, elimination and, for some, eradication (Annex 3).

3. **Expansion.** Recent successes in vector control, such as against malaria, onchocerciasis and lymphatic filariasis, have led to major reductions in vector-borne diseases. Further impacts could be achieved through expansion of proven vector control interventions.

4. **Optimization.** Re-alignment of national programmes to optimize implementation of vector control against multiple vectors and diseases, across geographical areas and human populations, will leverage available resources to maximum impact (Annex 4).

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5. **Collaboration.** Better engagement across ministries, sectors and partners as well as better sharing of regional data and experience will improve available information and expertise for the most effective use of all available tools and approaches to tackle vector-borne diseases (Annex 5).

6. **Adaptation.** The strong influence of social and environmental factors on vector-borne pathogen transmission underscores the critical importance of flexible vector control delivery and monitoring systems that support locally-tailored approaches that can be adapted to opportunities or challenges. Municipality and local administrative structures can be adapted to improve vector control services and enhance community engagement and mobilization.

7. **Innovation.** Development of novel tools and technologies such as new insecticides and formulations, effective vector traps, biocontrol through use of *Wolbachia* spp., genetic modification or other forms of vector sterilization, and housing improvements to exclude vectors have the potential to further reduce disease burden.

8. **Technology.** Advances that support evidence-based vector control such as real-time data capture systems or social media using mobile technologies, or risk stratification and predictive informatics tools such as geographical information systems, remote sensing and climatic models can be leverage to further optimize planning and implementation.

**Challenges**

Multiple interconnected challenges impede progress against vector-borne diseases. Threats to effective and impactful vector control can be grouped as systemic, structural, informational, and environmental, as well as political and financial.

1. **Systemic.** Capacity for entomological surveillance and vector control is insufficient in most countries at risk from vector-borne diseases.¹⁴ With a few notable exceptions, vector-borne disease programmes have limited expertise in public health entomology and poor infrastructure (e.g. lack of an insectary, basic laboratory and equipment) at national and subnational levels. This restricts the ability to perform basic functions related to vector control such as surveillance, monitoring and evaluation. Career structures for technical specialists and technicians within the health system are absent or weak. Attrition of trained individuals due to retirement or reallocation to other health areas, the agricultural sector or abroad is a major issue. This leads to inconsistency and restricts opportunities for high-level engagement with professionals from other sectors, such as sanitary engineering and urban planning.

2. **Structural.** Numerous countries that are endemic for more than one major vector-borne disease have disease-specific programmes and strategies that do not optimally leverage synergies and may compete for resources. Well-funded programmes – such as for malaria in some countries of sub-Saharan Africa – are often expected to respond to outbreaks of other vector-borne diseases without adequate capacity and resources at the expense of routine, core activities. A central vector control unit may be lacking or may operate in relative isolation. While capacity may be

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present in external institutions such as research institutes contracted to conduct surveillance or research, linkages are often weak, which impedes data sharing for decision-making. Data are often aggregated and managed at a level that is not informative for locally-adaptive vector control.

3. **Informational.** The evidence base is limited for most vector-borne diseases. Entomological surveillance remains weak in many countries despite insecticide resistance and changes in vector behaviour threatening the efficacy of vector control. Basic and applied research is limited in many settings, restricting the availability of such evidence to inform environmentally sound and effective deployment, combination and scale up of interventions – especially for new tools and approaches. Entomological, epidemiological and intervention data are often managed separately without linkage, resulting in insufficient information on the impact of vector control tools on entomological parameters and pathogen transmission.

4. **Environmental.** Changes in vector habitats such as those due to rapid urbanization, land use, water management or farming practices, and climate change are often unpredictable, uncontrollable and complex. With two thirds of the global population expected to live in urban settings by 2050,\(^{15}\) substantial populations in tropical and subtropical zones will be at particular risk of *Aedes*-borne diseases. Increased population movement due to either normal travel or displacement from humanitarian crises is likely to accelerate the introduction of exotic pathogens and expose non-immune populations to new infections and disease.

5. **Political and financial.** Massive funds have been provided for the scale up of insecticide-treated nets and indoor residual spraying against malaria since 2000. However, there has been limited focus on other vector control interventions or vector-borne diseases. Investments in entomological surveillance have remained minimal in comparison, and vector control monitoring and evaluation is often limited. Funds committed to the development of medicines, diagnostic tools and vaccines far exceed those for vector control tools and technologies. Expansion of domestic and global funding to combat other diseases, especially those that are *Aedes*-borne, while maintaining investments in malaria is urgently required.

**Response development process**

Following the support expressed by Member States at the Sixty-ninth World Health Assembly and the Executive Board at its 139th meeting for the development of a global vector control response for the post-2016 period, the Secretariat gathered input from experts representing national vector-borne disease control and elimination programmes, health ministries, research organizations and implementing partners. The process, led by the Secretariat, was supported by a dedicated Steering Committee consisting of leading vector-borne disease experts, scientists and representatives of Member States with ongoing or risk of vector-borne diseases, who provided additional extensive inputs to the draft document. The Global Malaria Programme’s Malaria Policy Advisory Committee, the Department of Control of Neglected Tropical Diseases’ Strategic and Technical Advisory Group

and the Special Programme for Research and Training in Tropical Diseases’ Strategic and Technical Advisory Committee were also consulted for input. Following these consultations, a revised draft was prepared by the Secretariat for use in regional and national consultations between October 2016 and February 2017. A broad online consultation with Member States and other stakeholders will be held throughout November 2016.

**Vision, aim and goals**

The vision of WHO and the broader infectious diseases community is a world free of human suffering from vector-borne diseases. The ultimate goal of the current response is to reduce the burden and threat of vector-borne diseases through effective, locally-adaptive and sustainable vector control.

As part of this vision, the response sets ambitious yet feasible global targets aligned with the disease-specific strategic goals and Sustainable Development Goal 3.3 with interim milestones to track progress:

**Table 1. Goals and associated milestones and targets for the draft global vector control response, 2017–2030**

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<tr>
<th>Goals:</th>
<th>Milestones</th>
<th>Target</th>
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These goals apply to all major vector-borne diseases of humans. Countries will set their own national or subnational targets, which may differ from the global targets. Individual regional targets may also be set.

**Priority activities**

To achieve the global targets, priority activities are set out with implementation targets for 2018 and 2020 and up until the interim period of 2022 (Table 2). It is anticipated that these will be revised and updated for the subsequent period of 2023–2030.

The activities and implementation milestones and targets have been developed after reviewing (1) the available vector control needs assessments and (2) additional supporting documents, and consulting with (3) WHO regional and country offices, and (4) national vector-borne disease control programmes. [Note: process ongoing]

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16 By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases.
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<thead>
<tr>
<th>Priority activities</th>
<th>Milestones</th>
<th>Targets</th>
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<td>National and regional institutional networks to support training / education</td>
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<tr>
<td>in public health entomology established and functioning</td>
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<tr>
<td>Foundation A</td>
<td>≥ 10%</td>
<td>≥ 25%</td>
</tr>
<tr>
<td>Relevant staff from Ministries of Health and/or their supporting institutions</td>
<td></td>
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<tr>
<td>trained in public health entomology</td>
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<tr>
<td>Foundation A</td>
<td>≥ 10%</td>
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<tr>
<td>National and regional registries of appropriate experts to support</td>
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<tr>
<td>entomology and vector control established and up-to-date</td>
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<tr>
<td>Foundation B</td>
<td>≥ 10%</td>
<td>≥ 25%</td>
</tr>
<tr>
<td>National agenda for basic and applied research on entomology and vector control</td>
<td></td>
<td></td>
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<tr>
<td>established and/or progress reviewed</td>
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<sup>a</sup> or integrated vector management strategic plans, if available.

Note: Progress indicators for each priority activity defined in Table 3.

*To be revised and updated for 2023–2030.
Response framework

Foundation

Effective and locally-adaptive vector control systems depend on two foundational elements: (1) enhanced human, infrastructural and health system capacity within all locally relevant sectors for entomological surveillance, vector control delivery and monitoring and evaluation, and (2) increased basic and applied research to optimize vector control, and innovation for development of new tools and approaches. Both elements are required to ensure maximum impact of sustainable vector control by using an evidence-based approach to planning and implementation.

A. Enhance vector control capacity

Effective and sustainable vector control is achievable only with sufficient human resources, an enabling infrastructure and a functional health system. Formulating an inventory of the human, infrastructural and financial resources available and an appraisal of existing organizational structures for vector control is an essential first step. The inventory should cover all resources available at national and subnational levels including districts. Since it is important to provide a career structure to attract and maintain capable staff at all technical levels of the vector control programme, an evaluation of career structures within national and subnational programmes must also be undertaken. Infrastructural capacity is essential also to support the activities of the programme, and includes technical and operational facilities as well as facilities for research and training. At a minimum, technical staff should have access to a functional insectary and entomological laboratory to support assessments of vector species, insecticide susceptibility and intervention bioefficacy. The internal programme inventory should be supplemented with a broader appraisal of additional relevant resources available outside of the vector-borne disease programme, including in municipality and local governments, non-health ministries, research institutions and implementing partners.

Capacity requirements must be carefully and comprehensively defined, in accordance with established national strategic plans and aligned with recommendations in this response. From this, key capacity gaps can be identified in reference to the established inventory. A comprehensive plan for developing the necessary capacity within programmes should be formulated and agreed upon (Box 3). The plan should identify the additional resources and associated costs to achieve its objectives, with clear terms of reference for human resources. Cost estimates should generally be conducted at national level. A clear budgeted plan will support mobilization of resources to address identified gaps.

Resources for capacity building could come from various sources including central government budgets, local property taxes, public–private partnerships, tourism sectors or from external sources. Where human resources are inadequate, efforts should be made to recruit staff from across sectors, who operate in the fields of vector management and control and, more broadly, in public health, development, agriculture or environmental science. Opportunities to leverage resources beyond the health sector should be explored, such as staffing arrangements that involve collaboration and time-sharing across sectors.
Capacity building priorities for established staff should be defined through a comprehensive training needs assessment led by the Ministry of Health, and aligned with available guidance.\(^\text{17}\) Programmes should include staff with knowledge and experience in multiple disciplines beyond the core technical fields of entomological surveillance, vector control implementation and monitoring and evaluation. Programme or project management expertise as well as experience in insecticide resistance (and pesticide) management will be highly beneficial. A sound understanding of the epidemiology of vector-borne diseases is essential. Database development and management experience is essential to ensure linkage of entomological, epidemiological and intervention data into a comprehensive monitoring and evaluation platform, which ideally should include geographical information system capability. Skills in information and communication technologies as well as behavioural change communication and community and local authority engagement are required.

**Box 3. Vector control programme staffing requirements**

A clear definition of staffing requirements at national and subnational levels is imperative. This is primarily to be defined through a comprehensive capacity needs assessment. Requirements will vary widely between countries dependent on vector-borne disease burden and population at risk, and will be driven by planned vector control interventions, and entomological surveillance and vector control monitoring and evaluation activities.

Roles and responsibilities of all staff positions should be clearly defined. Included should be public health entomologists, field technicians, laboratory technicians, data clerks/database managers and other administrative staff. Skill and experience requirements for each role must be outlined, a focus on leveraging expertise beyond entomology in order to ensure broad experience across the team/s engaged in entomology and vector control.

[Further specification of requirements to be added].

**B. Expand basic and applied research and harness innovation**

Vector control must be evidence-based to ensure local appropriateness and justify continued investment in implementation. Basic research is urgently needed to understand better vector aspects that influence interactions with humans and pathogen transmission, such as biology and behavioural and environmental factors. This will inform the development of innovative approaches and interventions. Applied research is needed to assess effectiveness and optimize programmatic delivery of vector control, in the context of healthy ecosystems.

A research agenda should be defined by the national vector-borne disease control programme, in collaboration with relevant stakeholders including experts from national and international research institutes. The agenda should outline a prioritized list of strategic focus areas required to inform vector control in the country, and should serve to guide research and academic institutes to align the focus of their work. A clearly defined national research agenda will avoid overlap and gaps in the work conducted, and will assist in identifying additional external resources to support priority work.

Coordination of research activities both within and between countries may ensure maximum relevance of findings across settings and regions. Funding bodies should align their requirements with the national agenda of the country or countries in which research is being supported.

Ideally, applied research should be led and conducted by the national vector-borne disease control programme; however, since human and financial capacity in national programmes may be focussed on implementation, this research may best be performed through collaboration with national research centres such as polytechnics, universities and institutes. Collaborations with international institutions should also be explored to leverage available advanced technologies. Formal institutional agreements will help to strengthen linkages between the programme and collaborating institutions and ensure sustainability. Research findings of any relevant work conducted in the country should be reported to the national programme as soon as available. Where applicable, raw data should be provided in a format that is easy to interpret and manage. Basic and applied research must follow standard ethical guidelines to ensure that the results are obtained without adverse effects on human populations, biodiversity and the environment.

Applied research will require entomological surveillance as well as monitoring and evaluation before and after the implementation of interventions. This may involve running large-scale field trials such as randomized controlled trials, which can be expensive and technically challenging but provide important evidence on efficacy and effectiveness. Such trials should be undertaken only where the necessary human, infrastructural and financial resources are available.

The following paragraphs summarize the research needed to improve the quality and delivery of vector control.

1. **Health-system resilience.** Research should assess available and optimized structures and mechanisms to support local tailoring of interventions as well as rapid and integrated response to outbreaks. Systems capabilities should be documented across settings that harbour different vectors, sustain the transmission of different pathogens, and have different levels of vector-borne disease burden. Community engagement and mobilization outcomes also require careful documentation. Such information is imperative to maximize use of human resources and improve the cost-effectiveness of vector control.

2. **Entomological surveillance.** Measurements of vector populations should leverage up-to-date methods and techniques to ensure that results are informative for guiding and assessing vector control. While the relationship between vector population densities and pathogen transmission and disease is often complex, opportunities may exist to use new technologies (such as novel adult mosquito sampling tools, antigen rapid diagnostic tests, xenomonitoring, remotely sensed data or mobile communications) or draw on experiences from other countries with similar vector bionomics or transmission conditions.

3. **Vector control monitoring and evaluation.** Monitoring and evaluation approaches often need to be tailored to the specific setting; rarely does a standardized approach generate the information necessary to tailor implementation appropriately. There is therefore an urgent need for an integrated monitoring and evaluation framework for vector control, across all vector-borne diseases of national importance. Strong evidence is available on the efficacy of core malaria vector control interventions. The evidence base is much weaker for most neglected tropical
diseases and is critically required for understanding the efficacy of current interventions against *Aedes*-borne diseases. The impact of large-scale development projects such as dam construction or major irrigation projects also merits assessment of the health impact. Applied research on how to combine tools in the most cost–effective way, as well as methods for mitigating vector insecticide resistance, are similarly critical. Randomized controlled trials are considered best practice for measuring the protective efficacy of new vector control tools using clinical and entomological outcomes, but require significant resources to do so.

4. **Innovation for new tools, technologies and approaches.** Investments should be made through product development partnerships to support the initial research and innovation for the development of new vector control and surveillance tools. Further applied research will be required at country level to determine the effectiveness of promising new tools and approaches across different settings. A clear definition of the evidence base needed to recommend their deployment is essential to ensure that research and development resources are well-placed. The WHO Vector Control Advisory Group provides guidance on this process; reforms are under way to optimize the pathway for new tools to deployment. Guidance on programmatic deployment of new tools will be developed by relevant WHO departments with support from specialized expert groups, depending on the vectors and diseases targeted.

5. **Trans-disciplinarity.** Research aimed at improving inter- and intra-sectoral collaboration should also be undertaken to document good practices. Identifying effective approaches for community engagement and mobilization underpin programme acceptance and sustainability. Research for behavioural change is imperative to ensure acceptability, participation and appropriate use of vector control tools including the adaptation of information, education and communication strategies. Environmental science research will help to understand the broader impact of various vector control strategies on local and regional ecosystems. Economic evaluations of vector control systems will also need to be done to assess the cost–effectiveness of intelligent vector control programmes.

**Pillars of action**

Action is required in four key areas to attain effective locally-adaptive and sustainable vector control. These four areas are aligned with integrated vector management, and include: (1) strengthening inter- and intra-sectoral action and collaboration; (2) enhancing entomological surveillance, and vector control monitoring and evaluation; (3) scaling up and integrating tools and approaches; and (4) engaging and mobilizing communities. There is complementarity in the activities within these four pillars, with some overlap evident.

**Pillar 1. Strengthen inter- and intra-sectoral action and collaboration**

Intersectoral collaboration is the coordination of vector-control activities between health and non-health sectors (other ministries and authorities, development partners, the private sector, etc.). Reduction of disease burden through vector control is a shared responsibility of all members of society. Strong coordination improves efficiencies and harnesses the diverse capital available in various areas (Box 4). In addition to saving lives and reducing suffering, this will yield other economic and social benefits. Sustainable initiatives to promote intersectoral and intrasectoral
collaboration in vector control will maximize efficiencies, and have greater impact than isolated, uncoordinated activities.

**Box 4. Control of Aedes-borne diseases**

*Aedes aegypti* is a vector of dengue, Zika, yellow fever and Chikungunya viruses. It is found in close association with humans, and inhabits containers commonly found in domestic and peri-domestic environs such as water-storage jars, flower pots and discarded plastics. Through its spread to most tropical and sub-tropical towns and cities, this mosquito threatens the health of millions. Interventions against *Ae. aegypti* often centre on the application of insecticides within domiciles, though this is often insufficient. Control can be enhanced by educating and empowering communities to identify and empty, remove or treat mosquito aquatic habitats in and around their homes. Urban settings can also be made more resilient by “building out” *Aedes* mosquitoes, such as by providing reliable piped water to circumvent the storage of domestic water at the household level. Solid waste management can also reduce *Aedes* larval habitats and screened housing will reduce densities of mosquitoes biting humans. This multi-pronged approach requires that the health sector work closely with those involved in urban planning, water, sanitation, solid waste management and housing design and construction to ensure adequate management of domestic and peri-domestic environs. Control of *Aedes*-transmitted diseases by targeting vectors requires an integrated approach that involves multiple partners both within and outside the health sector including the community.

Inter- and intra-sectoral collaboration will require strong political commitment from the central government including earmarked funds to support coordination activities. National vector control programmes should become an integral part of poverty-reduction strategies, national development plans and regional development cooperation strategies. While many countries have some form of vector control activities, the first step to strengthening them should be a situational analysis of the available capacity within the health sector and beyond. This will give a better understanding of the problems, opportunities, potential stakeholders and synergies available. Actors beyond the immediate health sectors could include authorities for agriculture, education, environment, finance, housing, transport, tourism and water. Stakeholders within the health sector include the directorates of infectious diseases, hygiene, sanitation, nutrition and others. The *Multisectoral action framework for malaria*[^18] and the One Health initiative[^19] are examples of multidisciplinary collaborative approaches that elevate action beyond the health sector.

After analysis, key stakeholders should be convened into an inter-ministerial task force whose mandate is the oversight, coordination and strengthening of vector control. Its members should include stakeholders from diverse ministries and constituencies as well as local authorities and communities, development partners and the private sector (Figure 4). Roles and responsibilities of this task force need to be clearly defined. Competing interests should be proactively managed, such as through a multistakeholder steering committee.

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as through the formulation of specific working groups or networks to differentiate decision-makers from partners.

**Figure 4. Representation of intersectoral coordination for vector control**

The initial activity of the inter-ministerial task force should be to coordinate a national vector control needs assessment if not available or to provide an update if needed. This will identify where intersections of vectors and diseases occur in order to identify opportunities for improved vector control delivery efficiency. The vector control needs assessment is also useful in helping countries to describe the policy and institutional framework within which decisions on vector control are made, the institutional arrangements that support vector control planning and delivery, the management procedures leading to vector control operations and the resource base which supports these operations. An appraisal of the partnership landscape is needed to identify all resources available to support vector control in the country. The assessment process is established in many countries and there may be needs assessments which have been carried out for specific diseases.

After the needs assessment has been undertaken countries should develop a costed workplan where actions can then be prioritized as required at national and subnational levels, in line with available resources. Municipalities should be involved in the process. A multi-stakeholder body such as existing donor groups or the country coordinating mechanism should also be involved or constituted to prioritize the raising and investment of resources. Where possible, inter- and intra-sectoral action should be translated into national rules and regulations that mandate action at national and subnational levels, such as through municipality by-laws. Each relevant ministry should ensure that their respective strategic plan allocates adequate resources to vector control.
Pillar 2. Enhance entomological surveillance and monitoring and evaluation of vector control

The capacity of vectors to transmit pathogens and their vulnerability to vector control measures can vary by species, location and time, as influenced by local environmental factors. Vector control must therefore be implemented on the basis of up-to-date local data. Vector surveillance involves the regular and systematic collection, analysis and interpretation of entomological data for health risk assessment, and for planning, implementing, monitoring and evaluating vector control. Vector surveillance should be conducted routinely at representative sites in areas where vector-borne diseases are endemic as well as those with high receptivity. This information enables country programmes to prioritize resources for the prevention and control of vector-borne diseases as well as to addresses specific threats to effective vector control.

Evaluation of programmatic progress and outcomes is needed to document periodically whether programme activities lead to expected impact on human health. Monitoring refers to the continuous tracking of programme implementation and performance and involves checking progress against predetermined objectives and targets, and adapting activities accordingly. Monitoring includes coverage, quality and entomological outcomes of vector control interventions, essential to maintaining vector control effectiveness. This information should be used to inform sound decision-making for policy, planning and implementation of vector control and assist in early response to the build-up of vector populations before outbreaks occur.

Surveillance, monitoring and evaluation are core responsibilities of the vector control programme, with adequate human and infrastructural capacity required at national and subnational levels to support necessary activities. Engagement of partners such as research institutions is necessary as the programme goes through the process of building internal capacity to fulfil this function. This involvement should not, however, be seen as a replacement for establishing and sustaining the requisite capacity within national programmes. Data sharing agreements with partners should be managed through institutional agreements that hold partners responsible for providing data to the national programme in a timely and proactive manner and in a predetermined format aligned with programmatic requirements.

Programmes must be aware of the entomological and vector-borne disease situation in neighbouring countries, more broadly in the region as well as globally. This information can be used to allow countries to be vigilant against threats such as importation of new pathogens or the emergence of insecticide resistance. Regional networks play a pivotal role in sharing data and experience across relevant settings. Regular communication and reporting of key summary data will help to promote collaboration and experience sharing. As an example, WHO has established a global

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A key element to maximize the public health impact of vector control is the deployment and scale up of tools and approaches appropriate to the epidemiological and entomological context. Proven and cost-effective vector control tools and approaches include long-lasting insecticidal nets, indoor residual sprays, space sprays, larvicides and environmental management depending on target vectors. In addition, a rich pipeline of products is under development to address key challenges such as malaria vector insecticide resistance and residual transmission.

One tool can have multiple effects against several vectors and diseases. For example, insecticide-treated nets against malaria and lymphatic filariasis (in settings where *Anopheles* are the principal vector), indoor residual spraying against malaria and leishmaniasis in India, and larval control for malaria and dengue vectors in cities with particular vector habitats. Tools effective against *Aedes* spp. can impact on dengue, chikungunya, Zika virus disease and yellow fever where their distributions overlap, and can impact on malaria in urban settings where *An. stephensi* is the vector.

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Each vector control tool that is selected for use in a particular setting should be implemented to a high standard and at optimal coverage. Tools must be manufactured to a high and consistent quality and have a clear evidence-base for efficacy in order to be deployed. High coverage of evidence-based and cost–effective tools offers the greatest immediate opportunity to reduce the ability of vectors to transmit disease. Where high coverage has not been achieved, this should be prioritized. Scale up is dependent on the availability of product and capacity for delivery. Decisions to deploy and scale up individual vector control tools or approaches should be informed by local information on vector distribution and disease transmission including receptivity or potential for disease spread. Ideally, local evidence on the impact of interventions should be used to inform their scale up, with monitoring and evaluation systems in place to track impact. Practical approaches to scale up are required, supported by local information to guide adaptations in vector control delivery. Community engagement and mobilization are also a critical component of scale up for many vector control interventions, especially those targeting Aedes spp. in domestic environments.

In some settings, multiple vector control tools can have greater impact in reducing transmission or disease burden than one tool alone. Core tools may need to be supplemented with additional tools to address specific challenges such as insecticide resistance.26,27 When considering whether to supplement core interventions with additional tools, control programmes should first determine whether any additional protection can be afforded by existing tools through improved delivery mechanisms or strategies. The appropriate combination of each tool is important. Programmes should avoid an approach that combines tools solely to compensate for deficiencies in implementation of any one tool, as this may divert resources and attention from reaching the full impact of existing interventions and may lead to resource wastage. Prioritization should be on the basis of evidence on cost–effectiveness, with adjustment informed by monitoring and evaluation outcomes. This is especially important for environmental management and source reduction. Targeted distribution of interventions to improve access or adaption of information, or education and communication strategies can further improve uptake and use.

Strategies should also be integrated that alter the domestic environment to reduce vector habitats such as improved water supply to prevent household-level storage, or to prevent vector access to human dwellings through house screening. Proper town and country planning with the basic concept of sanitation and drainage with proper solid waste management is a sustainable approach to vector control. These involve engagement across sectors (see Pillar 1). Opportunities for engagement outside the health sector in scaling up and integrating vector control interventions should be actively pursued (Annex 5). These opportunities are of particular importance for the control of Aedes vectors since linkages with professionals working in the housing and water sectors are crucial, such as urban planners and sanitary engineers (Box 3).

Vector control should also be integrated effectively with other disease control and elimination approaches, such as vaccines and mass administration of medicines.

**Pillar 4. Engage and mobilize communities**

Communities play a major role in vector control for prevention, control and elimination of vector-borne diseases. Success and sustainability of vector control interventions require coordination between many stakeholders but critically depend on harnessing local knowledge and skills within communities. Community engagement and mobilization requires working with local residents to improve vector control and build resilience against future disease outbreaks. Communities will take responsibility for and implement vector control if appropriate participatory community-based approaches are in place. These aim to ensure that healthy behaviours become part of the social fabric and that communities take ownership of vector control at both the intra- and peri-domiciliary levels.

Engagement strategies should be built upon social/anthropological and behavioural research, assessment and analysis in order to leverage local knowledge and skills (cultural capital). Participatory community-based approaches involve a process of dialogue, learning, decision-making and action. Traditional approaches and practices may be identified as appropriate for local situations. Community members, including vulnerable and disempowered groups, are capacitated to recognize strengths, self-assess, collectively identify, analyse and prioritize problems that affect them, and work out practical ways to address these problems. If well executed, this will strengthen the community’s capacity to continually identify new issues where action is required and will build mutual accountability, trust and partnership. Communities and service providers should meet regularly for mutual advocacy and to assess progress with the two-fold aim of improving vector control while empowering communities to gain mastery over their lives, achieve their own vision and goals, and ensure sustainable and locally-owned development.

Communication strategies are also needed in order to tailor approaches to local and disease-specific needs. These should use multiple channels including mass, local and social media and include various actors such as community health workers, local and religious leaders, positive deviants and school teachers in order to promote information and provoke dialogue.

Efforts to engage communities could act in concert with regulatory or legislative actions to support vector control, such as property access for larvicide application and source reduction. Training and capacity building are needed for community health workers and leaders that leverage existing training sources. Monitoring and evaluation of community engagement programmes and planning for long-term sustainability and scaling up should also be integrated. New technologies can be used for communication as well as monitoring and evaluation.

Governments and disease control programmes should advocate the inclusion of community engagement strategies in the policy agenda and budget. Advocacy could extend to explanations of current and emerging threats, the need for uptake of new tools and interventions, and the importance of dialogue to promote community ownership of vector control.
Enabling factors

Implementation of the draft global vector control response will require the strengthening of three key areas: (1) country leadership, (2) advocacy, resource mobilization and partner coordination, and (3) regulatory, policy and normative support.

Country leadership

Strong political commitment is needed to enable an integrated approach to vector control, both at national level but also sub-nationally including within local governments and municipalities. Establishing clear roles and responsibilities at the outset is key to sustainability. High-level commitment of multiple ministries is central to the intersectoral interactions required to plan, fund and implement the priority activities outlined in this response. Sustained political engagement will be required to maintain the momentum for the systems reforms required to adjust to an integrated approach. Establishment and regular convening of a national inter-ministerial task force for vector control as described for Pillar 1 is essential to enable multisectoral engagement, and will require dedicated funding. This will ensure there is the scope for adapting to any arising challenges and opportunities, and in response to changing trends in vector-borne diseases. Local mayors could oversee decentralized city or town task forces.

Collaboration between neighbouring countries is also important since vectors rarely respect borders and along with pathogens are easily transported among countries. Such collaboration affords the opportunity for trans-border initiatives that impact vector populations and protect human health. The International Health Regulations (2005) assist the international community with preventing and responding to acute public health risks that have the potential to cross borders, including vector-borne diseases.28 Regional engagement is of particular importance if there is significant cross-border labour migration or tourism. Active leadership along with strengthened human capacity at national and subnational levels will be required to foster productive engagement and collaboration in the shared vision of vector-borne diseases reduction.

Advocacy, resource mobilization and partner coordination

Broad advocacy initiatives are required to ensure awareness and involvement of those beyond the formal health sector and to secure funding. Representatives of each of the ministries on the inter-ministerial task force are responsible for ensuring that relevant vector control components are integrated into respective strategic plans. This will require effective communication across and between ministries, all of which should be centered on the national vector control strategy. A strong advocacy case needs to be built including information on the health, economic, social and cultural impacts of vector-borne diseases, the cost–effectiveness of vector control, and the benefits of intersectoral collaboration including in terms of resource- and cost-savings.

Predictable and long-term financing will be required to support vector control programming. International donors are encouraged to maintain and increase commitments to national vector-borne disease goals and programmes. Dedicated resources are urgently required to establish and

convene the inter-ministerial task force and to commence and sustain the other priority activities outlined in this response. It is anticipated that refined national vector control strategies will further set out the costs required for implementation of vector control in line with this response. Endemic countries are urged to increase the domestic resources directed to strengthening health systems and combating vector-borne diseases. As is the case with other regular health interventions, vector control should be included as part of the regular health budget considering that operations will be recurrent and long term.

Increased global financing will be required to support the implementation of this response. A critical assessment of the global funding architecture for vector-borne diseases is required to ascertain if revisions will better serve the needs of national programmes. Donor financing can then be directed to relevant portions of the strategy, with resource mobilization focused on filling apparent resource gaps. Human resources should be leveraged from both within and beyond the health sector.

New financing solutions should be conceived to tap into emerging development financing and private sector resources, including through public–private partnerships. As well as traditional funding sources in global health, other potential funding streams include major international programmes aimed at achieving the Sustainable Development Goals. Income streams outside of the traditional global health funding sector should be tapped into, such as for climate change and healthy cities initiatives for sustainable development. At the local level funding may be obtained from philanthropic groups, such as Rotary Clubs, and from local building or sales taxes or tourism taxes. Robust and predictable financing is also essential to consolidate vector control successes, such as for malaria. If intervention coverage is reduced, gains will be lost. Maintenance of robust vector-borne disease control programmes and capacities is paramount across all disease settings in order to attain strong returns on investment both for the programme and donors.

A large number of stakeholders are involved in providing support to national programmes for vector control, including development partners, private industry, research and academia, nongovernmental organizations and community health workers. National public health programmes need to improve the overall coordination of work on vector control for the most efficient use of resources, by harmonizing efforts, avoiding replication, and identifying and filling gaps. National programmes should ensure that all work on vector control implementation is fully in line with national strategic priorities and complies with WHO recommendations.

**Regulatory, policy and normative support**

Regulatory and legislative controls for public health will need to be updated or revised in line with the enhanced focus on vector control outlined in this response. At national and subnational levels, appropriate regulatory frameworks are required to ensure safe use of quality-assured tools by appropriately trained personnel. New legislation may be needed in order to support changes in programmatic structures, regulatory processes and supporting mechanisms to elevate vector control as a public health service. Introduction and enforcement of local by-laws may be required to enable effective vector control delivery including outbreak response, such as legislation permitting property access, inspection and treatment or removal of potential vector habitats. Introduction and enforcement of this legislation will require strong inter-sectoral coordination, leadership of local authorities and involvement of the judiciary.
Numerous potential vector control and surveillance tools and approaches are under development and are currently being evaluated by WHO. These tools could mitigate specific biological challenges that threaten to undermine effective vector control, such as vector insecticide resistance or residual transmission. As candidate tools and approaches become available, they will be reviewed by WHO for public health value and may be prequalified. This process will provide countries with clear product specifications and performance data to identify quality tools that are relevant to their particular setting.

National regulatory bodies will need to adapt to enable rapid introduction of proven tools and approaches. Careful and rapid assessment of product dossiers is required to ensure registration and appropriate uptake of validated tools. Bottlenecks to the introduction of new tools must be identified and removed early in order to be available for immediate use once the evidence base is available to define appropriate conditions for their deployment. Environmental management approaches require careful monitoring and evaluation to determine impact and provide strong case examples of good practice.

Robust quality assurance processes must be in place at national level to ensure that vector control tools are of the highest possible quality. Product specifications should be tested prior to deployment, and performance monitored throughout their lifetime. Regulatory and procurement processes should ensure that any quality issues are identified, reported and addressed immediately to minimize impact on vector control coverage or financial implications to the programme.

**Cost of implementing the draft response**

[Note: Analyses in progress; not anticipated to include disease-specific commodity and implementation costs.]

**Role of the WHO Secretariat**

The Secretariat will continue to provide support to Member States and work closely with organizations in the United Nations system, donors, intergovernmental organizations, institutions of research and academia and all other technical partners whose work is fundamental to successful implementation of this response. Recent reforms will improve support to countries for response to outbreaks and emergence of vector-borne diseases.

The Secretariat will continue to set, communicate and disseminate normative guidance, policy advice and implementation guidance to support country action. It will ensure that its policy-setting process – which includes the Malaria Policy Advisory Committee and the Strategic and Technical Advisory Group for Neglected Tropical Diseases – is responsive to the rapidly changing context of vector-borne diseases and that its global technical guidance is regularly updated to incorporate innovative tools and strategies that are proven safe and effective. The Secretariat will continue to assess and prequalify vector control products with support from the Vector Control Advisory Group and the Vector Control Technical Expert Group. Support will be provided to countries for the improvement of regulatory environments.
The Secretariat will provide guidance and technical support to Member States in reviewing and updating their national vector-borne disease strategies in line with the priority vector control actions outlined in this response. It will further provide guidance for capacity development including training. It will ensure that its own capacities are strengthened at the global, regional and country level to enable it to lead a coordinated global effort to reduce the vector-borne disease burden by 2030, and to support the implementation of all recommendations in this response. It will work with Member States to develop regional implementation plans, where appropriate.

The Secretariat will support countries in strengthening their national information systems in order to improve the quality, availability and management of entomological surveillance and vector control monitoring and evaluation data, and to streamline disease data and optimize their use for decision-making and programmatic responses. It will monitor implementation of the strategy and regularly evaluate progress towards the milestones and targets set. It will also provide support to countries for developing nationally appropriate targets and indicators to facilitate the subregional monitoring of progress.

In line with its core roles, the Secretariat will continue to monitor regional and global vector-borne disease trends, and make these data available to countries and global health partners. It will support efforts to monitor the efficacy of vector control interventions, and – to this end – maintain global databases for insecticide resistance. It will regularly report to the regional and global governing bodies of the Organization, the United Nations General Assembly, and other United Nations bodies.

WHO will promote the research and knowledge generation that is required to accelerate progress towards a world free of human suffering from vector-borne diseases.

The response will be updated at regular intervals in order to ensure linkage with disease situations and strategies, latest policy recommendation and complementary technical guidance.
### Progress indicators

Table 3. Progress indicators for priority activities for 2017–2022* for implementation of the draft global vector control response

<table>
<thead>
<tr>
<th>Priority activities</th>
<th>Indicators</th>
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<tbody>
<tr>
<td>National and regional vector control strategic plans developed/adapted to align with draft global vector control response</td>
<td>New or updated national vector control plan aligned with priority activities defined in draft <em>global vector control response</em>&lt;sup&gt;a&lt;/sup&gt;</td>
</tr>
<tr>
<td></td>
<td>New or updated regional vector control plan&lt;sup&gt;a&lt;/sup&gt; aligned with priority activities defined in draft <em>global vector control response</em></td>
</tr>
<tr>
<td>1 National inter-ministerial task force for multi-sectoral engagement in vector control established and functioning</td>
<td>Functional and representative national task force for multisectoral engagement in vector control convened within previous 12 months</td>
</tr>
<tr>
<td></td>
<td>Supporting committees to inter-ministerial task force established with clear terms of reference and convened within previous 12 months</td>
</tr>
<tr>
<td>2 National entomological surveillance systems strengthened and integrated with health information systems to guide vector control</td>
<td>% of countries that have completed or updated their situation analysis on entomology and vector control capacity and structure (including for outbreak response) through a consultative process within the previous 3 years</td>
</tr>
<tr>
<td>3 National entomological surveillance systems strengthened and integrated with health information systems to guide vector control</td>
<td>Routine and systematic entomological surveillance for all vectors of major vector-borne diseases conducted within previous 12 months</td>
</tr>
<tr>
<td></td>
<td>National entomological database updated within previous 12 months</td>
</tr>
<tr>
<td></td>
<td>Entomological surveillance system integrated with health information system to allow linkage of vector, epidemiology and intervention data</td>
</tr>
<tr>
<td></td>
<td>Entomological, epidemiological and intervention data reviewed by national expert committee within previous 12 months</td>
</tr>
<tr>
<td>4 National targets for protection of at-risk population with appropriate vector control aligned across vector-borne diseases</td>
<td>Proportion of national population at-risk of vector-borne disease/s covered by effective vector control in previous 12 months</td>
</tr>
<tr>
<td>5 National plan for effective community mobilization and sustained ownership developed</td>
<td>National vector control strategy incorporates effective community mobilization and sustained ownership</td>
</tr>
<tr>
<td></td>
<td>National entomology and vector control workforce appraised and enhanced to meet identified requirements across all relevant sectors</td>
</tr>
<tr>
<td>---</td>
<td>--------------------------------------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td></td>
<td>National human resource development plan completed or updated within previous 2-3 years</td>
</tr>
<tr>
<td></td>
<td>% of required national staff in position in previous 12 months</td>
</tr>
<tr>
<td></td>
<td>% attrition of required national staff in previous 12 months</td>
</tr>
<tr>
<td></td>
<td>% of required state/provincial staff in position in previous 12 months</td>
</tr>
<tr>
<td></td>
<td>% attrition of required state/provincial staff in previous 12 months</td>
</tr>
<tr>
<td></td>
<td>% of required district/municipality staff in position in previous 12 months</td>
</tr>
<tr>
<td></td>
<td>% attrition of required district/municipality staff in previous 12 months</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Regional and regional institutional networks to support training/education in public health entomology established and functioning</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>National programme of training or education (degree/diploma/certificate) that includes entomological surveillance, urban development, programme planning and implementation for vector control conducted in the previous 12 months</td>
</tr>
<tr>
<td></td>
<td>Regional programme of training or education (degree/diploma/certificate) that includes entomological surveillance, urban development, programme planning and implementation for vector control conducted in the previous 12 months</td>
</tr>
<tr>
<td></td>
<td>Number of countries of region for which national programme staff have accessed training/education or other support from a regional network in the past 12 months</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>Relevant staff from Ministries of Health and/or their supporting institutions trained in public health entomology</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>% of relevant staff at national level who have received training in public health entomology within the previous 3 years</td>
</tr>
<tr>
<td></td>
<td>% of relevant staff at State/provincial level who have received training in public health entomology within the previous 3 years</td>
</tr>
<tr>
<td></td>
<td>% of relevant staff at district/municipality level who have received training in public health entomology within the previous 3 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>National and regional registries of appropriate experts to support entomology and vector control established and up-to-date</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Established national registry of experts with relevant experience that has been updated within the previous 2 years</td>
</tr>
<tr>
<td></td>
<td>Established national registry of experts with relevant experience that has been updated within the previous 2 years</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th></th>
<th>National agenda for basic and applied research on entomology and vector control established and/or progress reviewed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Defined national agenda for basic and applied research that has been reviewed for progress within the past 2 years</td>
</tr>
</tbody>
</table>

*To be revised and updated for 2023–2030. * or integrated vector management strategic plans, if available
# Annexes

## Annex 1. Global burden of some major vector-borne diseases, as of October 2016

(Note: vector-borne diseases of specific local importance are not included)

<table>
<thead>
<tr>
<th>Vector</th>
<th>Disease</th>
<th>Estimated or reported annual number of cases</th>
<th>Estimated annual number of deaths</th>
<th>Estimated annual disability-adjusted life years</th>
</tr>
</thead>
<tbody>
<tr>
<td>Mosquitoes</td>
<td>Malaria¹</td>
<td>214 000 000 (149 000 000–303 000 000)</td>
<td>438 000 (236 000–635 000)</td>
<td>55 111 000</td>
</tr>
<tr>
<td>Dengue</td>
<td></td>
<td>96 000 000 (67 000 000–136 000 000)⁷</td>
<td>9110 (5630–10 842)⁴</td>
<td>1 143 000 (728 000 – 1 978 000)²,³</td>
</tr>
<tr>
<td>Lymphatic filariasis</td>
<td></td>
<td>43 850 000 (36 942 000–52 906 000)⁵</td>
<td>NA</td>
<td>2 022 000 (1 096 000–3 294 000)³</td>
</tr>
<tr>
<td>Chikungunya (Americas)</td>
<td></td>
<td>693 000 ³</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Zika virus disease (Americas)</td>
<td></td>
<td>500 000 ³</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Yellow fever (Africa)</td>
<td></td>
<td>130 000 (84 000–170 000)⁶</td>
<td>500* (400–600)⁴</td>
<td>31 000* (25 000–37 000)³</td>
</tr>
<tr>
<td>Japanese encephalitis¹⁰</td>
<td></td>
<td>42 500* (35 000–50 000)</td>
<td>9250* (3500–15 000)</td>
<td>431 552* (107 435–755 670)</td>
</tr>
<tr>
<td>Blackfly</td>
<td>Onchocerciasis</td>
<td>16 956 400 (11 478 000–26 789 000)⁵</td>
<td>NA</td>
<td>1 180 000 (557 000–1 993 000)³</td>
</tr>
<tr>
<td>Sandfly</td>
<td>(Muco)cutaneous leishmanias</td>
<td>3 915 000 (3 301 000–4 670 000)⁵</td>
<td>NA</td>
<td>42 000 (19 000–80 000)³</td>
</tr>
<tr>
<td>Visceral leishmanias</td>
<td></td>
<td>114 000 (94 000–141 000)⁵</td>
<td>62 500 (52 300–73 300)⁴</td>
<td>4 242 000 (3 488 000–5 045 000)³</td>
</tr>
<tr>
<td>Triatomine bugs</td>
<td>Chagas disease</td>
<td>9 434 000 (9 241 000–9 628 000)⁵</td>
<td>10 600 (4200–33 000)⁴</td>
<td>339 000 (184 000–846 000)³</td>
</tr>
<tr>
<td>Tick</td>
<td>Lyme borreliosis (USA)</td>
<td>85 500 ¹¹</td>
<td>NA</td>
<td>NA</td>
</tr>
<tr>
<td>Tsetse fly</td>
<td>Human African trypanosomiasis</td>
<td>19 700 (10 600–34 300)⁵</td>
<td>6900 (3700–10 900)⁴</td>
<td>390 000 (211 000–615 000)³</td>
</tr>
</tbody>
</table>

*Best estimate based on average of range.

Annex 2. Examples of some major successes achieved through vector control

<table>
<thead>
<tr>
<th>Place</th>
<th>Year</th>
<th>Disease</th>
<th>Intervention</th>
<th>Impact</th>
<th>Ref.</th>
</tr>
</thead>
<tbody>
<tr>
<td>Malaysia</td>
<td>1900</td>
<td>Malaria</td>
<td>Environmental management: draining breeding sites, forest clearing</td>
<td>Markedly less disease</td>
<td>1</td>
</tr>
<tr>
<td>Cuba</td>
<td>1903</td>
<td>Yellow fever</td>
<td>Integrated vector management in Havana: drainage or oiling of standing water, fumigation and isolation of yellow fever patients with screening and netting</td>
<td>Elimination of yellow fever</td>
<td>2</td>
</tr>
<tr>
<td>Panama</td>
<td>1904</td>
<td>Malaria and yellow fever</td>
<td>Integrated vector management: screening living quarters, draining or filling standing water, installing drains, larviciding using oil or Paris Green</td>
<td>Reduced malaria to low levels and elimination of yellow fever</td>
<td>2</td>
</tr>
<tr>
<td>Brazil</td>
<td>1942</td>
<td>Malaria</td>
<td>Larviciding with Paris Green and house spraying using short-acting pyrethroids</td>
<td>Eradication of <em>Anopheles gambiae</em>, the most efficient global malaria major (introduced species)</td>
<td>3</td>
</tr>
<tr>
<td>Global</td>
<td>1955–1967</td>
<td>Malaria</td>
<td>Global Malaria Eradication Programme based largely on indoor residual spraying with DDT and other residual insecticides, larval control and antimalarial medicines</td>
<td>Elimination of malaria from large parts of the world, particularly those with more temperate climates and seasonal transmission</td>
<td>4,5</td>
</tr>
<tr>
<td>Latin America</td>
<td>1950s and 1960s</td>
<td>Yellow fever and dengue</td>
<td>Container inspections, oiling of breeding sites and later perifocal spraying of DDT in water containers and nearby walls</td>
<td>Elimination or eradication of <em>Aedes aegypti</em> from large parts of the region</td>
<td>6</td>
</tr>
<tr>
<td>West Africa</td>
<td>1974–2002</td>
<td>Onchocerciasis</td>
<td>Aerial larviciding largely with microbial agents</td>
<td>Near-elimination of river blindness from much of West Africa</td>
<td>7,8</td>
</tr>
<tr>
<td>Singapore</td>
<td>1970–present</td>
<td>Dengue</td>
<td>Entomologic surveillance and larval source reduction</td>
<td>15-year period of low dengue incidence</td>
<td>9</td>
</tr>
<tr>
<td>Latin America</td>
<td>1991–2005</td>
<td>Chagas</td>
<td>Indoor residual spraying, house improvements and community education</td>
<td>Decline in infestation rate and a sharp decline in the infection rates of children born since the programme began; interruption of domestic transmission in many countries</td>
<td>10,12</td>
</tr>
<tr>
<td>Cuba</td>
<td>1981–present</td>
<td>Dengue</td>
<td>Community-based combination interventions, indoor residual spraying</td>
<td>No outbreaks, low incidence, majority of island free from vector</td>
<td>13</td>
</tr>
<tr>
<td>Tropics</td>
<td>2000–2015</td>
<td>Malaria</td>
<td>Long-lasting insecticidal nets, indoor residual spraying and prompt treatment</td>
<td>50% reduction in malaria prevalence and a 40% reduction in morbidity</td>
<td>14</td>
</tr>
</tbody>
</table>
### Nicaragua, Mexico

<table>
<thead>
<tr>
<th>Year</th>
<th>Dengue Programme Details</th>
<th>Result</th>
</tr>
</thead>
<tbody>
<tr>
<td>2011-12</td>
<td>Government run dengue programme (larviciding, space spraying) plus chemical-free approaches adapted to local circumstances based on community mobilization</td>
<td>29.5% lower risk of dengue virus infection in children, 24.7% fewer reports of dengue illness, lower entomological indices (house, container, Breteau, pupae per person)</td>
</tr>
</tbody>
</table>

**DDT:** 1,1,1-trichloro-2,2-di(4-chlorophenyl)ethane

Annex 3. List of relevant global and regional strategies, plans, frameworks and resolutions, as of October 2016

- International Health Regulations (WHO, 2005)
- Regional framework for an integrated vector management strategy for the South-East Asia Region (WHO Regional Office for South-East Asia, 2005)
- Global plan for insecticide resistance management in malaria vectors (WHO, 2012)
- Global Programme to Eliminate Lymphatic Filariasis
- Regional framework for surveillance and control of invasive mosquito vectors and re-emerging vector-borne diseases 2014–2020 (WHO Regional Office for Europe, 2013)
- Strategic framework for leishmaniasis control in the WHO European Region 2014–2020 (WHO Regional Office for Europe, 2014)
- Regional strategic framework for elimination of kala-azar 2016–2020 (WHO Regional Office for South-East Asia, 2015)
- Zika strategic response plan: revised for July 2016 – December 2017 (WHO, 2016)
- Strategy for arboviral disease prevention and control in the Americas (WHO Regional Office for the Americas/Pan American Health Organization, 2016)

In preparation

- Regional action plan for dengue 2016–2025 (WHO Regional Office for the Western Pacific)
- Strategic framework for integrated vector management in the Eastern Mediterranean Region (WHO Regional Office for the Eastern Mediterranean)
Annex 4. Relationship between Sustainable Development Goals and control of vector-borne diseases

<table>
<thead>
<tr>
<th>Goal</th>
<th>Relationship</th>
<th>Examples</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 No Poverty</td>
<td>Ending VBDs will reduce poverty and increase economic prosperity</td>
<td>• In Cambodia and Viet Nam, between half and two-thirds of affected households have incurred debt as a result of treatment for dengue&lt;br&gt;• The poorest of the poor are twice as likely to have malaria as those who are less poor</td>
</tr>
<tr>
<td>2 Zero Hunger</td>
<td>Ending VBDs improves nutritional intake and increases agricultural productivity</td>
<td>• Among children of the same socioeconomic status, those with malaria have poorer nutritional status than non-malarial children&lt;br&gt;• Adults suffering from malaria, visceral leishmaniasis and lymphatic filariasis have a reduced labour output, threatening food production&lt;br&gt;• Agricultural practices strongly influence transmission of VBDs</td>
</tr>
<tr>
<td>3 Good Health and Well-being</td>
<td>VBDs are a major contributor to global morbidity and mortality</td>
<td>• VBDs account for &gt; 17% of the global burden of infectious diseases; &gt; 80% of the global population is at risk from one VBD, with &gt; 50% at risk of two or more VBDs</td>
</tr>
<tr>
<td>4 Quality Education</td>
<td>Ending VBDs improves school attendance and educational outcomes</td>
<td>• Of those who survive cerebral malaria, 5–20% experience neurological sequelae that impair their ability to initiate, plan and carry out tasks&lt;br&gt;• Many children who survive Japanese encephalitis develop neurological sequelae and become physically and mentally disabled which limits educational outcomes and requires the provision of special syllabuses&lt;br&gt;• Education can be leveraged to reduce breeding sites of numerous vectors</td>
</tr>
<tr>
<td>6 Clean Water and Sanitation</td>
<td>Investment in clean water and sanitation can reduce the risk from VBDs</td>
<td>• Open stored water containers are a major breeding site for dengue vectors worldwide and, in India, for malaria vectors&lt;br&gt;• Provision of piped water can reduce the transmission of these diseases&lt;br&gt;• Similarly, improved latrines can reduce biting by vectors of lymphatic filariasis in urban settings</td>
</tr>
<tr>
<td>8 Decent Work and Economic Growth</td>
<td>Ending VBDs decreases productivity losses due to death and disability, and is likely to reduce birth rates</td>
<td>• Malaria constrains economic development in endemic countries&lt;br&gt;• A 10% reduction in malaria has been associated with 0.3% higher economic growth</td>
</tr>
</tbody>
</table>
### Enhancing infrastructure will help control VBDs
- Cities and towns need to be constructed and operate so that they reduce vector aquatic habitats; this can be achieved by piped water, well-designed toilets, adequate rubbish collection, efficient drainage and house screening
- Development projects need to be designed so they do not increase vector aquatic habitats (roads, irrigation, buildings)

### Ending VBDs reduces inequality in health and economic outcomes
- VBDs disproportionately affect the bottom billion
- The poorest of the poor are twice as likely to be infected with malaria as the less poor
- Controlling VBDs will help the poorest to prosper
- Health inequity is an important factor in urban centres

### Ending VBDs makes cities (and slums) safer and resilient
- The world’s tropical and subtropical towns and cities need to “build out” vectors of diseases; this is best achieved with an intersectoral approach involving the urban communities
- Resilience against VBDs needs to be included in strategic planning for urban development

### Sustainable waste removal will contribute to the reduction of VBDs
- Reducing the amount of chemicals used for the control of VBDs is feasible by adopting alternative approaches to vector control such as environmental sanitation
- Reducing waste generation will reduce aquatic habitats for *Aedes* mosquitoes and flies

### Mitigating the impacts of climate change has the potential to reduce VBDs
- VBDs are highly sensitive to climatic conditions, especially temperature, rainfall and relative humidity
- Patterns of epidemiology change more rapidly than health policy can respond
- Climate change can impact all VBDs

### Maintaining terrestrial ecosystems and halting biodiversity loss will help reduce VBDs in some places, but increase it in others
- Reforestation could impact malaria in complex ways depending on the vector; e.g. reduce malaria transmission in Latin America, but increase malaria in South-East Asia
- An increase of rubber plantations in South-East Asia potentially increases the risk of *Aedes*-borne disease to forest workers
- Bio-reserves can harbour vector populations

### Mobilizing financial resources will help end VBDs
- The global effort to control and eliminate VBDs is one of the largest public health initiatives ever undertaken
- Examples of successful partnerships are the Onchocerciasis Control Programme in West Africa, the Southern Cone Initiative against Chagas disease in South America and the Global Fund to Fight AIDS, Tuberculosis and Malaria

VBD, vector-borne disease
### Annex 5. Examples of collaboration for implementing vector control beyond the health sector

<table>
<thead>
<tr>
<th>Intervention</th>
<th>Ministries/organizations involved in implementation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Insecticide-treated nets, indoor residual spraying, insecticide-treated sheeting or tents</td>
<td>United Nations agencies, nongovernmental organizations, Department of the Environment</td>
</tr>
<tr>
<td>Drainage</td>
<td>Department of Public Works, municipalities</td>
</tr>
<tr>
<td>Drain clearance</td>
<td>Youth clubs that collect rubbish to sell, community members</td>
</tr>
<tr>
<td>Drying larval habitats</td>
<td>Department of Forestry, community participation</td>
</tr>
<tr>
<td>Swampland restoration</td>
<td>Department of the Environment</td>
</tr>
<tr>
<td>Removal of obsolete concrete water storage containers (used for building)</td>
<td>Department of Public Works, contractor, communities</td>
</tr>
<tr>
<td>Filling and levelling of areas with ground pools</td>
<td>Department of Public Works, community participation</td>
</tr>
<tr>
<td>Maintenance of irrigation channels</td>
<td>Farmers, Ministry of Agriculture, irrigation authority</td>
</tr>
<tr>
<td>Intermittent irrigation</td>
<td>Farmers, Ministry of Agriculture, irrigation authority</td>
</tr>
<tr>
<td>Improved housing</td>
<td>Department of Housing, nongovernmental organizations, microfinance initiatives, communities</td>
</tr>
<tr>
<td>Improved water supply</td>
<td>Department of Public Works, contractor, municipalities, communities</td>
</tr>
<tr>
<td>Larval surveys, application of larvicides</td>
<td>Schools, community groups, municipal corporations, public health staff, Department of the Environment</td>
</tr>
<tr>
<td>Improvement of environmental sanitation including solid waste and sewage management</td>
<td>Nongovernmental organizations, Department of Public Works, environmental health departments of health ministries, municipalities</td>
</tr>
<tr>
<td>Health education and promotion</td>
<td>Schools, work places, the media (TV, radio, internet), drama groups, religious and community groups, local authority education departments</td>
</tr>
</tbody>
</table>