Multisectoral Approach to the Prevention and Control of Vector-Borne Diseases

A conceptual framework

World Health Organization

TDR For research on diseases of poverty
UNICEF · UNDP · World Bank · WHO

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Alone we can do so little; together we can do so much.

Helen Keller[1]

[1]Helen Adams Keller (1880 – 1968) was an American author, political activist, and lecturer. She was the first deaf-blind person to earn a Bachelor of Arts degree. She became a world-famous speaker and author and she is remembered as an advocate for people with disabilities and other vulnerabilities.

Contents

Foreword

Some vector-borne diseases (VBDs) are still on the rise in many regions and countries, despite excellent progress in others. Due to complex interactions between pathogens, vectors, human behaviour, environmental conditions, and socioeconomic factors, many of the challenges in controlling these diseases can only be overcome through collaboration among different sectors. Further, the changing world we live in increases the complexity and limit our capacity to bring vector-borne diseases under control. This is especially true in countries with low resources.

Over the last 20 years, it has become evident that the health sector alone cannot succeed in the prevention and control of many diseases, including VBDs, and these require a multisectoral approach. The 2030 Agenda for Sustainable Development offers a great opportunity to bring together different sectors, such as water and sanitation, agriculture and education, by providing a common language to stakeholders. A global health agenda that looks beyond Sustainable Development Goal 3 ("Good health and well-being") will bring about multiple changes in society and improve many people's health and well-being.

Advancing research on how to implement multisectoral approaches for the prevention and control of vector-borne diseases is fully in line with the TDR strategy 2018-2023 and TDR's mission to reduce the burden of infectious diseases of poverty, especially in the most vulnerable populations. The need to recognize and better understand disease determinants and factors and how they can be tackled by different sectors is clear, in order to design comprehensive strategies involving multiple sectors for the prevention and control of vector-borne diseases.

Such an approach has been requested by several countries in the past few years and in response a Multisectoral Action Framework for Malaria was developed by the RBM Partnership to End Malaria and UNDP and released in 2016. However, this approach was also found to be very relevant to other VBDs, and to explore this a collaboration was initiated with the Swiss Agency for Development and Cooperation, the Canadian International Development and Research Centre, the Swiss Tropical and Public Health Institute and the Vectors, Environment and Society unit of TDR.

The objectives of the collaboration were to identify challenges and gaps and to conduct case studies to evaluate the use, adequacy, efficiency and impact of the framework into different context. The first activity involved commissioning six reviews on topics related to an MSA for the prevention and control of VBDs to identify knowledge gaps and practices in different contexts. The topics covered by the reviews are: the impact of industrial activities, the impact of population displacement, application of

eco-bio-social approaches and an overall review of multisectoral collaboration. The second activity was a workshop held in Geneva in 2017 to define a strategy. The experts attending this workshop came to a consensus that a guidance was requested on a conceptual framework of the MSA for VBDs.

This guidance document responds to that request and builds on past experiences and encourages a holistic view that stimulates new thinking on disease programme implementation and coordination. Recommendations are provided for a comprehensive conceptual framework on how to achieve a successful multisectoral approach. This framework is not a rigid formula to follow, but more an evidence-based guidance to be adapted to local contexts and situations. It intends to build country capacity to then take action and implement the best strategy to control VBDs using a multisectoral approach and thus improve living conditions.

The Vectors, Environment and Society unit in TDR led preparation of the guidance document, supported by the Swiss Tropical and Public Health Institute. The content incorporates findings from the six commissioned reviews and the discussions from the workshop on the general framework, case studies and recommendations. The development of this document was supported by TDR, the Swiss Agency for Development and Cooperation, the Canadian International Development and Research Centre and the Swiss Tropical and Public Health Institute. Other TDR groups were also consulted for their input, namely the Research Capacity Strengthening and Knowledge Management units. Other WHO departments and units also had the opportunity to provide inputs, such as the Preventive Chemotherapy and Transmission Control team and the Vector and Ecology Management team within the Department of Control of Neglected Tropical Diseases, and the Department of Public Health, Environment and Social Determinants at WHO. The document was reviewed by leading experts in VBDs and environmental health.

To accelerate progress towards tackling VBDs, we must break the silos and work together. It is our hope that this guidance will create that momentum and we encourage policy-makers, programme implementers and researchers to join us in this innovative thinking in the fight against VBDs. We also challenge relevant stakeholders from other sectors to commit and engage in this approach that will also provide them clear benefits in their own sectors.

John Reeder
Director, TDR (UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases)

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Abbreviations and acronyms

FAO	Food and Agriculture Organization of the United Nations
ITN	insecticide-treated mosquito net
IVM	integrated vector management
LLIN	long-lasting insecticidal net
MSA	multisectoral approach
NGO	nongovernmental organization
RBM	Roll Back Malaria Partnership to End Malaria
SDG	Sustainable Development Goal
TDR	UNICEF/UNDP/World Bank/WHO Special Programme for Research and Training in Tropical Diseases
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNICEF	United Nations Children's Fund
VBD	vector-borne disease
WaSH	water, sanitation and hygiene
WHO	World Health Organization

Abstract

The emergence, transmission and distribution of vector-borne diseases (VBDs) are determined by the pathogens, the vectors, the environment, the socioeconomics and the health system. These factors exceed the capacity of ministries of health and the health sector and require the involvement of many other sectors and stakeholders. Consequently, collaboration among sectors is essential to reach the "triple billion" goals. The synergy created by multisectoral approaches (MSAs) contributes to advancement of several Sustainable Development Goals (SDGs) simultaneously. This document was prepared to support Member States and other relevant actors in the fight against VBDs through the use of concerted, facilitating, inclusive, participatory and sustainable MSAs.

The document presents a conceptual framework covering the essential elements of successful multisectoral collaborations, which is based on systematic reviews of evidence from programmes for the prevention and control of VBDs. A coordination pathway and a sectoral pathway are described, and guidance is provided for a non-exhaustive list of sectors. Case studies provide real-life situations. Although the guidance document is based on lessons learnt from practices in countries, the conceptual framework remains theoretical. There is no single "silver bullet". Users of the guidance document should adjust and adapt the recommendations to their context to ensure a multisectoral strategy that best responds to local needs.

The document is organized as follows.

Chapter 1 explains the basics of VBDs, their impact on the most vulnerable populations, the disease determinants, the current prevention and control measures and challenges and opportunities. The determinants include mainly those related to pathogens and vectors, the environment, agriculture, socio-economic factors and health systems.

Chapter 2 introduces the concept, rationale and benefits of the MSA, which is defined in this document as "a recognized relation between a part or parts of the health sector and a part or parts of several other sectors, including government, public and private institutions and organizations, nongovernmental organizations (NGOs), formed to take action to achieve health outcomes (or intermediate health outcomes) in a way that is more effective, efficient or sustainable than could be achieved by the health sector alone". The background of the MSA is described to show what has been done so far and how. Some examples are highlighted from mobile and migrant populations and the impacts of industry and climate change.

Chapter 3 presents the goals and objectives of the conceptual framework as well as specific considerations in the development of multisectoral actions, such as planning and implementing them according to the context and ensuring that they are participatory and sustainable.

Chapter 4 describes each component of the conceptual framework: the "3C" pillars (commitment of government, coordination among sectors and community engagement), the dimensions of collaboration (horizontal among ministries in the same government, horizontal among stakeholder groups and vertical), the levels of multisectoral collaboration (from international to local), the resources (material, service, human, financial and policy) to be mobilized and shared, the sectors, the stakeholders, the domains of work and the enabling factors.

Chapter 5 describes the coordination process, which is formulated in six steps, from mandating a coordination committee to assessing impact. While VBD programmes are often led or conducted by governments, nongovernmental sectors and bodies play vital roles in multisectoral programmes for VBD control. The potential roles of NGOs, international organizations, the private sector and communities are described, and the implications of two major aspects – financing and legislation – are discussed. The importance of coherence with existing institutional structures, multisectoral collaborations and global multinational and multisectoral work is emphasized.

Chapter 6 provides detailed guidance on how the coordination committee should work with each sector to ensure that they participate effectively in a multisectoral VBDs programme. Specific guidance is given for the sectors of health, environment, water and sanitation, agriculture and aquaculture, energy, housing, education, research, finance and legislation. Case studies illustrate effective engagement of each sector in VBD programmes.

Chapter 7 briefly presents monitoring and evaluation of programme implementation through MSAs, with examples of indicators for measuring performance in terms of input, process, output, outcome and impact. The main recommendations for a successful MSA included in this conceptual framework are summarized and immediate next steps are suggested for decision-makers and sectors. Finally, the planned revision of the document with an updated framework is anticipated.

Chapter 1

Vector-borne diseases

1.1 Vector-borne diseases

Vector-borne diseases (VBDs) are caused by pathogens transmitted to the host by arthropod vectors. They contribute substantially to the global burden of communicable diseases and are a major public health problem, especially to individuals and communities in low- and middle-income countries. They are caused by viruses, bacteria and parasites transmitted by mosquitoes, sandflies, triatomine bugs, blackflies, ticks, tsetse flies, mites, snails and lice *(1).* They are transmitted by vectors **(Box 1.1)** that acquire the pathogens during blood-feeding and then inject them into a new host. The major human VBDs are malaria, dengue, schistosomiasis, lymphatic filariasis, onchocerciasis, leishmaniasis, Japanese encephalitis, Chagas disease, yellow fever, chikungunya, West Nile fever, Zika virus disease, tick-borne encephalitis, Lyme disease, Rift Valley fever and human African trypanosomiasis. The burden of other VBDs is lower such as those due to O'nyong nyong and Mayaro viruses and Crimean-Congo haemorrhagic fever, rickettsial diseases and plague, but they still pose a threat to human health and are sometimes of local importance.

Box 1.1 Vectors and their transmission

Vectors are living organisms that can transmit infectious diseases from one host to another either animals and/or humans, acting as "vectors" of disease-causing pathogens, which are viruses, bacteria and parasites. Common vectors are mosquitoes, sandflies, triatomine bugs, ticks, fleas, snails and other fly species.

Transmission of vector-borne diseases is very rarely mechanical, when vectors pick up infectious agents and transmit them without changes or life cycle of the latter occurring inside the vectors, but most of the transmission is biological, when the pathogens spend part of their life cycle inside the vectors before being transmitted to hosts. Biological transmission of VBDs usually occurs when vectors ingest pathogens during bloodsucking from an infected host (human or animal) and inject them into a new host at the next bloodmeal or by another mechanism *(2).* Transmission includes processes whereby the pathogens multiply within the vectors.

1.2 Impact of vector-borne diseases on human health

More than 80% of the world population is exposed to at least one major VBD, while over half are at risk of two or more *(2).* The Global Burden of Disease Study in 2017 indicated that the four major diseases transmitted by mosquitoes (malaria, dengue, lymphatic filariasis and yellow fever) resulted in losses of nearly 50 million disability-adjusted life years (DALYs) and an estimated 665 000 deaths *(3,4).*

Intensive malaria prevention and control over the past two decades have resulted in major reductions in the rates of morbidity and mortality. Nevertheless, the disease was still the fourth leading cause of early death and disability in countries with low socio-demographic indexes in 2017, as in the 1990s *(5).* The incidence of dengue is also constantly increasing with the number of cases being 30 times higher during the past 50 years and increasing fatalities *(6).* Diseases transmitted by flies, fleas, ticks and triatomine bugs also contributing significantly to human morbidity and remains a major challenge in many low- and middle-income countries. **Table 1.1** lists the major VBDs and their estimated burden.

Table 1.1. Examples of VBDs by type of vectors and estimates of local or global burden

Vector	Disease	Reference	Year	Region	Disability-adjusted life years (x 1000) or cases	Deaths
 **Mosquitoes**	Malaria	*3, 4*	2017	Global	45 015	839 518
	Dengue	*3, 4*	2017	Global	2 923	49 779
	Lymphatic filariasis	*3, 4*	2017	Global	1 364	NA
	Japanese encephalitis	*7*	2005	Global	432	9 250[a]
	Yellow fever	*3, 4*	2017	Global	314	13 761
	Chikungunya[b]	*8*	2017	Americas	61 613 (suspected no. of cases)	101
	West Nile fever[b]	*9*	2018	Europe	2 083 (reported autochthonous infections[c])	180
	Zika virus disease	*3, 4*	2017	Global	2.2	57
	Rift Valley fever[b]	*10, 11*	2006–2007 outbreak	Kenya	3.4 per 1 000 population	NA
 **Sandflies**	Leishmaniasis	*3, 4*	2017	Global	774	34 461
 **Tsetse flies**	Human African trypanosomiasis	*3, 4*	2017	Global	79	4 886
 **Blackflies**	Onchocerciasis	*3, 4*	2017	Global	1 343	N A
 **Triatomine bugs**	Chagas disease	*3, 4*	2017	Global	232	8 639
 **Ticks**	Tick-borne encephalitis[b]	*12*	2011	Slovenia	167.8 per 100 000 population	NA
	Lyme disease[b]	*13*	2010	The Netherlands	10.5 per 100 000 population	NA
 **Snails**	Schistosomiasis	*3.4*	2017	Gobal	1 435	9 754

NA, not available

[a] *Annualized average over combined epidemic and inter-epidemic periods*

[b] *Reported cases (per population or region), rather than disability-adjusted life years*

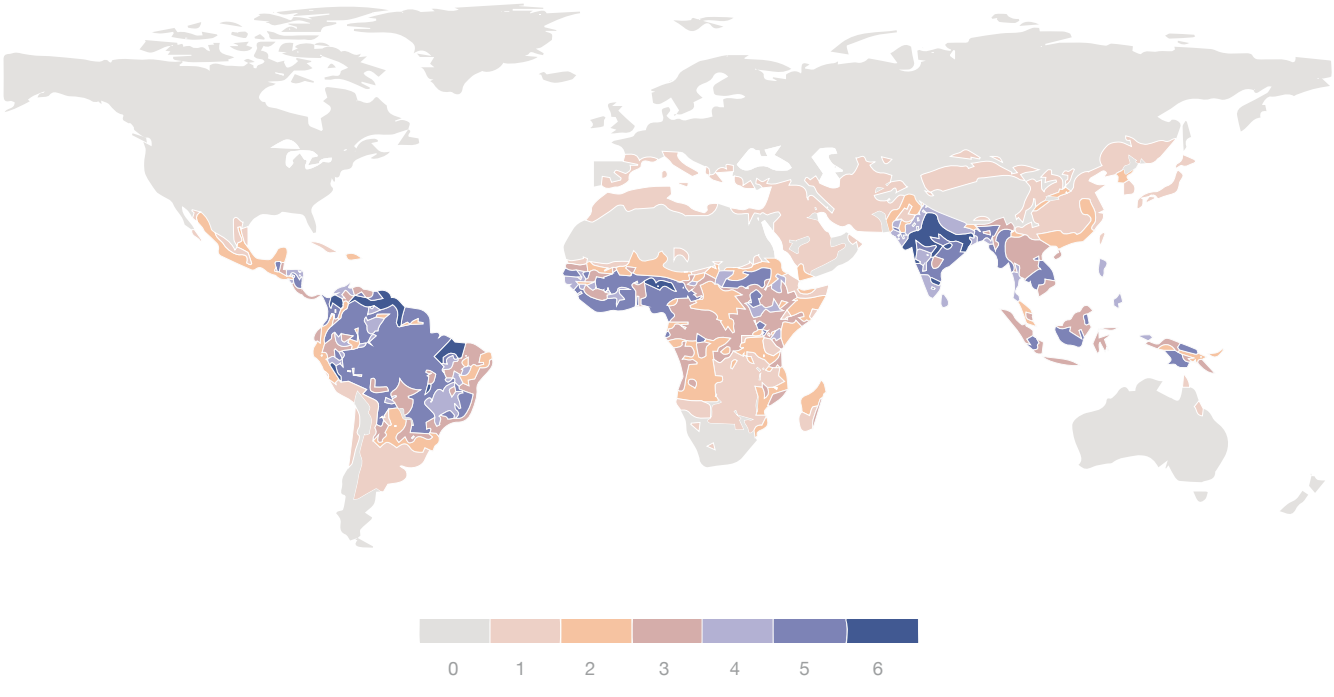
[c] *Number of reported autochthonous infections in 2018 in the European Union, the European Economic Area and European Union enlargement countries*

VBDs also have significant direct and indirect economic costs. The direct costs include personal and public expenditure on prevention and control, as well as expenses for treatment of illness. The indirect costs are due to disability and early deaths preventing people from conducting their normal activities, including work, social activities and supporting their families, leading to loss of productivity and income and discounted lifetime earnings. The direct and indirect economic losses further exacerbate poverty and impede economic development. The cost of dengue illness per year in the Americas was estimated to be US$ 2.1 billion *(14).* In countries with a heavy malaria burden, expenditure on the disease may account for as much as 40% of total public health expenditure, while the growth rate of the gross domestic product per capita in these countries is 0.25–1.3% less than in countries without malaria *(15,16).* Each adult case of malaria has been estimated to result in 3.4 days of lost productivity, with a minimum additional indirect cost of US$ 10.85 *(16).* Further costs are associated to the increasing resistance of the pathogens to drugs and of the vectors to insecticides which are consequently increasing the cost of treatment and control.

1.3 Population at greatest risks

VBDs affect all human populations, living in urban, peri-urban, rural and isolated communities, but they disproportionally affect populations in low- and middle-income countries and communities with low socioeconomic status. Inadequate living conditions, particularly lack of access to safe water and sanitation, and poor housing, increase the risk of VBDs in general. In addition, malnutrition, poorer baseline health and weakened immunity render these populations even more vulnerable. Mapping of the combined global distribution of seven major VBDs (malaria, lymphatic filariasis, leishmaniasis, dengue, Japanese encephalitis, yellow fever and Chagas disease) showed that the populations of low-income countries are the most affected, notably in sub-Saharan Africa, South Asia and South America **(Fig. 1.1).**

Fig. 1.1 Global distribution of malaria, lymphatic filariasis, leishmaniasis, dengue, Japanese encephalitis, yellow fever and Chagas disease (*2*)



Source: adapted from reference 2
The intensity of colours (from pink to blue) indicates the number of VBDs that pose a risk in each 5 x 5-km grid cell.

Differences in the transmission patterns of VBDs and local socioeconomic conditions affect different population groups. Certain VBDs are affecting populations by gender, often because of their different social roles and activities *(17,18).* Nevertheless, more globally, the most vulnerable groups are those with low or no immunity against the diseases, those who spend a significant amount of time outdoors exposed to vectors bites and communities with low socioeconomic status, often with poor-quality housing, a stressful physical environment, malnutrition and insufficient access to basic facilities and services such as safe water, sanitation and health care. The following groups are considered to be the most vulnerable:

- **Young children**, without fully developed immunity
- **Pregnant women,** with decreased immunity during pregnancy.
- **People living with HIV,** with decreased immunity.
- **Mobile populations and internal migrants** from areas with no or low transmission of certain VBDs and therefore no immunity and inadequate living condition.
- **Outdoor workers, night workers, agricultural workers,** with increased exposure to vectors.
- **People in humanitarian emergencies and natural disasters,** who may have inadequate food and living conditions and limited access to health facilities.
- **Other people living in poor-quality housing and who lack access to basic facilities and services.**

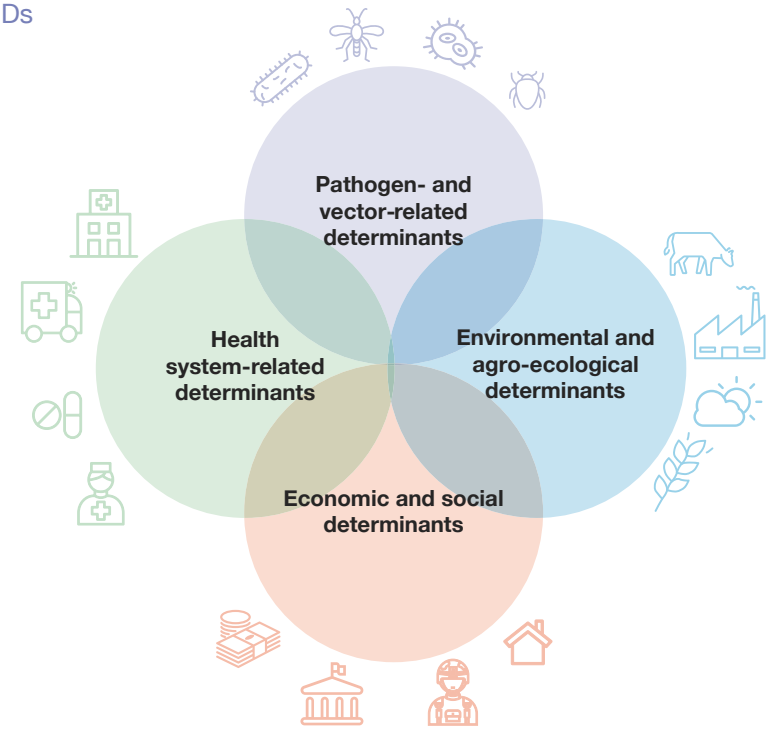
Vulnerability is also linked to other determinants, further discussed below. Increasing mobile populations are a particular concern. Naing et al. *(19)* demonstrated that mobile and migrant populations are at increased risk of malaria and contributes to the failure of malaria eradication campaigns. Abdul-Ghani et al. **(Annex III)** reported an increased threat of chikungunya due to human mobility patterns.

1.4 Determinants of vector-borne diseases

The emergence, transmission and distribution of VBDs are linked to a wide range of partially overlapping factors of different importance, including biological elements such as pathogen mutation and vector behaviour, social elements such as poverty and human behaviour and environmental determinants such as climate change. In the USA for example, four categories of risk factor were linked to the transmission of West Nile virus: environmental (temperature, precipitation, wetlands), socioeconomic (housing conditions), the built environment (catch basins, ditches) and inadequate mosquito abatement policies *(20).* Most cases of malaria in the Amazon River Basin were associated with recent colonization by humans, new agricultural settlements and open-cast mining *(21,22).* Emerging chikungunya outbreaks in non-endemic countries and re-emerging epidemics have been linked to virus mutation but also to climate change and human mobility. The recent spread and outbreaks of dengue in Asia and sub-Saharan Africa have been attributed to rapid urbanization and globalization *(23).*

Understand the determinants of VBDs and the sectors in which they arise will help to design comprehensive strategies for the prevention and control of these diseases. For this guidance presented herein, determinants are grouped into four broad categories related to: i) the pathogen and the vector; ii) the environment, agriculture and ecosystems; iii) socioeconomic factors, and; iv) the health system **(Fig. 1.2, Box 1.2).**

Fig. 1.2 Determinants of VBDs



Box 1.2 Examples of the four types of determinant for VBDs

Leishmaniasis on the Indian subcontinent:

Mutation of a gene in *Leishmania donovani* spread throughout the pathogen populations on the Indian subcontinent. The resulting mutant parasite species showed frequent resistance to antimonials, which may have contributed to the persistence of the epidemic *(24)*.

Schistosomiasis in Côte d'Ivoire:

The construction of two large hydroelectric dams in the 1970s markedly increased the prevalence of *Schistosoma haematobium* in the urine and stool samples of schoolchildren *(25)*.

Malaria in China and Myanmar:

The use of vector control tools such as bednets, synthetic repellents and mosquito coils was significantly more frequent among population groups with higher income, better education and better housing. Diversity in population behaviour influences the efficiency of vector control *(26,27)*.

Dengue in India:

A poor surveillance system due to lack of funding was suggested to have led to severe under-reporting of cases. Additionally, the national health care system was often unregulated, and infrastructure was lacking, which undermined the capacity of the health sector to deliver services *(28)*.

Pathogen- and vector-related determinants

The types and severity of the diseases are determined by pathogens that coevolve with their vectors according to the changing habitats and human and animal host populations. Pathogen-related determinants include species type, rate of adaptation to new environments and susceptibility to drugs. Vector-related determinants include the species, behavioural characteristics, breeding places, feeding times and preference and susceptibility to insecticides. Pathogens that are viruses, particularly those with RNA genomes, have high mutation rates and evolve rapidly, such as West Nile and chikungunya viruses *(29–32)*. Tabachnick *(33)* demonstrated that climatic and environmental changes in Europe influence formation of new episystems

of Bluetongue virus, a midge-transmitted virus that causes disease in ruminants. To better adapt to new environments, pathogens undergo genotypic and phenotypic modifications, which can change their replication, virulence and interaction with both vectors and hosts. Similarly, the life cycle traits of arthropod vectors, including fecundity, longevity, competence, population abundance, biting and resting behaviour, are influenced by changes caused by the environment, climate and human activities. Such changes influence the vector–pathogen–host cycle, which in turn modifies the disease transmission pattern and the clinical and epidemiological features of the diseases. For example, the resistance of pathogens to drugs and of vectors to pesticides both pose challenges to the prevention and control of VBDs.

Environmental and agro-ecological determinants

Important aspects of vector populations, such as species diversity, composition and abundance, are closely linked to local climate and ecosystems, which determine the ambient temperature, humidity, abundance of surface water, water temperature, chemical composition, soil moisture and other conditions. Differences in the tolerance of different species to extreme conditions shapes the distribution of vectors. Therefore, changes in environmental factors through either slow, natural processes or faster human activities strongly affect vector abundance and species composition by creating or removing suitable breeding sites and living habitats. Climate change contributes to modification of natural systems and hence influences the distribution of vectors. Human activities that may result in environmental changes include changes in the management and use of land, clearing of forests, mining and other extraction industries, large-scale construction and development projects (e.g. roads, dams, irrigation systems, railways, pipelines, biofuel plantations), urban and peri-urban development (particularly unplanned), water resources (quantity and quality) and solid waste management. Poorly constructed and organized houses, such as in urban slums, are more likely to have cracks and crevices in the floors and walls, poorly managed household rubbish and stagnant water, all of which provide optimal breeding environments for certain vectors.

Economic and social determinants

Economic and social determinants in each region and community are also affecting VBD transmission patterns. As illustrated in **Fig. 1.1,** people living in tropical and subtropical lower-income countries are at greater risk of VBDs. The economic and social development of a country affect the health of its people, as good living conditions decrease their vulnerability to disease. Various economic and demographic factors are involved in the development of society and include fragmentation of habitats, growth of urban slums with inadequate housing, industrial activities, population

mobility and migration, access to safe water and solid waste and excreta management. Human mobility and trade in particular contribute to the transfer of exotic vector mosquitoes to new geographical areas and the subsequent spread of VBDs. International trade in used tyres, "lucky bamboo" *(Dracaena sanderiana),* timber and other goods has contributed to the spread of *Aedes albopictus,* a secondary dengue vector, from Asia to North America and Europe *(34).* Unstable malaria transmission was found in association with gold mining, an activity which increases human movement and results in environmental, economic and demographic changes *(35).*

Poverty, social inequality and malnutrition directly and indirectly jeopardize population health. Poorer health at baseline compromises people's immunity and makes them prone to infectious diseases, including VBDs. The development of a country also determines the level of education, the institutional capacity and the organization of services, which are linked to public health through public knowledge and government prioritization of health service delivery. Good leadership and equitable distribution of power and resources throughout communities are a solid basis for a robust health system, while political instability and insecurity pose major threats to the living conditions and well-being of populations and their access to health facilities.

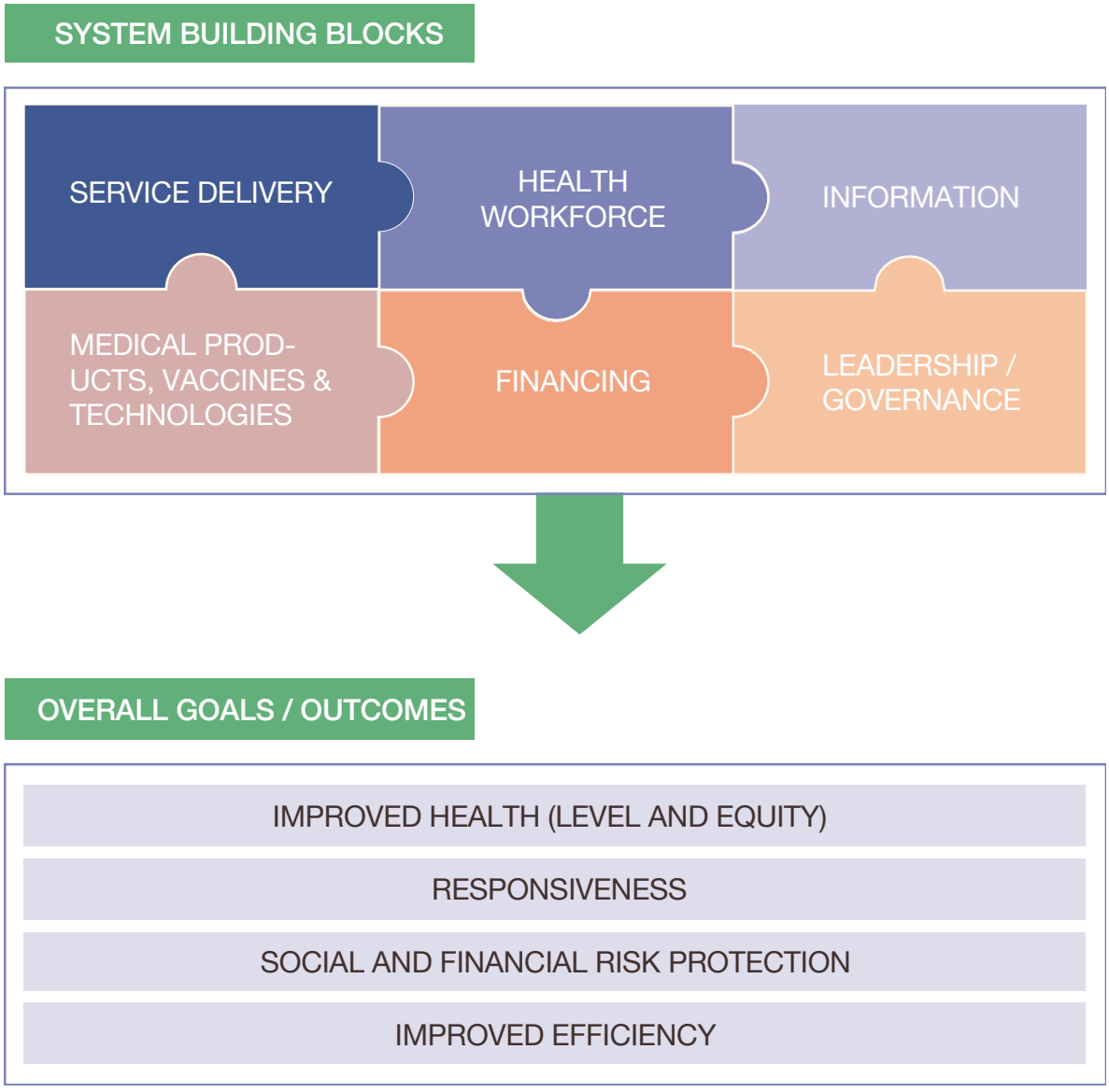
At the individual level, occupation and social status are associated with vulnerability to some diseases. Dabo et al. *(36)* studied schistosomiasis in schoolchildren and found that not only living and going to school near snail-colonized water but also the occupation of the parents were related to the risk of infection. Thus, children whose parents were workers were seven times more likely to be infected than those whose parents were civil servants. The mechanisms and pathways by which socioeconomic and environmental determinants affect the transmission of VBDs are complex and interrelated, and VBDs probably have socioeconomic ramifications for populations in endemic areas.

Health system-related determinants

The robustness of a health system directly determines its capacity to protect the population from VBDs and to improve their health. The health system determinants are the six building blocks described by WHO *(37)*: leadership and governance, health workforce, health information, essential medical products and technologies, service delivery and financing **(Fig. 1.3)**. Engaging, accountable health governance is essential, as, in its absence, coordination of VBD prevention and control, resource mobilization and collaboration with other sectors will be hindered. Other impediments to efficient, comprehensive prevention of and response to VBD outbreaks are lack of access to health service or medical products. This can be due to remote residence or inadequate transport, sub-standard disease detection and diagnosis due to inadequate equipment or lack of staff at health care facilities, inadequate public sensitization and lack of information and insufficient funding. The capacity of health governance also depends

on political stability, economic sustainability and the priority of distributing funds. Lack of experience in VBD control in many regions jeopardizes the global effort.

Fig. 1.3 The WHO health system framework



Source: adapted from reference *37*.

1.5 Prevention and control of vector-borne diseases

Interventions for VBD prevention and control are grouped as:

- **vector control (removal of eggs, larval and adult stages control)**
- **personal protection**
- **environmental and agricultural management**
- **community education and mobilization campaigns**
- **mass drug or vaccine administration**

Each category includes different methods. Some commonly used methods for diseases transmitted by different vectors are listed in **Table 1.2.**

Table 1.2 Commonly used methods for the prevention and control of major vectors and the diseases they transmit

	Mosquitos	Sandflies	Tsetse flies	Blackflies	Triatimine bugs	Ticks	Snails
Long-lasting insecticidal net	●	●	●		●	●	
Indoor residual spraying	●	●	●		●	●	
Outdoor spraying	●	●	●	●		●	
Adding chemicals to household water storage	●						
Adding chemicals to irrigation canals and small streams				●			●
Other insect repellents[a]	●	●	●	●	●		
Insecticide-treated targets and animals		●	●			●	
Baited traps and screens			●				

Reduction of breeding habitats[b]	●						●
Biological control	●						
Waste management	●	●					
Housing modification	●	●			●		
Personal protection[c]	●	●	●			●	●
Removal of vectors						●	●
Mass drug treatment	●[d]			●[e]			●[f]
Vaccines	●[g]					●[h]	

Sources: references *34, 38, 39*

[a]*Coils, vaporizing mats, aerosols, fumigant canisters, insecticide-impregnated paint or curtain.*

[b]*Includes designing water containers to prevent access by mosquitoes, e.g. with tight lids; regular drainage of water bodies, lining of irrigation canals with concrete, removal of vegetation in irrigation canals.*

[c]*Includes application of insect repellent on the skin or clothing, wearing long-sleeved shirts and long trousers, protective boots, avoiding places and times when vectors are active.*

[d]*Lymphatic filariasis.*

[e]*Onchocerciasis.*

[f]*Schistosomiasis.*

[g]*Yellow fever and Japanese encephalitis.*

[h]*Tick-borne encephalitis.*

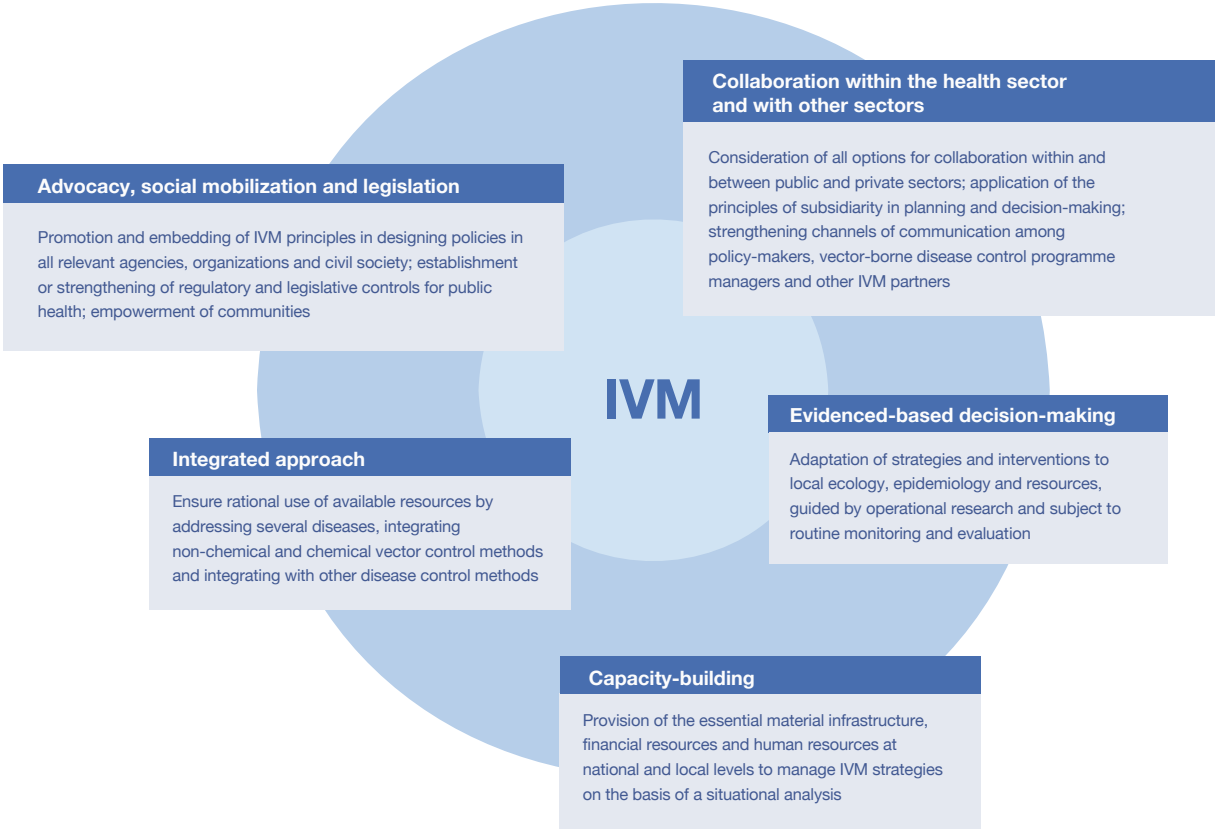
The choice of intervention depends on the context, including the local ecology and behaviour of the vector species (habitat, flight range, feeding and resting patterns, response to pesticides), the local epidemiology of the disease, human activity (farming, irrigation), culture and local institutional and economic capacity. Choice and application of any of these methods should also be based on evidence from basic and operational research.

In 2004, WHO developed the Global strategic framework on integrated vector management (IVM) for use of several methods against a single VBD or a single or several methods against several diseases *(40).* The aim of the integrated approach is to improve the efficacy, cost–effectiveness, ecological soundness and sustainability of vector control **(Box 1.3).**

Box 1.3 Integrated vector management

Definition: "a rational decision-making process to optimize the use of resources for vector control. IVM requires a management approach that improves the efficacy, cost effectiveness, ecological soundness and sustainability of vector control interventions with the available tools and resources" *(40)*

Key elements



Since evidence for the impact of vector control on VBDs can be controversial, and IVM was difficult to apply, it was replaced by simpler operations in many countries. However, after the Zika virus epidemic in the Americas in 2015–2016, the IVM framework was emphasized again.

The recent emergences of arboviral epidemics (dengue, chikungunya and Zika) have resulted in the Global vector control response 2017–2030 adopted by the seventy-first World Health Assembly, and including a pillar (among the four of the strategy) for better coordination and integration of sectors

and diseases to achieve the control of VBDs *(41)*. As shown in **Table 1.2,** some prevention and control measures are applicable to more than one disease, because some vectors transmit more than one disease. For example, *Aedes* mosquitoes are responsible for transmitting chikungunya, dengue and Zika viruses; therefore, the control of *Aedes* mosquitoes will limit the transmission of all three diseases. Other studies have demonstrated the benefit of combining methods. For example, combining contact tracing with targeted indoor residual spraying increase the possibility to better fight the dengue transmission *(42).* In another example, the integrated approach for malaria control in Malindi, Kenya, included distribution of long-lasting insecticidal nets (LLINs), larval source management and community education and resulted in a significant decrease in the proportion of malaria cases among children admitted to hospital *(43).*

Challenges

Knowledge gaps

General lack of understanding, data and information on the epidemiology and entomology of VBDs and on human factors such as demography and the links among these domains limit the design of effective prevention and control strategies. The lack of data is commonly due to poor or incomplete surveillance and lack of capacity for basic and applied research. In certain regions, the actual numbers of cases are under reported or cases are misclassified because of substandard surveillance and lack of resources. Limited local evidence obviates tailored approaches for each region and community. Activities that are not based on understanding and consideration of local vectors can result in inefficient interventions and wasted resources. For example, as the biting habits of malaria mosquito species differ, insecticide-treated nets and indoor residual spraying are ineffective against mosquitoes that bite outdoors in the early evening *(44).*

Lack of strong political will and leadership

Strong political will is critical for an effective system for VBD prevention and control. Without it, there will not be an active or efficient response from all sectors or mobilization of resources, resulting in deficient programmes and projects. Weak impetus and commitment from a government is often attributed to lack of knowledge, conflicting priorities and inadequate sensitization of governing authorities and decision-makers by programme organizers.

Limitations in current surveillance and control capacity

The surveillance of VBDs is based on diagnostic tests that may not have the required sensitivity, but the surveillance systems are also too weak in some countries to allow a quick and efficient response. In the control capacity, although vaccines are the most effective means for preventing some VBDs, there are no vaccines for many others, and there is no treatment for a few VBDs, including dengue, Zika and chikungunya viruses. When the

treatment for some specific VBDs exists, is not standardized in some regions. For the vectors, current control methods are challenged by the increasing threats of insecticide resistance and adaptation of vectors to new habitats *(45,46).* The efficacy of insecticide spraying depends on coverage and timing, and the impact may be limited if the intervention is poorly planned *(47).* Another concern is the effect of chemicals on the environment and non-target fauna. VBD control strategies are also facing new challenges with the evolution of disease transmission patterns. The shift from a global strategy for the control of morbidity to interruption of the transmission and elimination of the diseases has revealed incompatibility with approaches and techniques that worked when the disease prevalence was high *(48).* Current strategies must be innovative with solutions tailored to the local context to control VBDs.

Necessity to involve other sectors than the health sector alone

Many diseases transmitted by vectors cannot be controlled effectively by the health sector alone. As discussed in section 1.4, prevention and control of VBDs require responses that are beyond the capacity of the health sector. For example, lack of safe water and sanitation, unplanned urbanization with unsafe houses and inadequate management of solid waste can increase the risk and transmission of VBDs. Collaboration with other sectors is thus necessary in regions with large-scale development. Some development projects and industrial activities such as mining and oil and gas extraction alter the environment and thus affect vector distribution and the patterns of the disease transmission. Inadequate consideration of social, demographic and environmental determinants and failure to understand the mandates of other sectors halt the momentum of control. Creative ways should be found to ensure that all relevant sectors work together for VBD control.

Impact of climate change and global population mobility

The impact of climate change on VBDs is complex, with local specificities requiring investigations to recommend policies. Climate change and extreme weather events have been correlated with changing patterns of transmission of vector-borne pathogens and even disease outbreaks *(49).* Climate change disproportionately affects tropical regions and low-income countries, where the burden of poverty and disease is already high, and the impact on the transmission of infectious diseases, including VBDs, exacerbates the challenges. Climate change, travel patterns, rapid urbanization, population growth, migration for employment, displacement because of humanitarian crises and increased global trade contribute to greater global population mobility and movement of people with no immunity into areas of high transmission. The complexity of effective vector control and poor access of mobile and migrant populations to early diagnosis and treatment are likely to jeopardize overall control of VBDs.

Insufficient sensitization

There are significant gaps between knowledge and current practices to control VBDs. Insufficient advocacy for household and personal protection often lead to incomplete, ineffective use; for example, bednets may be widely distributed but not used properly. Qayum et al. *(50)* found that worn-out bednets were not replaced even if they were unusable. Uneven health education results in heterogeneous knowledge about VBDs, even in the same country. In some situations, health education may be limited such as in rural areas or among ethnic groups with limited literacy or language barrier.

Lack of relevant, adequate policies

International organizations, including WHO and the United Nations Development Programme (UNDP), have been advocating for decades for global vector response strategies through guidelines and frameworks. However, the effort comes often from the health sector only and is often disconnected from development in other sectors, resulting in many determinants of VDBs not being accounted for, hence jeopardize a comprehensive prevention and control. The gap is reflected in sectoral policies that do not include consideration of VBDs. Inclusive policies developed by extensive consultation with other sectors to address all the determinants of VBDs are lacking. Health sector policies alone are not enough; multisectoral dialogue is essential. For example, the health and agriculture sectors should develop relevant policies for managing resistance to insecticides and pesticides.

Lack of sustainable financial support

Lack of sufficient, continuous domestic funding frequently impedes development of adequate, sustainable VBD programmes in most low-income countries, where dependence of projects on foreign financial aid makes projects unsustainable. Although substantial financial support has been provided for control of malaria in some countries, funding for non-malaria VBDs has been limited. New funding mechanisms and solutions for sustained domestic and global funding are necessary for scaling-up VBD control globally. This may include harnessing funding from other sectors by showing the potential co-benefits of integrating VBD prevention and control into their routine activities.

Opportunities

Synergy with the global momentum of the Sustainable Development Goals towards human well-being

The prevention and control of VBDs extend beyond SDG target 3.3 to other SDGs targeting poverty, hunger, education, water and sanitation, inequality, climate change, partnerships and others. Progress on other goals will benefit VBD control. As an example, the One Health approach is a platform for collaboration between health, agriculture and environment sectors to tackle health issues, including implementing programmes, policies, legislation and research. WHO's health-in-all-policies approach strengthens legitimacy and accountability at all levels of policy-making in all sectors, by advising governments to consider the health implications of decisions, seek synergy and avoid harmful effects on health. A framework for this health-in-all-policies approach has been prepared, with a training manual *(51,52).*

SUSTAINABLE DEVELOPMENT GOALS

Goal 3. Target 3.3

By 2030, end the epidemics of AIDS, tuberculosis, malaria and neglected tropical diseases and combat hepatitis, water-borne diseases and other communicable diseases *(53).*

Recognition of the importance of VDBs in the global health agenda

Recognition of the importance of VBDs in the global health agenda has led health professionals, government leaders, researchers and others to advocate vigorously for the prevention and control of VBDs and to design strategies and operational frameworks. Although action is still lagging in many countries, examples of successful reduction or elimination of prioritized VBDs have been documented, such as the effective response in Cuba to a dengue epidemic in 1981, which led to near-eradication of *Ae. aegypti* in the country *(54).* Control of *Ae. aegypti* and *Ae. albopictus* in Singapore, mainly with environmental measures in integrated vector control, is another success *(55).* The lessons learnt provide a realistic guide for strengthening implementation in other affected areas.

Resource optimization

With a carefully designed and integrated approach, resource use can be optimized. For instance, Stone et al. (*56)* showed in a simulation analysis that mass distribution of LLINs for malaria control also controls lymphatic filariasis.

Stimulation of collaboration

Multisectoral approaches have been adopted by WHO, other United Nations agencies and governments for other health issues, such as nutrition, antimicrobial resistance, HIV infection, early childhood development, noncommunicable diseases and prevention of road traffic accidents. Synergy in institutional collaboration increases collective control of public health issues, making multisectoral collaboration more and more the “new normal”.

Multiple entry points for interventions by sector and disease

In view of the broad range of determinants of VBDs, transmission can be prevented in various ways. Improvements in VBD control will be made not only with advances in disease treatment or wider coverage of vaccination but also through education and agricultural and aqua-cultural development. New methods of work among sectors will stimulate strategic and innovative solutions. Moreover, spreading responsibility increases the number of people who can be held accountable, so that they become a complete VBD workforce.

Research

Research with cost-effective tools will provide information about the real burden of diseases, transmission risks and the most efficient control methods and further guide programmes in using the best surveillance and response strategy. The European Commission, the United Kingdom’s Medical Research Council and Biotechnology and Biological Sciences Research Council, the International Centers of Excellence for Malaria Research and numerous other research institutes are supporting increased research activities on VBDs. The results fill various knowledge gaps, and new evidences can be used to improve policies and strategies. In implementation research, lessons from practice lead to further research questions to refine implementation.

Chapter 2

Introduction to the multisectoral approach

2.1 A multisectoral approach to vector-borne diseases

2.1.1 Definitions

Definitions of intersectoral and multisectoral activities are presented in **Box 2.1** Kickbusch & Szabo *(57)* distinguishes "global health governance" from "global governance for health", whereby the former refers to collaboration among stakeholder groups to improve global health and the latter to collaboration from "institutions and processes of global governance that do not necessarily have explicit health mandates but have a direct and indirect health impact". An MSA to health combines the two terms, as it refers not only to a collaboration to improve human health but also involves coordination and coherence of processes that were not designed for health but in which the outcomes on health and equity are defended and enhanced. While the terms "multisectoral" and "intersectoral" are often used interchangeably, in this document, "multisectoral" is preferred to "intersectoral" to emphasize the fact that the collaboration can include more than two sectors, while "sectors" include different areas and ministries as well as stakeholder groups.

In this document, the MSA is defined as:

A recognized relationship between part or parts of the health sector with part or parts of several other sectors, including governmental sectors, public and private institutions and organizations, NGOs and others, which has been formed to take action on an issue to achieve health outcomes (or intermediate health outcomes) in a way that is more effective, efficient or sustainable than could be achieved by the health sector alone.

Box 2.1 Definitions of multisectoral and intersectoral approaches to health

- Participants at the international conference on Intersectoral Action for Health: A Cornerstone for Health-for-All in the Twenty-first Century *(58)* defined "intersectoral action for health" as: "A recognized relationship between part or parts of the health sector with part or parts of another sector which has been formed to take action on an issue to achieve health outcomes, (or intermediate health outcomes) in a way that is more effective, efficient or sustainable than could be achieved by the health sector acting alone." In this definition, intersectoral action for health concerns only the health sector and one other sector. It is thus a bilateral relationship. A working group identified the key factors required to achieve a common vision, values and goals for intersectoral action for health:

- Leadership, champion, catalyst
- Analysis or priority-setting
- Mutually beneficial relationship
- Integrated action at macro or micro level
- Institutionalized health impact or gain assessment
- Variation of institutional long-term policy
- Training, tools and capacity development
- Coordination and integrating mechanism, partnering
- Social mobilization or community empowerment

- The Multisectoral Action Framework for Malaria states that the framework requires: "action at several levels and in multiple sectors, globally and across inter- and intra-national boundaries, and by different organizations" *(59).* The notions of "complementarity", "effectiveness", "sustainability" and "synergies to accelerate both socioeconomic development and malaria control" were also emphasized.

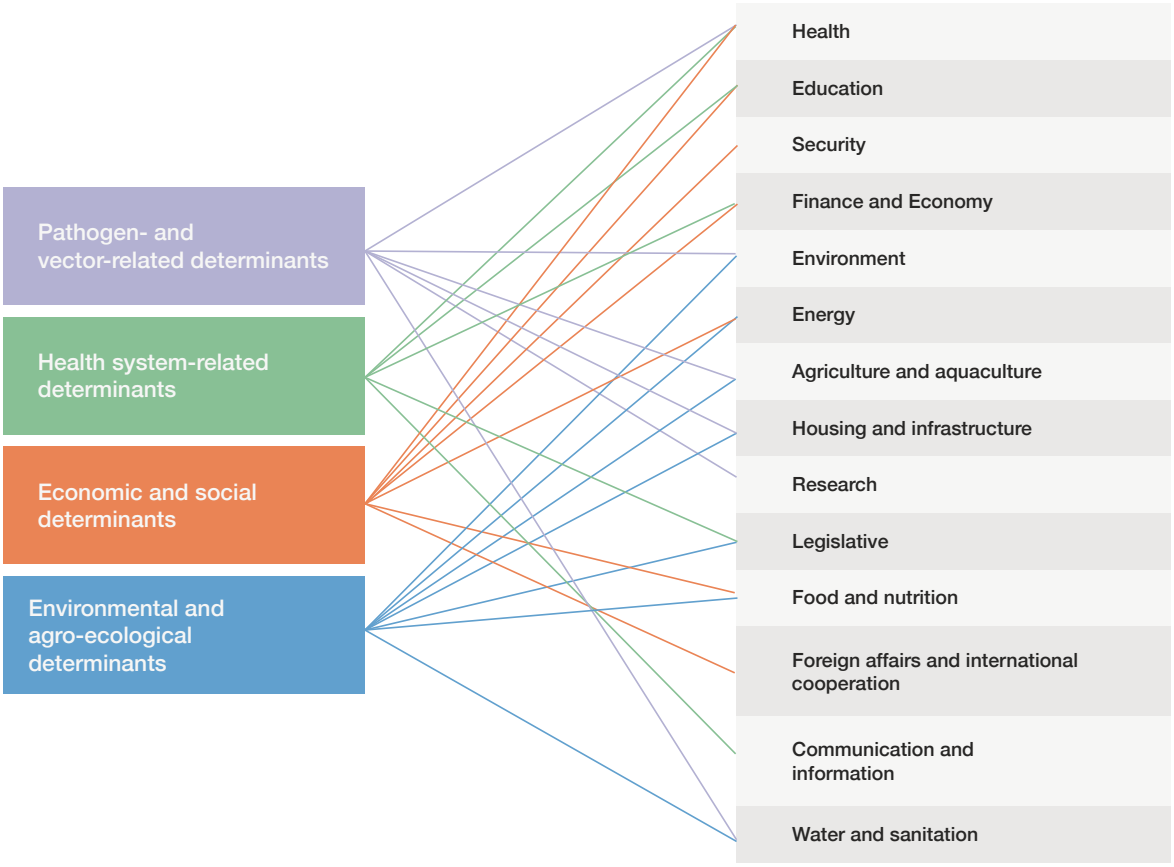
- An update of the Multisectoral Action Framework for Malaria, the Action and Investment to Defeat Malaria 2016–2030, reiterated the importance of "working together, building inclusive partnerships within and across boundaries and sectors to address inequalities everywhere, and promoting dignity and prosperity for all mankind" *(16).* Considerations of population mobility, drug and insecticide resistance, sustainable habitats, food security and climate change were addressed. The document highlighted the importance of learning lessons from IVM, strengthening private sector engagement, expanding international and regional partnerships, keeping people at the centre of the response and strengthening the enabling environment through policies, high-quality data and better health systems.

- The Health Policy Project referred to multisectoral coordination as "deliberate collaboration among various stakeholder groups (e.g. government, civil society, and private sector) and sectors (e.g. health, environment, economy) to jointly achieve a policy outcome", which, if successful, can "eliminate policy implementation barriers, facilitate scale-up, and increase the impact that one sector or partner might have had alone" *(60).*

2.1.2 Use of multisectoral approaches

Like many other health issues, VBDs are determined by complex factors both within and outside the health sector **(Fig. 2.1).** Consequently, the health sector cannot solve the issues alone, and single countries, regions or governments may have limited capacity for the prevention and control of VBDs. WHO has increased work on the social determinants of health to promote population health and reduce health inequality. Engagement of non-health sectors for coordinating concerted action on convergent goals is, however, challenging. When the IVM strategy was introduced, uptake was poor because of limited understanding and insufficient political willingness among other factors *(41).* The MSA is essential to strengthen VBD control and systems to sustain outcomes according to the characteristics of diseases, populations, geographical distribution, communities and risk factors *(61).*

Fig. 2.1 Examples of associations between the determinants of vector-borne diseases and various sectors



The MSA can strengthen the prevention and control of VBDs in six ways, by:

- maximizing synergy and fostering sharing of human, infrastructure and financial resources;
- including all the determinants of VBDs;
- facilitating scaling-up, sustainable control and funding and increasing impact;
- complementing each sector with knowledge, expertise and reach;
- increasing the coherence of strategies and policies in each sector with regard to VBDs; and
- empowering communities.

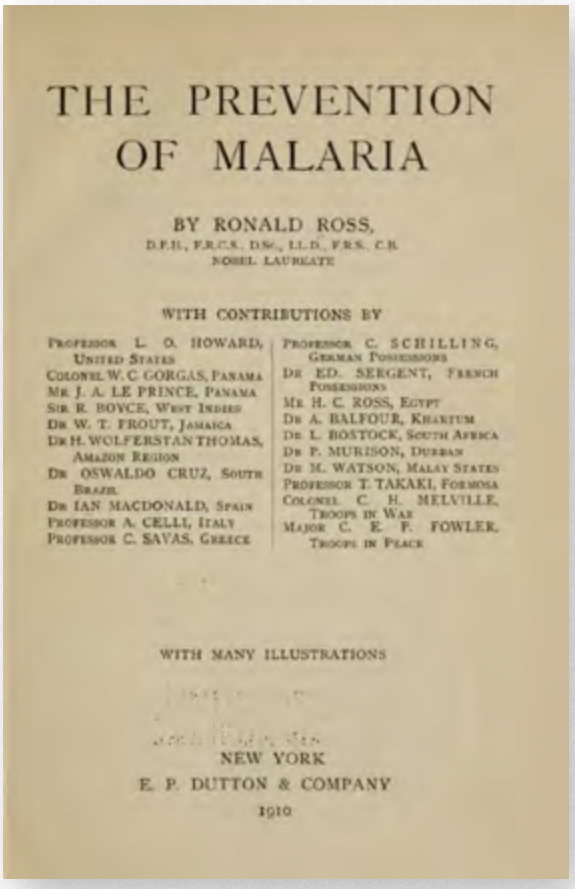
In addition, the MSA is likely to have co-benefits for each sector, facilitate integration of health into non-health programmes and strategies and serve as a platform for achieving other health-related goals. Although the cost of the MSA has rarely been analysed, a study in Ethiopia compared the cost of a community MSA with that of "vertical" indoor residual spraying and found that the cost with the MSA was lower *(62).*

2.1.3 Background of multisectoral approaches to control of vector-borne diseases

Involvement of several sectors in health and well-being was introduced in the 1950s during technical discussions at the Fifth World Health Assembly *(63).* Multisectoral collaboration was further advanced in the Alma Ata Declaration in 1978 *(64),* at the Thirty-ninth World Health Assembly in 1986 and the WHO publication Intersectoral action for health – the role of intersectoral cooperation in national strategies for health for all *(65),* the Ottawa Charter in 1986 *(66),* the international conference on intersectoral action for health in 1997 *(58),* the WHO report on the social determinants of health in 2008 *(67),* the Rio political declaration in 2011 *(68)* and resolution WHA67.12 of the Sixty-seventh World Health Assembly *(69).* These documents called upon all non-health sectors in national and community development to coordinate their work to protect and promote the health of all people, and in particular the sectors of agriculture, animal husbandry, food and nutrition, industry, education, habitat, housing, public works, communications and information,

environment and industry. Plans and guidance for countries and development partners have since been issued on various aspects of health, including nutrition, maternal and child health and communicable and noncommunicable diseases. Case studies of multisectoral collaboration in countries include interventions: to improve the nutrition of adolescent girls to prevent anaemia in schools in Indonesia *(70);* to promote a healthy weight for children and adolescents in the USA by changing policy *(71);* to improve the delivery of health care for indigenous women in communities in Guatemala *(72)*; and to improve coverage of human papillomavirus vaccination of adolescent girls in Malaysia *(73).*

The MSA has a long history in control of VBDs, since recognition of the association between fevers and proximity to swamps and marshes more than 2000 years ago *(74).* Environmental management and improved housing were then shown to reduce the incidence of VBDs such as malaria and yellow fever, and this approach for the control of malaria was endorsed during the World Health Assembly in 1978, by inclusion of the biological, social, ecological and economic determinants of the disease *(75).* The shift from a single-sector (health) approach to an MSA has become empowered over the past 10 years. WHO's revised malaria control strategy in 2007 recommended that Member States "mobilize other sectors to implement malaria control as part of healthy public policies", and this was reiterated in the global malaria action plan of the RBM Partnership *(76,77)*. An MSA framework for malaria was prepared by RBM and UNDP to provide inspiration and guidance for policy- and decision-makers in all sectors *(59).* The WHO Global vector control response 2017–2030, approved by more than 190 countries in a World Health Assembly resolution, recommended this strategic approach as one of four pillars of action *(41)* **(Box 2.2).**



THE PREVENTION OF MALARIA

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1910

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Box 2.2 Extract of World Health Assembly resolution WHA70.16 *(78)*

The Seventieth World Health Assembly,
Having considered the report on global vector control response;
URGES Member States:

"to build and sustain, as appropriate, adequate human-resource (especially public health entomology), infrastructural and institutional capacity and capability at **all levels of government and across all relevant sectors,** based on a vector control needs assessment;"

"to promote collaboration in line with the 'One Health' approach and the integrated vector and communicable disease approach, as appropriate, **across all levels and sectors of government,** including municipality and local administrative structures, and with the engagement and mobilization of communities through organized stakeholder groups;

"to collaborate, as appropriate, **with international, regional, national and local institutions and non-State actors from relevant sectors** to support and contribute to the implementation of WHO's strategic approach for integrated global vector control and response;"

2.2 Current examples of the multisectoral approach to vector-borne diseases

2.2.1 Environment and health in Africa

The adoption of the Libreville Declaration *(79)* in 2008 during the first Interministerial Conference on Health and Environment in Africa called upon African countries and their development partners to address the environmental determinants of human health and ecosystem integrity in a coherent strategy. Countries committed themselves to 11 priority actions to strengthen systems, increase resources, improve capacity and coordination and use integrated strategies to address linked issues of health and the environment. The Health and Environment Strategic Alliance was then established to coordinate implementation of the Declaration. The second Interministerial Conference, in Luanda, Angola, in 2010, reaffirmed the commitment, with vector control listed in one of the 10 priorities. A synthesis of outcomes in 2016 showed that 34 countries had established a country task team, 12 had a national plan for joint action, 23 had integrated management of health and the environment into their policies with strategies and national development plans, and in most countries the health programmes include environmental issues related to vector control *(80).* Multisectoral projects on vector control and management of chemicals and waste have been conducted in Congo, Ethiopia, Gabon, Kenya, Mali and Sierra Leone. The outcome of the third Interministerial Conference, in Libreville, Gabon, in 2018, was a strategic action plan to scale up health and environment interventions up to 2029 in order to promote government investment in environmental problems that affect human health *(81).* These agreements and strategic plans have created an enabling political environment in Africa and are paving the way for a more integrated approach to policy-making in health and environment.

Clim-HEALTH Africa, an international network of institutions, was established in 2013 with support from WHO in response to the growing threat of climate change to public health *(82).* The network provides a virtual hub for sharing expertise in capacity-building in African communities and institutions among practitioners, policy-makers and negotiators for integrating climate change and health into policy, socio-economics, planning and

programming. This network is contributing to implementation of the International Health Regulations (2005), of the Luanda Commitment and other strategies related to climate change, such as the African Union Strategy for Climate Change and Health, the Global Framework of Climate Services and the Climate for Development in Africa Programme.

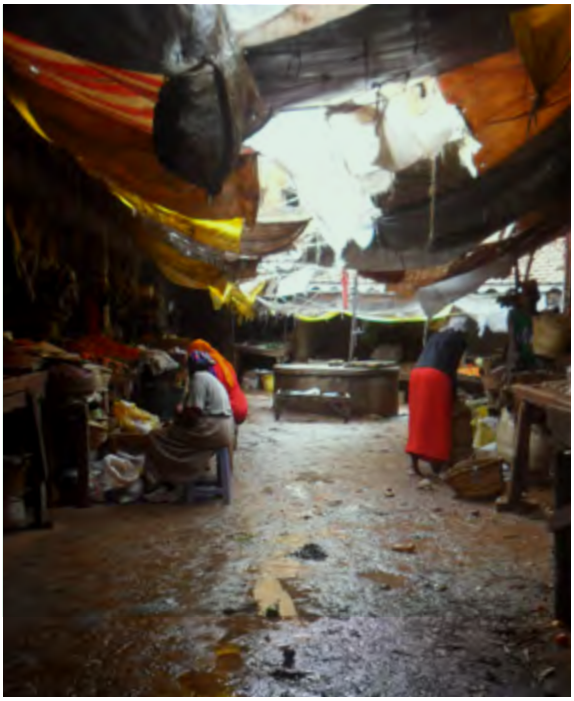
2.2.2 Case studies

Many publications on multisectoral collaboration for the prevention and control of VBDs have appeared in the past two decades. Reviews of previous MSAs for VBDs indicated the involvement of numerous non-health sectors, such as education, research, defence, immigration, civil registration, labour, industry, mining, energy, environment, engineering, water and sanitation, agriculture, fisheries, irrigation, transport, travel, children's and women's welfare, social welfare, rural development, public security, media and information *(19,44,83)*. Sectors other than government, such as the United Nations and other international organizations, multilateral organizations, the private sector (industry) and civil society organizations (including international and local NGOs, faith-based organizations, volunteer groups and community organizations), were also engaged. People in the health sector apart from ministries of health were involved, such as physicians, specialists in public health and social sciences, virologists, immunologists, entomologists, epidemiologists, pathologists, primary health care and other health care providers and officials. The reviews demonstrate the various levels of collaboration, from global to regional, national, sub-national, provincial and local.

In 2018, Herdiana et al. *(83)* screened databases for published articles with the keywords "multisectoral" and "vector-borne diseases" and found 194 articles published since 1970. In the 50 articles that met the inclusion criteria, the main VBDs were malaria and dengue as the focus of most studies, indicating lack of interest in other, "neglected" VBDs. In the selected articles, local collaboration dominated. Community mobilization and health education were the most common multisectoral interventions implemented through MSA, followed by diagnosis, treatment, prevention, surveillance, monitoring and evaluation, mass drug administration, cross-border collaboration, research, advocacy and legislation.

In a review of articles on displaced people, Naing et al. *(19)* identified promotion of personal protection through use of insecticide-treated nets (ITNs) as the most frequent intervention implemented through an MSA, followed by early diagnosis and treatment. The reported MSA involved collaboration among ministries of health, other government agencies, United Nations agencies, the private sector and community volunteers. The mechanisms included: i) collaboration on research between NGOs, universities and research institutes, ii) joint surveillance and surveys by ministries of health and international organizations and NGOs, iii) support from industry owners and employers to ensure better access to health care facilities, support from NGOs, volunteers and community health workers to the ministry of health in distributing bednets and education, iv) participation of private firms in a lending scheme for ITNs, v) information-sharing and training among sectors, and vi) bilateral control in border areas and support from ministries of labour in registering migrants. Ministries of health often collaborated with local or international NGOs and United Nations agencies. Local NGOs usually assisted in implementation of interventions, such as distributing nets and sensitizing communities, whereas international organizations provided financial support. The roles of the different sectors in such collaborations included providing access and logistic, technical and financial support, social mobilization, policy development, planning and implementation of activities and monitoring and evaluation.

Almost all the studies in which outcomes before and after an intervention were measured reported positive effects of multisectoral interventions through indicators on disease, vectors, knowledge and communities' behaviour. The effects due to the MSA and/or to each sector/activity are not easy to discern. Nevertheless, the few studies show that collaboration and participation was superior in the MSA compared to other approaches, especially when the MSA included strong community empowerment *(83).* Likewise, the few comparisons of the sustainability of interventions for community empowerment showed that community-controlled interventions based on partnerships were more effective than those with a vertical approach.



In another review, Antonio et al. **(Annex III)** used slightly different terms to retrieve publications and found 69 articles on MSA for malaria, dengue and yellow fever published since 1985. Most of the studies were on use of the MSA for malaria. The partnerships in these studies included the Malaria Control Programme, the Dengue Control Programme, RBM, the Multilateral Initiative for Malaria, the Asian Centre of International Parasite Control, the Global Fund to Fight AIDS, Tuberculosis and Malaria, Primary Health Care Nepal and IVM. Most of the collaborations were initiated by multilateral organizations, followed by ministries of health and academic and research institutes; none were initiated by communities. The projects were funded mainly by the public sector (17/28), followed by private and mixed sources. The resources provided were categorized as material, human, financial and policy. The types of interventions were identified as: advocacy, health education, health research, public health measure, resource mobilization, service delivery and training. Most strategies were used in communities, followed by policy and organization levels; several interpersonal interventions were identified, for health education (by health workers for parents), public health measures (home visits by doctors) and household training in simple mosquito control methods.

For the control of *Aedes*-borne diseases, a review of vector control and eco-bio-social approaches **(Annex III)** suggested that integrated multidisciplinary and multisectoral interventions were the most effective for control of *Ae. aegypti,* resulting not only in direct elimination of the vector but also changing social and environmental factors that contribute to proliferation. Many studies highlighted community empowerment and participation.

2.3 Challenges to apply multisectoral approaches to the prevention and contol of vector-borne diseases

Although the links of various sectors to VDBs are clear, studies of use of the MSA for the prevention and control of VBDs revealed lack of experience and lack of documentation on theoretical and robust multisectoral mechanisms. Countries and regions may develop their own multisectoral strategies and programmes but do not describe them in published reports; therefore, little information is available on their design, implementation or impact. More studies are needed on the theoretical base of the approach. General recommendations for improving the effectiveness and efficiency of the MSA must also include better communication, more dedicated funds and political commitment to increase access to resources, tools and measures for controlling VDBs.

Lack of political will and strong leadership

As mentioned above, political will is essential for multisectoral collaboration. Weak political will and leadership result in a lack of initiative, commitment, accountability and facilitation, poor resource allocation and inadequate engagement of sectors. Inadequate governance obviates establishment of a shared policy framework for concrete actions and policies.

Inadequate communication and coordination among partners

Poor communication, lack of coordination and of acknowledgement of the responsibilities of partners also jeopardize successful multisectoral collaboration. Lack of consultation in planning and unclear communication of roles and responsibilities make it difficult to mobilize resources and result in uncoordinated implementation and sometimes power struggles. Furthermore, once

communication is established, each player may exercise responsibility in an uncoordinated manner, which will undermine collective performance and synergy. In the urban malaria control programme in Dar es Salaam, United Republic of Tanzania, a bilateral agreement with the Japan International Cooperation Agency required a clear separation of responsibilities, which resulted in an unsustainable programme *(84)*. Disconnection among sectors may arise from difference in priorities and interests, basic values, budget and the definition of success. Differences in organizational culture, agendas, structure and operating mechanisms among partners are further obstacles to efficient planning and coordination.

Unsustained funding and unsustainable interventions

Deficient interventions are frequently due to inadequate funding. Antonio et al. **(Annex III)** found that most funders were in the public sector, indicating that more sources of funding should be mobilized from private or mixed sources. Similarly, in terms of number of projects, they also found that national governments participated most frequently in funding.

One reason for discontinuation of funding is lack of donor confidence when an intervention appears to have no long-lasting impact. Projects for vector and pathogen control often result in decreased incidence of disease only during campaigns. However, the donors often do not understand that the control can be sustained only if the associated funding is also sustained. Prevention and control of VBDs does not work with a single “shot”.

Insufficient participation of communities

Lack of community participation and involvement in project planning and implementation results directly in ineffective control of disease transmission. Lack of ownership by communities makes projects vulnerable. Antonio et al. **(Annex III)** reported that the common top–down MSA may disconnect stakeholders from their responsibilities in the longer term, resulting in interventions that do not reach their target beneficiaries.

Other challenges

Insufficient engagement of relevant sectors, inadequate human resources and poor understanding are further challenges. Naing et al. *(19)* found that most multisectoral collaborations (25/36) were between ministries of health and local or international NGOs and United Nations agencies, and the participation of other government ministries and the private sector was limited. The mobility of professionals was a leading cause of discontinuity in partnerships; difficulty in recruiting health practitioners for affected areas, shortages of skilled, knowledgeable personnel and inadequate training and local capacity are further problems.

Knowledge gaps

Role and contribution of the MSA in prevention and control of VDBs

The role of the MSA in partnerships and its contribution to successful prevention and control of VBDs should be better understood. In malaria programmes and projects with multisectoral collaboration, the impact of an intervention on disease incidence or prevalence or on communities having received intervention have been analysed but not the indicators of the effectiveness of multisectoral collaboration, although MSA may have been the key element in the success of the intervention. Lack of understanding and indicators of the contribution of multisectoral collaboration to the prevention and control of VBDs limits proper use of the MSA. The contributions of different sectors have also rarely been studied, and the division of duties, responsibilities and resources is unclear. Further research and analysis are necessary to understand the contribution of multisectoral work to its effectiveness on the prevention and control of VBDs, not only to determine the contribution of each sector but also to identify the multisectoral mechanisms that have the greatest impact.

Sectoral costs and returns

As the actual engagement of non-health sectors in the control of VBDs is not often known, the cost to each sector and the short- and long-term returns on investment are unclear. How different sectors can efficiently contribute to disease control programmes is poorly understood. Cost–effectiveness and outcomes are strong incentives for non-health partners, especially in the private sector, and lack of information may discourage decision-makers and financial support. For example, corporations with industrial operations are encouraged through return on their employees' health to take added responsibility of draining stagnant water bodies to reduce vector breeding sites.

Practical implementation of the MSA

Although the importance of multisectoral collaboration in the prevention and control of VBDs has been reiterated in numerous resolutions and strategies, documented examples of practical experience with the MSA are rare, particularly for VBDs transmitted by non-mosquito vectors. Theoretical and detailed pathways should be provided of application of the MSA for the prevention and control of all types of VBDs, with more evidence on collaboration mechanisms and enabling factors.

Other knowledge gaps

National institutional, social systems and capacity for multisectoral collaboration should be identified. The direct relation between VBD control and the SDGs has been mentioned, but more information is required on the association between VBD transmission and the activities of other sectors such as the industrial activities with the examples of natural resource extraction and development projects.

2.4 Particular concerns

2.4.1 Mobile and migrant populations

Mobile and migrant populations (MMPs) are more vulnerable than other populations because of their poor living conditions, little use of personal protection such as ITNs and limited access to health care. These populations may also be involved in the transmission of VDBs, either as “passive acquirers” when non-immune people move to a high-prevalence area or as “active transmitters” when people carrying pathogens enter a location with low immunity in the local populations *(19)*. Human displacement and migration spread not only pathogens but also vector and reservoir species into new areas, as well as drug resistance. Ignorance about the risks of exposure of these populations and their influence on VBD transmission compromises the control or eradication of VBDs.

A number of examples are available. The recent increase in the incidence of leishmaniasis in Lebanon was attributed to transportation of the leishmania parasites by refugees from the Syrian Arab Republic *(85).* Malaria cases were detected among Venezuelan migrants in Ecuador and in the Tumbes Region of Peru after the recent massive migration of Venezuelans *(86).* Increasing population movement may also increase importation of the parasite that causes Chagas disease to areas where the vectors (triatomine bugs) do not yet carry the disease, increasing the potential for local transmission *(34).* High migrant density does not, however, necessarily mean an increased risk of transmission of VBDs, if the environmental conditions are not suitable for vector and pathogen proliferation. The risks can be mitigated by interventions such as free distribution of ITNs *(87).*

In the context of malaria, mobile and migrant populations are defined by the International Organization for Migration as "individuals who move to and/or from the endemic/studied areas for a certain period of time and live and/or work at a certain distance from forest and/or forest-like settings" *(88),* although countries may include their own vulnerable mobile population groups according to context *(89).* In general, the definitions include populations who move for economic or social reasons or to find refuge from armed conflict or a disaster. The categories of mobile and migrant populations relevant for malaria programmes in the Greater Mekong sub-region are listed in **Box 2.3.**

Box 2.3 Proposed categories of mobile and migrant populations relevant for malaria programmes in the Greater Mekong sub-region *(89)*

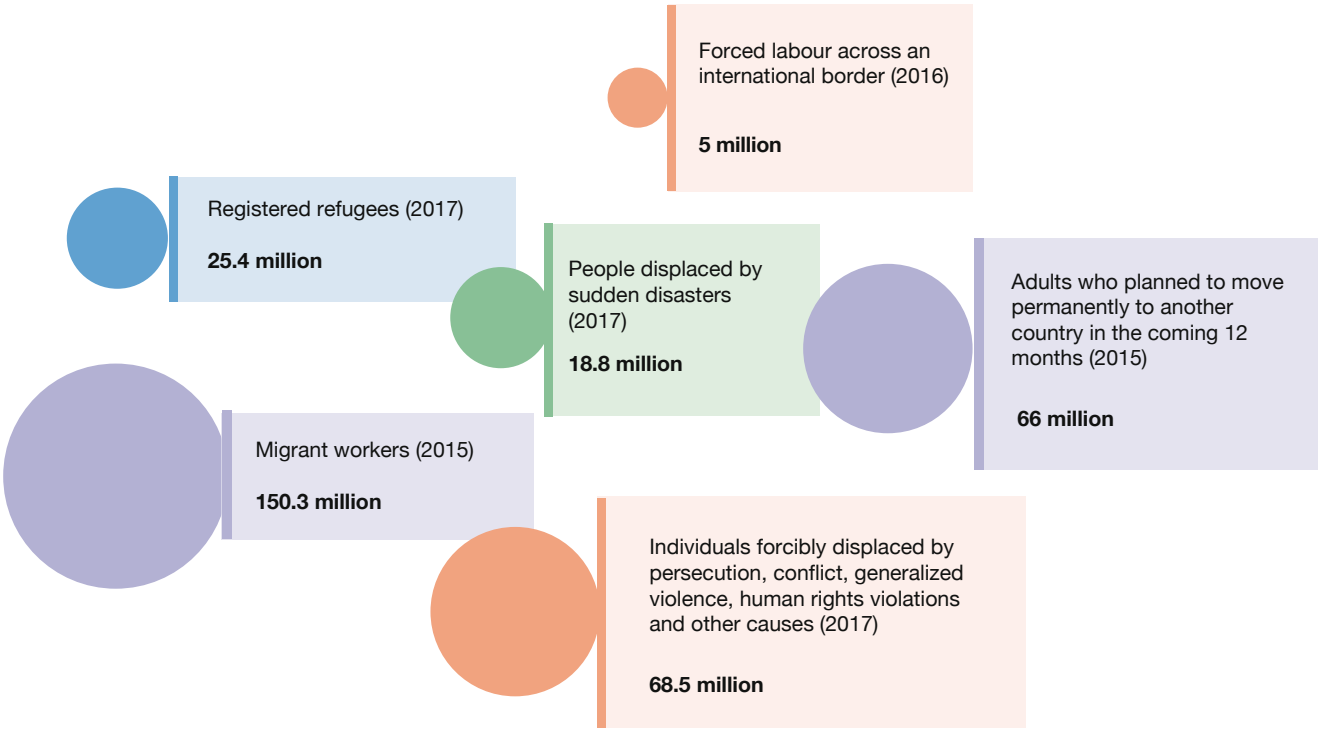
- remote populations (in forested areas);
- seasonal agricultural workers on plantations and their families;
- workers on large, long-term infrastructure projects in endemic areas, with long-term migration from non-endemic to endemic areas and from "poor" to more industrialized areas;
- forest workers;
- internally displaced people, who have been forced to leave their residence as a result of conflict, violence, violation of human rights or natural or man-made disasters *(90);*
- civil service officers such as agronomists, security guards, border patrols and United Nations soldiers;
- people moving for work for other reasons than the ones reported above;
- national populations returning from abroad; and
- foreign populations moving into new areas.

Systematic identification of displaced populations in a region is highly recommended for health reasons. Active surveillance of mobile populations is necessary to provide timely support, particularly during outbreaks. People working in foreign affairs, international cooperation, trade, industry, transport, security and the military may be effective partners in controlling the spread of VBDs by mobile and migrant populations.

Abdul-Ghani et al. **(Annex III)** suggested five "technical elements" in a multisectoral strategy for containment of chikungunya outbreaks as a result of human displacement: outbreak risk assessment and communication, mobilization of displaced and resident populations in areas of conflicts or disasters, mobilization and involvement of stakeholders, rapid notification and strengthened surveillance, and IVM deployment. Naing et al. *(19)* included a category of "test and treat" in interventions for mobile and migrant populations.

The epidemiological relevance of mobile human carriers is still not well-known, particularly their role in the maintenance, resurgence or reintroduction of a disease in certain areas. The different categories of mobile and migrant populations and their numbers allow a best estimate of the situation **(Fig. 2.2).**

Fig. 2.2 Indicators of MMP groups by reason for migration



Source: reference *91.*

2.4.2 Impact of industry

The association between VBD transmission and industrial activities such as mining and oil and gas extraction has been reviewed by Jones et al. *(44)*. Strong evidence was found for a link between industrial activities and transmission of malaria, leishmaniasis and dengue, while the link with yellow fever, West Nile virus and other arboviruses was considered plausible but less well documented. Case studies have shown links between active malaria cases and mining in Brazil, Colombia, Peru and French Guiana. Mining communities, especially illegal, are particularly vulnerable because of high mobility, poor access to adequate health care, and poor living conditions *(19)*. Industrial development projects can also have a positive impact on VBD control. Knoblauch et al. *(92)* monitored selected health indicators in children living in a copper mine development area in north-western Zambia and found that those living in villages in the development project area generally had fewer *P. falciparum* infections, anaemia and stunting than children living in other sites. This was attributed to new housing and employment for project workers.

Nevertheless, the dramatic environmental changes and human migration caused by industrial activities are strongly associated with VBDs. Excavation of minerals affects larval habitats, local water quality and availability, soil quality and other factors increasing vector proliferation. Removal of trees and fragmentation of habitats for large industrial projects also alter vector dynamics. Industrial activities lead to economic and demographic changes that increase contact between vectors and people, create vulnerable populations due to mediocre living conditions and exacerbate inadequate health care.

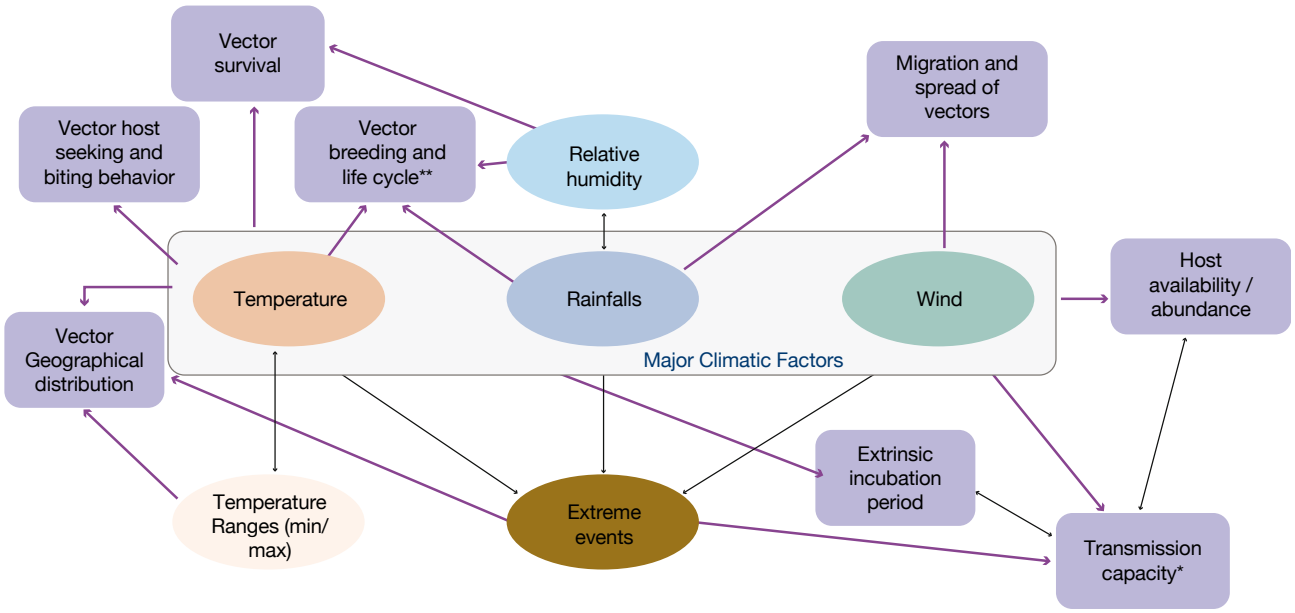
Hydropower projects also affect VBDs. Hydropower dams along the Mekong River and its tributaries have been associated with increases in the incidence of VBDs such as malaria, dengue and schistosomiasis *(93)*, and the construction of hydroelectric plants in Brazil increased populations of sandflies and thus the prevalence of leishmaniasis *(94,95).*

The planning of development projects should therefore include a health impact assessment for VBDs. Furthermore, industrial sites should ensure access to health care and vector control programmes. Industrial partners should be involved in collaborations through their incentive to maximize productivity by reducing disease in their workforce and exercise corporate social responsibility. Jones et al. **(Annex III)** called for more research on the impacts of specific industries on VBD transmission, such as the effect of exposure to toxic chemicals on human responses to pathogens and on the epidemiology of VBDs.

2.4.3 Environmental changes

VBDs are sensitive to environmental changes such as in climate and land-surface characteristics due to natural or anthropogenic activities, as they determine vector habitats, life cycles and transmission. Climate change poses uncertain threats to the global environment. Increased temperatures and longer warm seasons will influence vector bionomics and behaviour, including host-seeking **(Fig. 2.3)**. Daily minimum and maximum temperatures also affect vector mortality rates and transmission capacity. Some of the pathogen's life-cycle characteristics, such as incubation time and replication rate, are also closely related to temperature. Changes in temperature are shifting the geographical distribution of vectors *(49),* and changes in relative humidity affect vector lifespan and activity.

Fig. 2.3 Examples of the major direct effects of climate change on VBDs. The elements and relationships included are not exhaustive.



*Transmission capacity and pathogen reproduction and survival are host-dependent and not so much climate-dependent
**Vector breeding and life cycle include the duration of the development in days, the reproductive capacity and the seasonality

Modifications in global precipitation are changing the breeding habitats of vectors and the length of the season during which vectors can survive. Overall changes in weather and climate may increase the abundance of VBDs in tropical and subtropical zones and result in re-emergence of endemic VBDs, and tropical and subtropical VBDs may also spread to more temperate zones as they become more suitable vector habitats *(96).* Climate change also impacts vector survival and host preferences through the availability of animal and human hosts. Climate change and extreme weather events have socioeconomic impacts on human lives, potentially increasing vulnerability to illness and exposure to vectors and pathogens. These changes further complicate the epidemiology of VBDs and the challenges of prevention and control.

Campbell-Lendrum et al. *(97)* proposed that individual short-term risks be assessed with outcomes on control measures, in order to manage the risks, strengthen disease control and, ultimately, increase resilience to long-term climate change.

Finally, the environmental changes can also act in the opposite direction and prevent the transmission of VBDs by making the environment less suitable to a disease. Nevertheless, there is strong need to better understand how the changes will affect the diseases patterns.

Chapter 3

Conceptual framework

3.1 Goals and objectives

3.1.1 Goals

The goal of this conceptual framework is to provide guidance for governments as well as public and private institutions in using a concerted MSA based on facilitating, inclusive, collaborative, participatory, sustainable mechanisms. While the guidance is mainly for national governments, it can be tailored for sub-national and decentralized entities. The framework is designed to support supra-ministerial leaders and the health sector and to enhance the capacity of decision-makers in other sectors to achieve efficient prevention and control of VBDs. Health systems should be strengthened continuously to ensure effective, efficient, equitable delivery of interventions and to reduce vulnerability. The guidance first focuses on collaboration and coordination of government sectors, which are then responsible for engaging nongovernmental partners and sectors. The guidance then proposes recommendations for engaging with other non-government sectors.

> “(to control malaria) the mass administration of ITN did a very good job, but after removing all the ‘spikes’ of the disease burden, now the contextual residual and persistent malaria is exposed, and that’s where we need MSA.
>
> **- Dr Florence Fouque, TDR**

3.1.2 Objectives

This document:

- presents a comprehensive conceptual framework for an MSA to the prevention and control of VBDs and the essential components to be included in the collaboration;
- identifies non-health sectors associated with the determinants of VBDs to assist them in deciding on sectoral objectives, partners and actions;
- provides guidance on planning and coordinating strategic, efficient multisectoral collaboration and on the roles and responsibilities of different stakeholders; and
- should assist governments in understanding how nongovernmental stakeholders, such as the private sector, international organizations and communities, can be engaged in collaboration.

A successful multisectoral programme must be relevant to the situation. Therefore, while this document presents an overall picture of how the MSA should be used and its main components, the application of the guidance to detailed strategies and programmes should remain flexible and adapted to local capacity and institutions. Strong advocacy and global work on infectious diseases, including VBDs, over the past decade have resulted in mechanisms and activities similar to those suggested here. The first step in a collaboration based on the MSA must be a detailed inventory and evaluation of national and subnational organizational structures, activities and resources to identify gaps and update and strengthen those mechanisms to ensure comprehensive multisectoral collaboration.

3.2 Considerations in planning and using a multisectoral approach to vector-borne diseases

3.2.1 Major outputs and outcomes of a multisectoral approach

The short-term outputs of an MSA can be classified into three categories:

(i) the products or services provided by each sector in the collaboration, such as materials for advocacy (videos, brochures, courses, workshops), research, scaled-up ITN distribution, updated building code that includes eliminating vector breeding and resting sites and physical elimination of breeding sites, such as draining unused pools;

(ii) the products or services resulting from joint projects and interventions, such as posters and flyers on prevention of mosquito breeding prepared jointly by health, housing and education sectors; and

(iii) the establishment of robust institutional arrangements for multisectoral collaboration, such as a coordination committee, new communication channels, resource mobilization strategies and service delivery strategies.

In the long term, effective use of an MSA for the prevention and control of VBDs should: i) decrease morbidity and mortality due to VBDs, ii) reduce the exposure and vulnerability of all population groups to VBDs, and iii) increase resilience to VBDs and strengthen the capacity of the health system to protect public health with optimal use of resources. The success of multisectoral collaboration is also reflected in outcomes related to the primary "business" of each sector, which are indispensable incentives for non-health sectors to initiate collaboration. In addition, an MSA will sensitize major stakeholders, increase the access of populations to basic health care services, ensure health equity, facilitate prioritization of health in all sectors, build trust among sectors and improve policies, plans and multisectoral coordination at all levels of governance, not only for the prevention and control of VBDs but also for other health outcomes. A successful multisectoral collaboration might extend its joint force to other areas and strengthen the capacity of central and local governments.

3.2.2 The multisectoral approach and integrated vector management

The most successful strategies for controlling *Ae. aegypti* vectors are integrated approaches *(98,99).* The concept of IVM was introduced "to overcome challenges experienced with conventional single-intervention approaches to vector control" *(40)* and to promote application of the MSA to human health. Collaboration within the health sector and with other sectors is one of the five elements for implementation of IVM, with optimal use of resources, planning, monitoring and decision-making *(40)* **(Fig. 3.1).** The MSA is not complementary to IVM but represents the larger framework in which IVM is embedded. By mobilizing multiple sectors and facilitating collaboration, the MSA enhances the capacity of IVM. Moreover, the holistic prevention and control of VBDs through an MSA goes beyond vector control to strengthen other elements.

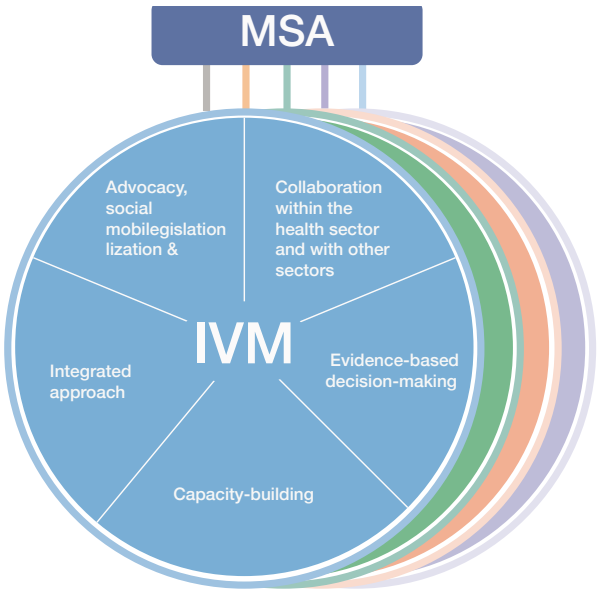


Fig. 3.1 Multisectoral approach (MSA) and integrated vector management (IVM)

3.2.3 Learning by doing

There is little rigorous evidence on best practices in the MSA and their impact on VBDs, and more evidence should be built for multisectoral action. In this guidance, those involved in VBD prevention and control are encouraged to "learn by doing", testing the approach, recognizing its limitations and collecting evidence for improvement and decision-making.

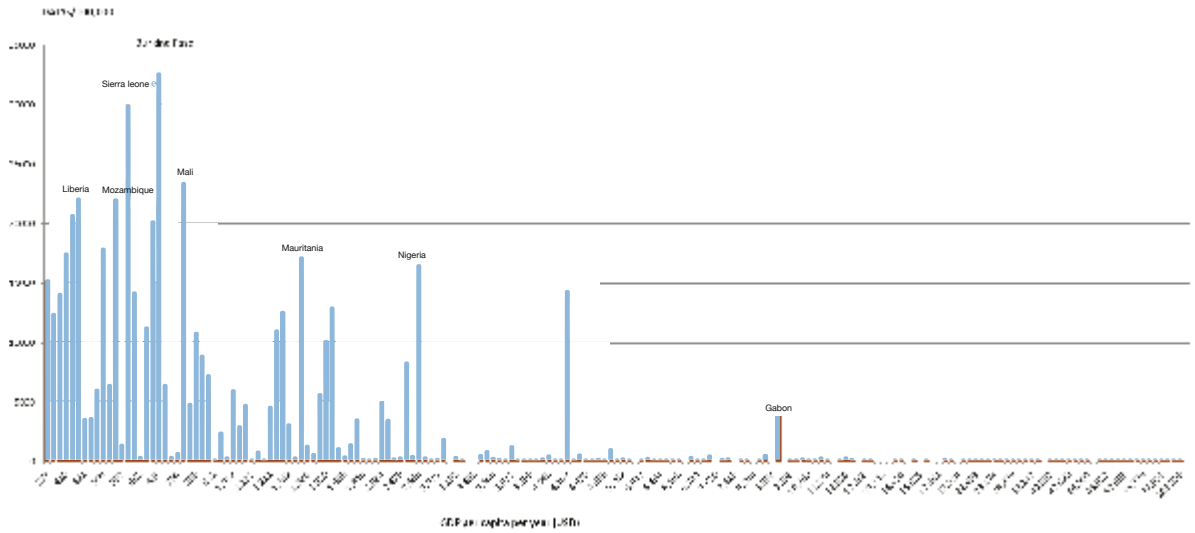
3.2.4 Contextual planning and implementation of a flexible multisectoral approach

The planning and implementation of a multisectoral project depend on the context. The MSA can be used at different levels of VBD prevention and control and for different purposes, e.g. for outbreak response, surveillance and monitoring or for targeting seasonal workers. The models of engagement and the structures may differ for different purposes. The degree of collaboration varies from light coordination to collaborative problem-solving. The sectors and stakeholders to be included also depend on the context. As an example of a successful MSA, for decades, private sector pharmaceutical companies such as GlaxoSmithKline and Merck have been collaborating with the health sector to eliminate lymphatic filariasis through mass drug administration, by providing not only free drugs but also financial, programme and management expertise *(100).* When outbreaks occur in areas of political instability and conflict, the security sector (such as the military) has frequently been called upon to facilitate the health response *(101,102).* Deployment of troops during humanitarian emergencies may, however, result in transmission of VBDs to civilian populations *(103).* Therefore, the right collaboration model and interventions should be determined, including but not limited to local disease priorities, determinants, entomology, vulnerable populations, baseline population health, economic circumstances, institutional arrangements, programmes, resources and institutional capacity, as well as cultural acceptance.

3.2.5 The multisectoral approach to human rights and equity

The right to health is fundamental for all, and WHO is committed to reduce inequality, promote the health of refugees and migrants, improve the health of women and children and engage with communities. The numerous socioeconomic factors associated with VBDs are not only determinants of health but also an issue of human rights. The determinants of health equality and equity lie beyond the health sector. VBDs are particularly frequent in disadvantaged populations, as shown in **Fig. 3.2.** Therefore, by engaging sectors that target diverse population groups, the MSA can ensure health equity, reaching the most vulnerable and remote population groups.

Fig. 3.2 Mean numbers of disability-adjusted life years due to VBDs, with maximum yearly numbers between 2000 and 2015, plotted against the mean gross domestic product (GDP) per capita (mean annual values for 2010–2016) in WHO regions *(104)*



3.2.6 The multisectoral approach and new ways of working

Partners in an MSA must be open to new ways of working and innovative collaboration. The sector(s) that leads a collaboration will depend on the main interventions and objectives. In an effective collaboration, the health sector must recognize when to relinquish control of interventions that are the core business of other sectors and in which the health sector does not have the most knowledge or experience. In these cases, the role of the health sector is to facilitate collaboration and to supervise interventions to ensure that health priorities, objectives and policies are accounted for at all stages.

The MSA comprises horizontal collaboration among sectors, sub-sectors or stakeholders within one sector. Institutional arrangement should also ensure a mechanism for vertical extension of the MSA to all levels of governance, decision-making and jurisdictions to ensure sharing of information in both directions (top-down and reverse) and that policies are based on the knowledge and practical experience. Contextual considerations should be included, as different levels of government have different targets in planning. Experience from multisectoral collaboration in HIV/AIDS control in Canada demonstrated that a concerted intervention was most successful, and the best outcomes were achieved with both vertical and horizontal collaboration *(105).*

Multisectoral work should be not only “concerned” or “informed” but participatory, including civil society. Governments should establish an internal culture of valuing and fostering collaboration and sharing *(60)*. Participation should not be considered “voluntary” but rather a core role and responsibility of participants. Civil society must be an active collaborator, with ownership and responsibility for activities

3.2.7 Sustainability

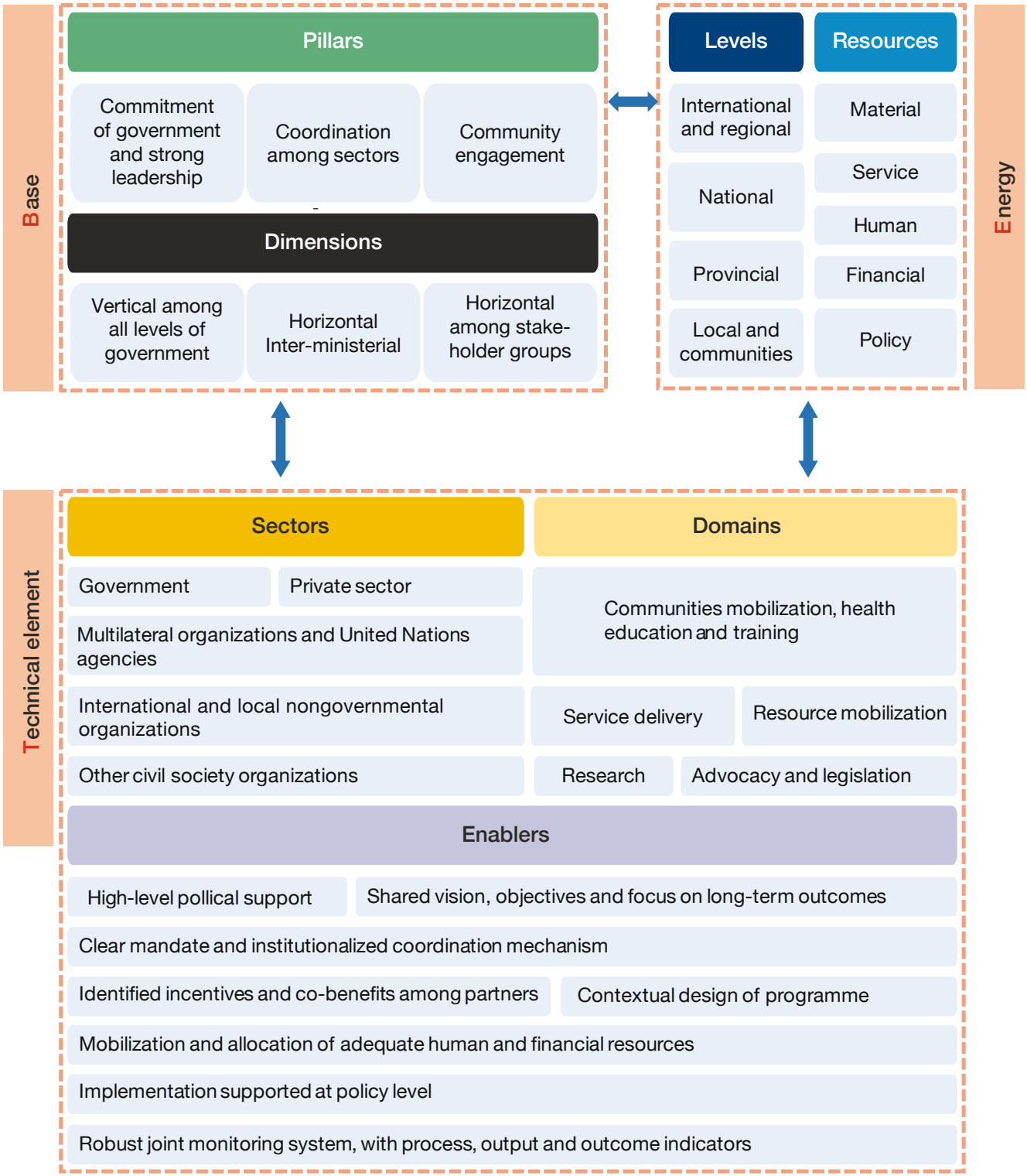
The long-term sustainability of interventions should be one of the goals of the MSA, to control VBDs with minimal risk of resurgence and strengthen public health system. Sustainability is assured not only by financial support but also by human resources, governance and institutional arrangements. Collaboration requires mechanisms to ensure its continuity despite changes in government or termination of a project. As for other long-term health interventions that rely on multisectoral collaboration (e.g. noncommunicable diseases, health equity, nutrition), the budget for VBD prevention and control should be part of the regular health budget, as maintenance and scaling-up of interventions depends on long-term funding. A VBD programme that is robust, with a long time frame and increased capacity and coverage is more likely to give strong returns on investment.

> Financial and operational sustainability should be planned from the inception of national and regional control initiatives.
>
> **- Jones et al. (Annex III)**

3.3 The framework

The conceptual framework is based on three categories of elements: the Base, the Energy to fuel activities and the Technical elements **("BET", Fig. 3.3)**. The three blocks contain seven components, with pillars and dimensions as basic requirements, levels and resources for energy, and sectors, domains and enablers as technical elements. These components are the ingredients of a customized, tailored MSA. Use of the framework is coupled with two pathways, the MSA coordination pathway (section 5.1) and a sectoral pathway (section 6.1).

Fig. 3.3 The **BET** conceptual framework of an MSA for the prevention and control of VBDs



Pillars

The three pillars of an MSA are:
i) the commitment of governments and other leaders, and the political will and capacity to get engaged into an MSA; ii) the coordination, through mobilization of other sectors for a proactive response from their leaders and decisions on coordination of independent and dependent collective work; and iii) the community engagement, with meaningful participation of communities throughout planning and design to programme initiation, implementation and monitoring.

Dimensions

The dimensions of collaborations through an MSA are one vertical and two horizontal. Vertical collaboration takes place between units at different levels of a hierarchical structure *(106).* The horizontal dimensions are inter-ministerial and among stakeholder groups, and take place between organizations or units on the same hierarchical level or in independent hierarchies.

Levels

The levels at which the MSA is considered or used are international, regional, national, provincial, local or community, depending on the size of the problem and the units of government leading implementation. Implementation of the MSA at different levels will include vertical collaboration between the various levels of government, crossing several geographical levels.

Resources

Partners can contribute the following resources: material infrastructure, equipment, supplies and commodities; services; human resources; financial resources; and policy, including legislation, political support and an enabling political environment. Mitigation of resource gaps is a major benefit of a collaboration based on the MSA.

Sectors

The stakeholders involved in a project for the prevention and control of VBDs based on the MSA include but not limited to health, environment, water and sanitation, agriculture, aquaculture, energy, housing, education, research, finance and legislation. Partners outside government can contribute diverse competence and resources. International organizations, the private sector, international and local NGOs and civil society organizations are also significant collaborators in the control of VBDs.

Domains

Multisectoral collaboration is effective in various domains, including community mobilization; health education and training; services, such as diagnosis and treatment, personal prevention, sustainable vector and environmental management, surveillance, risk assessment, monitoring and evaluation, vaccination and mass drug administration; resource mobilization; research; advocacy; and legislation. Several domains may be included in a single programme, and many opportunities arise from innovative collaboration.

Enablers

Many factors influence performance at different stages of a collaboration based on the MSA *(19,83)*. They include: high-level political support; a shared vision, objectives and focus on long-term outcomes; a clear mandate, with defined roles and responsibilities; identified incentives and co-benefits among partners; adequate human and financial resource mobilized and allocated; contextual design of programmes; coordination mechanism institutionalized and managed at policy level; and a robust joint monitoring system with process, output and outcome indicators.

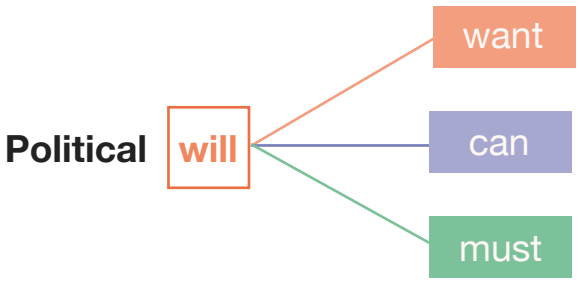
Chapter 4

Components of the framework

4.1 The "3C" Pillars

4.1.1 Pillar 1: Commitment of government and strong leadership

Strong political will in a committed government is of major importance for a country's MSA to VBD prevention and control and for initiating action. In the face of competing priorities and limited resources, the strength of political will and commitment will determine the involvement of decision-makers and the human, material and financial resources that will readily be allocated to VBD control. Political leaders may not engage enough in VBD control. It is therefore essential to understand why the control of certain VBDs is not prioritized. According to Malena *(107),* the means for ensuring political will include ensuring that political leaders "want", "can" and understand that they "must" consider interest and incentives, confidence in capacity, and pressure or obligation as detailed below.



How to mobilize political will?

- **pressure from affected populations;**
- **an outspoken scientific community** to provide robust evidence of the disease burden, population vulnerability and the urgency of action, including VBD control;
- **incentives, such as economic cost–effectiveness, clear benefits and co-benefits** to government, social responsibility, government accountability, political stability, strong links among sectors, exploration of new funding schemes;
- **confidence in the feasibility of and capacity** for efficient multisectoral collaboration for the prevention and control of VBDs;
- **sensitization and capacity-building;**
- **alliances among countries and regions; and**
- **peer pressure and influence.**

Effective institutionalization of leadership is essential to avoid unsustainable interventions due to changes in leaders or their interest. A government should actively steer and effectively manage a whole-of-government programme, with leadership for all the elements of an MSA, including strategic planning, policy development, resource mobilization and programme implementation, coordination, monitoring and evaluation. Will alone does not guarantee sustainability. Countries should also develop an MSA for long-term development and enact legislation to protect the strategy from political instability. As the commitment of political leaders is closely related to their capacity, strengthening leadership and management capacity in all sectors and levels of government and cultivating champions in sectors is likely to encourage political commitment.

What is a leadership?

In the context of the prevention and control of VBDs, committed, capable leadership is reflected by the ability to:

- **consolidate common vision and intrinsic interests;**
- **set national targets** for protection of the population;
- **mobilize diverse stakeholders;**
- **set an agenda** that is responsive to the needs of multiple stakeholder groups;
- **involve all relevant government sectors** in collective action by influencing their priorities, decisions and actions;
- **understand the necessity of and promote shared leadership;**
- **include the prevention and control** of prioritized VBDs in the national economic, social and environmental development plan;
- **ensure a positive regulatory and policy environment;**
- **use policy, legal and regulatory instruments** for direct transfer of resources; and
- **cultivate, mediate and manage relationships.**

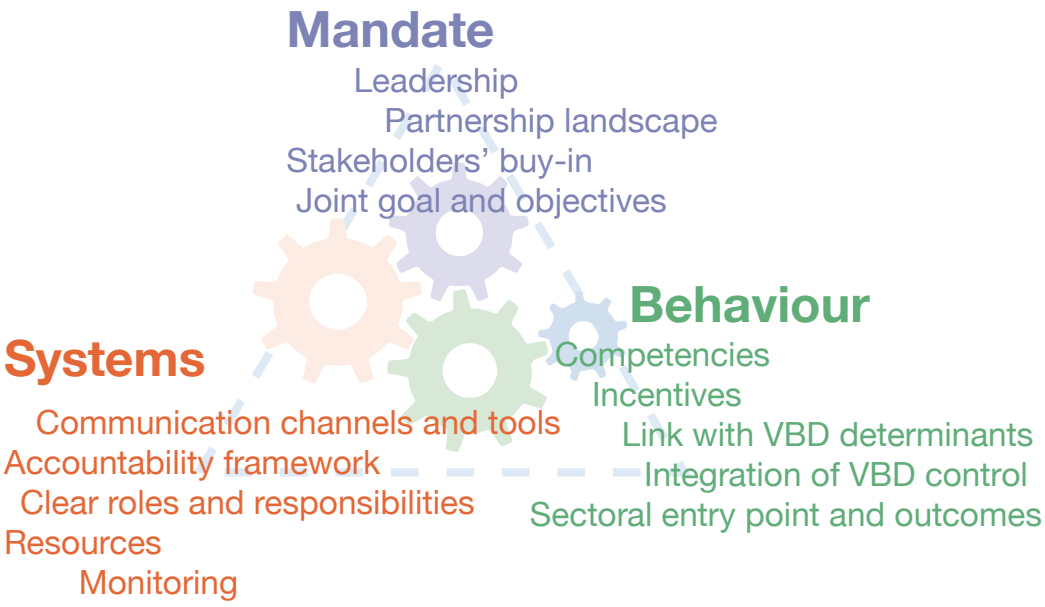
Multisectoral coordination may be led by the health sector; however, effective mobilization of other government sectors often requires the authority of the head of State, while the health sector coordinates relevant sectors to inspire action and support. During multisectoral collaboration and implementation of interventions, leadership should be shared and distributed according to tasks and expertise.

4.1.2 Pillar 2: Coordination among sectors

The main building blocks of multisectoral collaboration are the sectors and their coordination. As sectors have their own priorities, interests, values, budgets, agendas and operating mechanisms, an efficient, beneficial collaboration requires careful coordination of work by leaders, catalysed by various factors **(Fig. 4.1).** Effective coordination will allow collaborative planning, exploitation of opportunities, filling gaps and ensuring the coherence of the work of each stakeholder while avoiding unnecessary replication of actions and waste of resources. Effective coordination requires commitment. Many countries already have an institutional structure for coordination of plans and management of multisectoral projects for public health; e.g. Chile has a Ministry of Planning and Coordination *(61).* Examples of other countries who have or are establishing One Health coordination mechanisms are shown below:

- One Health coordination units in Kenya *(108)* and the United Republic of Tanzania (in the Prime Minister's office) *(109);*
- One Health coordination office in several sectors in the USA, such as in the Department of Agriculture *(110);*
- One Health coordinating structure and a coordination platform of which the Vice-President of the country is the Chairperson in Liberia *(111);*
- One Health Steering Committee in Rwanda *(112).*

Fig. 4.1 Factors for successful coordination



Source: Adapted from reference *113.*

Some countries have an IVM plan, as recommended in WHO's Global Vector Control Response 2017–2030, and most have a multisectoral coordination mechanism. With establishment of the Health and Environment Strategic Alliance for joint implementation of the Libreville Declaration, formal, continuous coordination mechanisms were established in some countries, such as country coordination committees or task teams. Coordination mechanisms are in place for other global alliances and partnerships (Annex 2). As a coordination committee cannot be established for every health outcome and to avoid replication and inefficient use of resources, a new committee should not be formed if a mechanism already exists. Rather, additional resources should be mobilized, other partners and components added as necessary and the mechanism strengthened so that it can coordinate work on the prevention and control of VBDs in addition to its current remit. When a coordination mechanism for VBDs is merged with broader health or development mechanisms, coordination between VBD and other activities should be assured by arrangements such as meetings and reporting specifically on VBD activities. If the collaboration is international, coordination must be both national and international.

The association between the activities of sectors and the prevention and control of VBDs will determine the form of the collaboration, the degree of integration and amount of collaboration, from temporary to permanent collaboration *(114)* **(Fig. 4.2).** A formal partnership with shared responsibilities ensures achievement of a common goal.

Fig. 4.2 Degrees of collaboration

	Coexistence	Communication	Cooperation	Coordination	Collaboration
Formality	Informal				Formal
Accountability	Not applicable	No surprises	Not get in the way & help where possible	Actively align activities	Actively ensure goal achievement
Characteristics	Self reliance	Shared information	Shared resources	Shared work	Shared responsibility
	• No formal communication • Policies and services developed in isolation • Autonomy emphasized • May have common concerns	• Informal meetings such as web exchanges • Irregular exchange of practices • Autonomy retained • Getting together on common interests	• Formal (face -to-face) meetings • Regular exchange of staff, information and practices • Autonomy attenuated • Getting together on common projects	• Sharing on a regular formal bases • Regular exchanges and specific undertaking • Autonomy further attenuated • Working together on shared projects	• Formal partnership • Shared policies and/or practices • Autonomy further attenuated still • Working together to common goals

Source: adapted from reference *115*

Checkbox: How to enhance commitment and coordination

For the institutions

- Establish systems and arrangements to formalize and **facilitate communication:** a multisectoral forum for VBD prevention and control, regular meetings, reporting system, networks among government sectors and among countries, while allowing flexibility for adapting mechanisms.
- Involve partners at an **early stage** and at **all phases** of the project cycle to cultivate collaboration and ownership.
- Through evidence-based advocacy, ensure common understanding of and agreement on **priorities.**
- Sign **official,** written inter-agency **agreement(s).**
- Use laws and regulations to **institutionalize** the collaboration, **create routines,** and **warrant sustainability and continuity.**
- Create a **steering committee** with the participation of all stakeholders, and establish task forces.
- Develop **national and regional plans** for the prevention and control of VBDs, and define the role and responsibilities of each sector.
- **Integrate** VBD control into the core activities of other government sectors (education, water, agriculture, irrigation, urban and rural development).

Funding

- Estimate **costs and budget.**
- Earmark **funds**.

Capacity assessment and building

- Clearly define, communicate and agree on **roles and responsibilities,** and estimate the **time and contributions** of staff of partner agencies.
- **Build capacity** in management of multisectoral collaboration.
- **Share the workforce** by staffing arrangements and time-sharing (both horizontal and vertical).
- Devise **shared "mental models"**, such as theories of change or logic or outcome models *(116).*
- **Cultivate champion** sectoral leaders.
- **Recognize that collective, collaborative competence and capacity are** as important as those of the individual.

Communication

- Ensure **open, inclusive, informed discussion and exchange.**
- **Jointly develop guidelines** (such as for multisectoral coordination and integration, services, policies and procedures) and other communication materials and publications.
- **Establish a centralized information system** for cross-sectoral information-sharing and collective learning to understand how other sectors operate and the impact of each sector on implementation and the overall objectives.

4.1.3 Pillar 3: Community participation

Interventions for VBD prevention and control should resolve health issues and benefit communities. Community participation increases the coherence between interventions and their targets and facilitates change. Collaboration with local residents will harness local knowledge, skills and networks, which contribute to the appropriateness of collaborative interventions; traditional practices might be adapted. Individuals with VBDs sometimes face barriers to services such as water, sanitation and hygiene (WaSH) or are not allowed to participate in planning and decisions due to stigmatization. Inclusive engagement of communities can help to overcome stigmatization and social exclusion. In addition, an empowered community increases the sustainability of interventions. For instance, interventions that require behaviour change are easier to establish if the entire community is mobilized rather than individuals, such that the changed behaviour becomes a social norm. Community participation is therefore a powerful component of any control programme. Engagement of volunteers has been shown to be cost–effective and practical and to save time in managing VBD outbreaks.

Community participants can be classified into three types according to their roles and responsibilities **(Box 4.1).** Community engagement evolves from sensitization to acceptance, dialogue, active engagement, participatory action and decision-making. In the most effective community engagement, community members are not passive receivers of information and interventions but partners who are actively involved in analysis, decision-making and execution of activities.

Community participation can include recruiting community volunteers. However, this recruitment needs guidelines and adequate training to avoid reluctance of health workers to take responsibility *(117).* Well-designed programmes and training are essential to ensure effective, meaningful community engagement. A case study of intersectoral coordination and community empowerment for *Ae. aegypti* control in Havana City, Cuba, is described in **Box 4.2.**

Box 4.1 Three types of community participants

Founders

Involved in the design of a project, e.g. community health workers, community leaders, head of social service or other civil society group.

Leaders

have responsibilities during implementation of a project, e.g. teachers, parents.

Participants

Other community members.

Box 4.2 Case study: Intersectoral coordination and community empowerment for *Ae. aegypti* control in Havana City, Cuba *(118,119)*

A study was conducted in Cuba to determine the effectiveness of a community approach to prevention of dengue by strengthening intersectoral coordination. *The Ae. aegypti* control methods consisted of eliminating unusable containers in and around houses, covering tanks, and cleaning public and inhabited areas. Three years later, a complementary strategy for community empowerment was added in half of the intervention areas. Implementation of sanitation activities and community organization and participation for dengue prevention were boosted by intersectoral interventions comparing to controls sites where only routine control activities were conducted. The process indicators, community outcomes and entomological data further reflected effectiveness of the community empowerment element over that seen with the intersectoral interventions alone. The contributions of different sectors to the intersectoral coordination strategy were:

Activities	Government	Public services	Education sector	Cultural sector	Health sector	Community organizations	External experts
Sanitation							
Identification of high-risk places		•			•	•	
Planning and coordination	•	•	•	•	•	•	•
Dissemination			•	•	•	•	
Social mobilization	•				•	•	
Provision of resources	•	•					
Collection of recyclable material							
Planning and coordination			•			•	
Execution of the activities			•			•	
Social communication							
Identification of messages and target groups			•	•	•	•	•
Planning and coordination	•	•	•	•	•	•	•
Implementation	•		•	•	•	•	
Provision of resources			•	•	•		•

Community empowerment included formation of community working groups and interventions in five participatory processes: capacity-building, community dengue surveillance, social communication, behavioural change and participatory evaluation. The principal individual and collective practices that were promoted were covering water tanks, protecting rainwater containers and eliminating useless containers. Municipal health authorities organized short courses for family doctors and epidemiologists on dengue prevention, intersectoral coordination, community participation and strategic planning.

Checkbox: How to strengthen community engagement

- **Sensitize the community** by theoretical and practical training, household inspection, printed educationalmaterials, local media, including posters, notice boards, village radio, short TV programmes and Internet tools and social media.
- Before planning activities, hold a **public consultation** with communities to understand their viewpoints and the community structure, culture, habits and needs, and their previous experience with community development programmes, especially for VBDs. Consultation also demonstrates the **attention and good will** of the implementers, **increase trust and accountability.**
- Identify community and civil **society leaders** (e.g. religious leaders, tribal head, teachers, parents).
- Identify the population groups **most affected** by VBDs.
- Include information on VBDs in **primary education.**
- **Empower women and young people,** as this has proven to benefit community development projects.
- Establish a **peer-influencing** system to encourage behaviour change.
- Ensure the **ownership** of intervention activities by community members.
- Ensure that the **results** are **communicated** to the communities involved.

What can communities do

- Provide observational information on vectors, the environment, disease and behaviour.
- Assist in mapping the environment and households, and identify vulnerable groups for coordinated environmental management.
- Receive training in inspecting premises and identifying, emptying, removing or treating vector breeding and resting sites.
- Receive training in surveillance and sampling.
- Receive training in mobilizing other community members.
- Train other community members.
- Distribute vector control tools and education materials.
- Form discussion groups to identify problems and needs.
- Participate in designing and planning interventions and in testing new VBD control methods.
- Reduce insecticide use that are impacting vector control (in particular in agriculture)
- Assist in health impact assessment.
- Support the bottom–up approach by advocating for services and mobilizing relevant decision-makers.

Keeping people at the center

4.2 Dimensions of collaboration

4.2.1 **Dimension 1:** Horizontal collaboration among the ministries or sectors of a government

This dimension refers to collaboration among different sectors at the same national, provincial or local government level, including departments, ministries, bureaus, divisions and branches. As discussed in sections 1.4 and 2.1, the determinants of VBDs concern disciplines under the responsibility of several ministries. Inter-ministerial collaboration facilitated by a national coordination mechanism will ensure that VBDs are addressed comprehensively, with clear roles and responsibilities and accountability. Formation of a national inter-ministerial task force as a legal entity increases the probability of obtaining financial support from international donors.

Such collaboration allows sectors to explore outside their own disciplines and find joint solutions. This will develop the capacity of the participating ministries, which will overall reinforce government. Formal, high-level political support is a powerful force for efficient cooperation. National ministries collaborate mainly by mobilizing resources and policy dialogue, which can further drive, guide and facilitate provincial and community VBD campaigns.

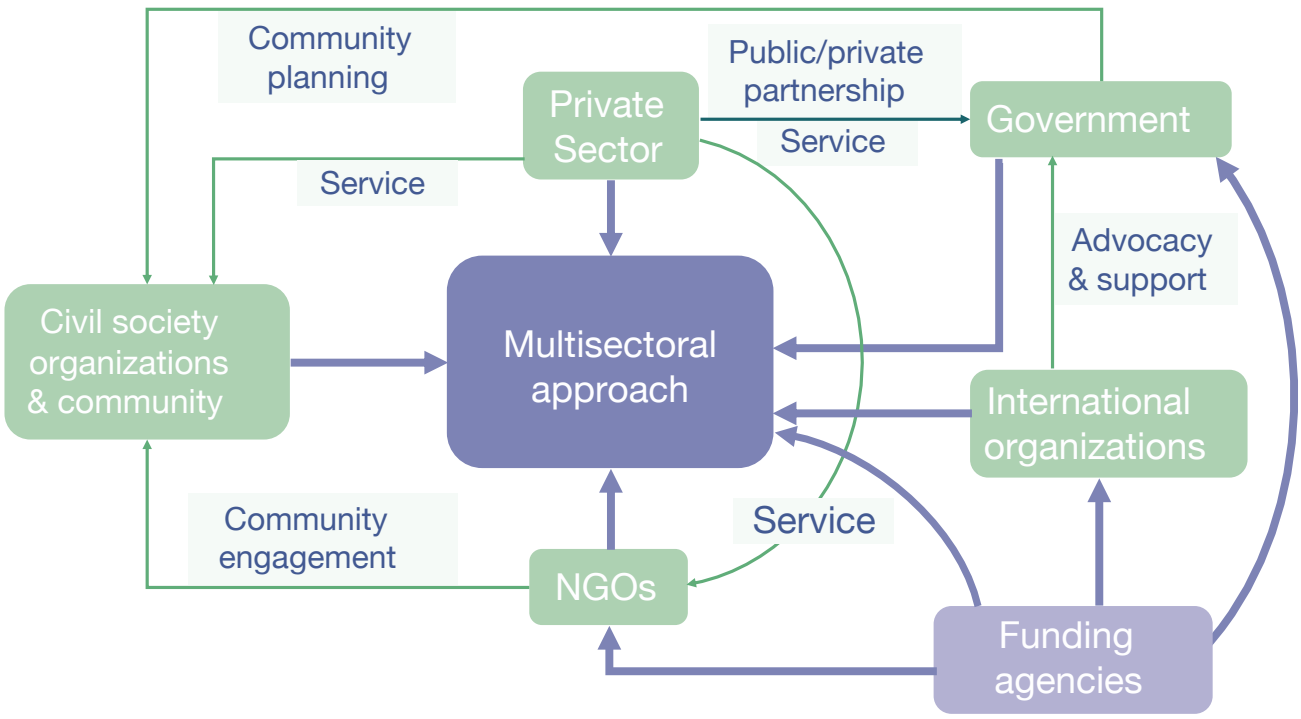
At the level of local government, the horizontal direct collaboration has been found effective *(83).* Local authorities play various roles, including providing access for an intervention, technical and financial support, social mobilization, policy development, planning, logistics and implementing and monitoring activities. A beneficial feature of a local MSA is strong connection with the community, which leads to more effective implementation.

4.2.2 **Dimension 2:** Horizontal collaboration among stakeholder groups

Ministries within the same government with different responsibilities for disease determinants contribute to the prevention and control of VBDs. The scale and complexity of the task requires national and local governments to collaborate with diverse partners to overcome shortages of human resource, funds and equipment and facilitate delivery of services. Horizontal collaboration thus should also involve NGOs, multilateral and bilateral organizations, the private sector, research institutes, civil society organizations and communities. Differences in organizational culture and structure, operation, resources, networks and geographical experience allow learning and innovative solutions. As shown in **Fig. 4.2** and **Fig. 4.3,** various types of partnership can be formed among stakeholders within a programme.

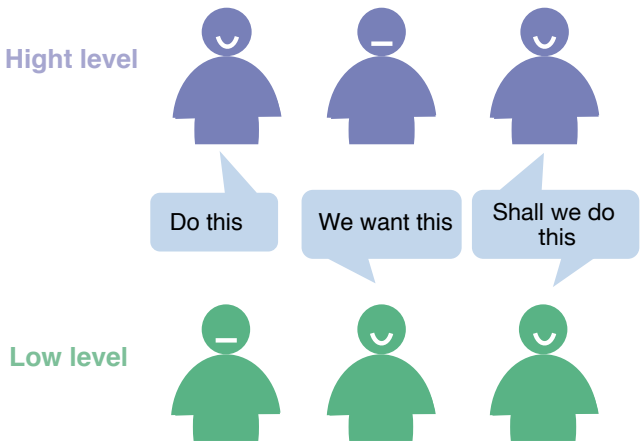
The association between the activities of the sectors and the prevention and control of VBDs will determine the form of the collaboration, the degree of integration and the amount of collaboration, from temporary to permanent collaboration **(Fig. 4.3).** A formal partnership with shared responsibilities ensures achievement of common goal(s).

Fig. 4.3 Partnerships in multisectoral collaborations



4.2.3 Dimension 3: Vertical collaboration

Vertical collaboration or multi-level governance involves different hierarchical levels of a government and its administration, but also among other non-governmental partners. Because the different levels and sectors are interconnected, with some overlap of responsibilities and activities, coordination is essential to achieve coherence and complementarity. Vertical collaboration ensures exchange of information, efficiency and efficacy at each level and less administrative overlap and duplication. It also provides an opportunity to decrease local discrepancies between strategies and interventions. Although vertical collaboration should be the norm in governments, it is not always the reality. Little or no vertical collaboration is seen, particularly during changes in government.



Vertical collaborations fall into one of three categories:

(i) Top–down: authority imposes priorities and strategies, with implementation monitored through a legal framework and institutional obligations

(ii) Bottom–up: based on local needs and problems, requiring financial, professional or technical support from a high level of government

(iii) Based on dialogue: circulation of ideas among all stakeholders in decision-making and in implementation of policies; top–down support with bottom–up planning and management.

In vertical collaboration built on dialogue, the higher level of government can contribute by creating an enabling, supportive environment through guidelines and standards, improving access to information and providing institutional mechanisms to advance implementation. The government can plan the MSA at the national level and establish technical and regulatory support for implementation at local level. In IVM, vertical implementation of decentralized vector control programmes should follow the principle of "subsidiarity", in which planning and implementation are managed locally, backed by governance at a higher level *(120).* Units at different levels can collaborate directly by

providing services, while local coordination of various sectors mirrors actions at national level but with closer connection with the community to ensure that the response meets their needs. Local authorities ensure close linkage between the high-level vision and local actions and inform contextual decisions with lessons learnt.

In an optimal collaboration, each level of the government must have formal roles and responsibilities, authority to lead and conduct monitoring, evaluation and reporting. Each level must also adjust their programmes and policies to the collective perspective and agree on obligations. To strengthen and smooth cooperation and maximize coherence and synergy, contracts or agreements can be used and a strategic coordination committee can be formed. The costs and benefits of vertical collaborations to partners at different levels of government are usually highly asymmetrical. Finally, an inclusive MSA should broaden collaboration in both horizontal, as well as vertical dimensions, as demonstrated in Zambia **(Box 4.3).**

Box 4.3 Case study: development of an IVM strategy in Zambia *(121)*

In response to a surge in malaria incidence in Zambia at the end of the past century, the Government adopted a new malaria treatment and control policy, with IVM as the approach to vector control. IVM was delivered by collaboration among the health sector and other sectors and partners.

MAJOR STAKEHOLDERS	RESPONSIBILITIES OF ORGANIZATIONS
Ministry of health	- Plans, conducts, coordinates, monitors and evaluates activities - Provides staff and transport - Mobilizes partners - Distributes commodities
Bilateral and multilateral organizations	- Provides logistical and technical support - Conducts monitoring and evaluation
Academic and scientific institutions	- Provides technical support and monitoring

Ministry of Defence	- Provides transport and staff
Ministry of Environment	- Regulates insecticide storage and judicious use
Ministry of Housing and local government	- Provides staff and transport - Implements interventions
Mining and agricultural companies	- Technical assistance in capacity-building - Provides additional members of the workforce - Increases coverage of interventions
Chemical companies	- Provides stewardship, transport, disposal of empty sachets - Technical assistance in capacity-building
Collaborative public–private partnerships	- Supports operational research on larval source management
Social marketing organization	- Spearheads social marketing of ITNs
Non-profit-making organization	- Coordinates ITN distribution by NGOs
Community members	- Implement activities

Implementation of the National Malaria Policy began in 2003. An evaluation of the impact of IVM between 2003 and 2007 showed that more households had at least one ITN, with greater utilization, and more structures were sprayed. Consequently, the incidence of malaria in the intervention districts fell markedly during the investigation.

4.3 Levels of the multisectoral approach

The MSA can be applied at international, regional, national, provincial and local levels, with complementary work and accountability at all levels. Local collaboration may suffer from inadequate capacity and require support from national institutions. Nevertheless, local planning and management are indispensable for any multisectoral programme, as local collaboration tends to be more flexible and better grounded, resulting in more precise programmes and more efficient implementation. Therefore, a comprehensive, whole-of-government MSA should include vertical coordination to ensure the coherence of the strategy at all levels.

The level of collaboration is commonly determined by the entity that initiated and coordinates the programme and its scope, with the involvement of organizations and donors in multisectoral collaboration at other levels. Internationally funded programmes are often implemented in locally prioritized areas in collaboration with local authorities. International, regional and national collaboration often involve policy development and resource mobilization, which have implications for subnational activities and are the basis for activities at lower levels. Provincial or state governments often serve as intermediary structures between national and district levels; thus, guidance at provincial level can facilitate local implementation of a national strategy. The mechanism and domains of collaboration at this level are thus a mixture of those of national and local collaboration, with the advantages of both: more authority, capacity and resources and at the same time access to contextual information and institutional structures.

The general characteristics and domains of collaboration at different levels are shown below.

INTERNATIONAL AND REGIONAL

- Advocacy: sensitize country leaders, conduct workshops, build capacity and build momentum.
- Develop guidelines, decision-support tools and a conceptual framework.
- Harmonize the activities of international agencies.
- Mobilize resources.
- Enact global policies, such as for mobile and migrant populations.
- Encourage operational research as a basis for policy-making.
- Facilitate multisectoral and multinational networking.

NATIONAL

- Ensure inter-ministerial collaboration.
- Provide strategic policy decisions and advocacy.
- Prioritize VBDs.
- Develop guidance and a national strategic and regulatory framework to guide the MSA and to standardize operations, with national and subnational quality assurance.
- Create structures and mechanisms for dialogue among high-level government sectors and for overseeing implementation.
- Develop joint monitoring mechanisms.
- Estimate costs and reallocate national resources.

PROVINCIAL

- Bridge national planning and local implementation.
- Collaboration is between those at national and local levels and harnesses the advantages of each.
- Collaborations are often formed in response to national requirements and community demand.

LOCAL (DISTRICT, COMMUNITY)

- Often, collaboration between local government and various nongovernmental partners for service delivery.
- Community engagement and empowerment for taking ownership.
- More research required on context, interventions and surveillance.
- Opportunity to induce behavioural change.
- Interventions directly linked to impact.

Local collaborative interventions are effective because of the proximity of authorities and decision-makers to communities and because they are delivered directly to their target.

The effectiveness of national collaboration for VBD prevention and control depends on the governance of a country. The governments of countries with regionally autonomous areas and a decentralized fiscal system exercise less authority *(122),* changing the pathway to effective implementation of interventions. Reviews indicated that decentralized collaborations are easier and more likely to be implemented *(83,116),* while national collaboration is usually more difficult, because different ministries defend their interests and compete with each other for the national budget *(61).* Local collaborations also optimize efficiency and give more value for money. To ensure the effectiveness of collaboration at a higher level, the impact of the intervention should be forecast, to promote local initiative, response and autonomy. A key element of fruitful implementation at a higher level is standardized operating procedures, while at the same time recognizing the heterogeneous context and priorities of communities to allow flexible adaptation and translation into local actions. Collaborative planning at national level should include consideration of budget allocations to different local sectors. Effective communication of the expected outcome and output of international, regional and national collaborations and facilitated access to the outputs helps to ensure local access.

4.4 Resources

Health intervention programmes, including for VBD control, often lack resources. A major benefit of an MSA is pooling of resources and their optimal use. This benefit is particularly pronounced where resource is scarce.
The resources required for comprehensive multisectoral collaboration for the prevention and control of VBDs are categorized as material, service, human, financial and policy **(Table 4.1)**. Resources are available from national VBD control programmes (from tax revenues, budget reallocation and emergency funds), various government sectors, development agencies, donor agencies, the private sector, civil society and communities. The types and amount required depend on the objectives and coverage of programmes, differ by country and region and differ also for national, provincial and local collaborations. Equally important as the resources themselves is the timing of allocation, the resource management and the organizational structures in which resources are to be used. Sufficient resources should be allocated not only for curative services but also for preventive measures. Useful tools for resource planning are listed in **Box 4.4.**

Table 4.1 Resources that could be shared in a multisectoral collaboration for the prevention and control of VBDs

Material	Infrastructure	Laboratory facilities, insectaries, research and training centres, on-site clinics, drug stores, water supply system, offices
	Equipment	Laboratory equipment (microscopes, stereoscopes, diagnostic kits), technical equipment (computers, surveillance tools, audiovisual and copy machines, health and non-health data and information, other relevant technology), storage equipment, vehicles
	Supplies and commodities	Vector control tools and materials (bednets, sprays, insecticide, larvicide, repellent, clothing, house improvement materials), medicines, promotional materials, educational materials
Service		Health service, environmental monitoring and improvement, data management and analysis, training, construction, project management, procurement, transport, logistics, research, advocacy, communication
Human*		Health workers, entomologists, epidemiologists, microbiologists, ecologists and environmentalists, engineers, government officials, project managers, administrators, teachers, researchers, technicians and operators, community members, volunteers
Financial		Monetary assistance and donations
Policy	Legislation/rules	Malaria committee, strategic plans, school and occupational health policies, international declarations, foreign relations
	Political support	Government endorsement and adoption of intersectoral collaboration projects, good organizational structure, strong political commitment
	Resource mobilization	Government participation and mobilization of community, creation of enabling environment by providing human and financial resources and assistance in project implementation and monitoring

Source: adapted from a commissioned review

*The contributions of human resource include knowledge, experience, expertise, physical capacity, management capacity, networks and time.

Box 4.4 Examples of tools for resource planning

Tool	Reference	Developer	Description
TIPAC	*123*	ENVISION	A Microsoft Excel program for accurate estimation of costs and funding gaps in public health programmes
OneHealth tool	*124*	IAWG-COSTING Future Institute	Software for strategic national health planning; provides projected cost scenarios.
NetCALC	*125*	NetWorks Project	Excel tool for modelling scenarios of continuous distribution approaches according to data on LLIN use and situation and to project the capacity of various channels to reach the target coverage.
Indoor residual spraying operational manual	*126*	WHO	Guidance on costing, budgeting and financing, with examples of capital and operational budgets for an indoor residual spraying campaign
Tsetse Muse, Tsetse Plan and HAT-trick	*127*	Liverpool School of Tropical Medicine	Tools for decision-making support and financial planning for tsetse fly control programmes

Users of the MSA and partners should:

(i) ensure the availability, sustainability and accessibility of resources from central government for multisectoral collaboration, including interventions and coordination, and research on VBDs;

(ii) lobby for mobilization and commitment of resources from government and development partners;

(iii) coordinate the allocation and use of the resources for optimal use and maximum benefit; and

(iv) explore and encourage innovative sources of resources and management models.

The health sector must enforce its own human resource policy and develop human resources for all sectors to ensure the sustainability of the health, environment, economic and educational aspects of prevention and control programmes for VBDs. Effective multisectoral programmes with community mobilization can also generate resources, such as newly trained workers and income.

4.5 Sectors and stakeholders

While the health sector (e.g. the ministry of health) is the lead entity in the prevention and control of VBDs, in most of the situations in this guidance document, the roles and responsibility of other sectors are emphasized and their collaboration with government departments in both health and non-health sectors, with development partners, research and academic institutions, the private sectors and civil society organizations **(Table 4.2).** Each sector of a government (health, environment, agriculture and others) has a wide range of partners. While ministries of health, private hospitals, clinics and health care providers are the main stakeholders in VBD prevention and control, other health sector partners include pharmaceutical companies, health research institutions in pathology, epidemiology and entomology, health educators and trainers. Education and research are directed by ministries of education and pertain strongly to private schools and universities, private research institutions and scientific organizations for innovation and technology, sometimes involving NGOs.

Because of the life cycles and behaviour of the vectors, as well as modes of transmission of the pathogens responsible for different VBDs, the methods for prevention and control differ. Thus, the relevance of non-health disciplines may also differ. In planning programmes, each sector should identify its priorities. For example:

- Chagas disease is prevented mainly by improving housing and spraying insecticide on the walls to kill vectors.
- Sandflies that transmit leishmaniasis are controlled by improving housing, managing waste, cleaning and drainage.
- The main interventions to prevent schistosomiasis are improved sanitation, safe management of excreta and improved water supplies to reduce use of surface water.
- Transmission of some mosquito-borne diseases like malaria and dengue and of schistosomiasis *(128–130)* is influenced by mining and dam construction, which are the responsibility of the energy sector.

Table 4.2 Examples of government and non-government sectors in an MSA to prevent and control VBDs

Key government sectors*

- Health
- Environment
- Water and sanitation
- Agriculture and aquaculture
- Energy
- Housing
- Education and research
- Finance
- Legislation

Development partners: governments, international organizations

- Japan International Cooperation Agency
- Swedish International Development Cooperation Agency
- Swiss Agency for Development and Cooperation
- United Kingdom Department for International Development
- United States Agency for International Development
- Other government networks and partnerships such as the Asia–Pacific Malaria Elimination Network, Trans-Kunene Malaria Initiative
- Unitaid
- WHO, UNEP, United Nations Human Settlement Programme, International Organization for Migration, FAO, UNICEF, UNDP, United Nations High Commissioner for Refugees, TDR

Other government sectors

- Foreign affairs
- Trade and industry
- Urban and rural planning and development
- Animal welfare and husbandry
- Communication and information
- Social protection and security
- Labour
- Public safety and welfare
- Meteorology
- Justice
- Culture
- Transport
- Tourism
- Science and technology

Private Sector

- Farms
- Laboratories
- Private hospitals, clinics and pharmacies
- Large corporations or companies that provide health care to their workers
- Pharmaceutical companies
- Mining and oil and gas extraction
- Chemical companies
- Agricultural companies
- Associations of private companies
- Banks
- Private foundations such as the Bill & Melinda Gates Foundation, Rockefeller Foundation and Wellcome Trust

International and local NGOs

- Oxfam
- Global Environment Facility
- RTI International
- World Vision
- Global Fund to Fight AIDS, Tuberculosis and Malaria
- Innovative Vector Control Consortium
- Médecins sans Frontières
- Other global initiatives and partnerships such as RBM and Gavi, the Vaccine Alliance
- Local NGOs
- Other donor agencies

Other civil society organizations and leaders

- Faith-based organizations and religious leaders
- International service organizations such as the Rotary Clubs and Lions Clubs
- Local charity organizations
- Community groups and partnerships, such as women's groups
- Professional associations such as farmers' groups
- Volunteer groups
- Traditional health care providers
- Labour unions
- Pastoral organizations

*Key government sectors included in the sectoral guidance in this document

Other disciplines may be included in decision-making, depending on the local context. For instance, when mobility is an important consideration, departments of migration, transport, foreign affairs, security and the armed forces may be involved. For example, engagement of the Ministry of Fisheries was essential in Nyabondo, Kenya, to forestall proliferation of poorly maintained or disused fish ponds, which contribute significantly to increasing malaria vector populations. Biolarvicides were used, and fish were re-introduced into the ponds as predators of mosquito larvae *(43).* Some other nongovernmental sectors and stakeholders are listed in **Table 4.2.** A case study of use of the MSA for malaria control is shown in **Box 4.5.**

Box 4.5 Case study: Bioenvironmental control of malaria in Kheda, India *(131)*

Because of increasing insecticide resistance, an alternative method for integrated vector control was started in rural Kheda district, with simple techniques such as source reduction, minor engineering, environmental management, health education, community participation, biological control and inter-department coordination.

- Village heads conducted the work.
- The National Institute of Malaria Research designed and planned activities.
- Primary health centres and community health centres and sub-centres collected baseline data.
- Medical officers supported the intervention.
- Wage workers conducted larval control activities.
- The Department of Fisheries, the Public Works Department, the Irrigation Department and the Forest Department conducted mosquito control activities.
- Gujarat Energy Development Agency, Vadodara and National Wasteland Development Board, New Delhi, supported massive tree plantation.

4.6 Domains of work to be included in a multisectoral approach

The questions to be asked with regard to VBDs are not only how to cure them but also how to prevent them, how to ensure services for people and how to motivate people to access the services. A comprehensive programme for prevention and control encompasses many domains. The purpose of multisectoral collaboration may be a jointly designed strategy, action plan and tools, establishment of a permanent or temporary structure, policies and other collaborative activities. The strategies and technical elements can be categorized as: community mobilization, health education and training; service delivery; resource mobilization; information-sharing; research; and advocacy and legislation.

An inclusive MSA should encompass all these domains through collaboration for specific objectives. Most multisectoral programmes have included more than one of these domains. As they overlap, careful coordination is necessary for maximal effects. New programmes should be aligned with existing interventions, such as routine VBDs control, to share infrastructure and competence.

4.6.1 Domain 1: Community mobilization, health education and training

Effective engagement of communities is one of the most powerful strategies. In an MSA, the implementing entity must inform, empower and involve communities about the intervention so that they will act and facilitate change. Communities can participate in planning, executing and evaluating projects. Therefore, health education and training are often included in collaborative work on VBD control programmes, including campaigns, face-to-face encounters, school activities and health communication. In most programmes, health education and training are also provided to health professionals, local health workers and community leaders. Reinforcement of the health workforce helps to ensure effective health service delivery and the accountability of health professionals in the prevention and control of VBDs. A case study of community control of *Aedes*-borne diseases in India is summarized in **Box 4.6.**

Box 4.6 Case study: Community control of *Ae. aegypti* in Chennai, India *(132)*

A study was conducted to determine the efficacy and enabling and limiting factors of an environmental intervention for community control of the dengue vector *Ae. aegypti.* The interventions included provision of covers for water containers, clean-up campaigns and dissemination of information on dengue. Education and training were conducted with groups of women, field workers and teachers. The study showed a substantial increase in understanding of dengue in comparison with the control group, who received only routine Government services and some information, education and communication.

Examples of community engagement include:

- the Tamil Nadu Corporation for Development of Women Project for sensitization of women's self-help groups about the objectives, methods and vector control strategies used in the intervention;
- self-help groups, in which one focal point from each group mobilized other members of the group for clean-up campaigns and distribution of information, education and communication materials in the community;
- distribution of water container covers and health education materials and organization of meetings;
- mobilization of heads of schools by the Education Department;
- heads of schools encouraged teachers and students to participate, especially in disseminating messages about dengue and environmental sanitation;
- local neighbourhood associations, the health department and a private recycling company involved in management of waste disposal and recycling.

4.6.2 Domain 2: Service delivery

Collaboration in service delivery is another domain of multisectoral interventions. Stakeholders in the public and private sectors contribute the necessary resources (funds, authority, workforce, knowledge, information, institutional arrangements) to facilitate service delivery. Local partners are usually involved in service delivery because they are familiar with the local environment, structure and social and demographic context. Responsibility for planning, formulation of policy and guidelines, distribution of resources and monitoring is usually at a higher level of government. Services are delivered either by reinforcing an existing facility, such as a school, local health office or environment monitoring bureau, or by a team of volunteers and task groups. The services include: diagnosis and treatment, personal prevention (indoor residual spraying, LLIN distribution), sustainable vector management, including environmental management, integrated surveillance and risk assessment (vector, disease, environment, weather, demography, migration and other factors) and vaccination and mass drug administration.

Integrated approaches are commonly used when several measures are combined. The effectiveness of combined measures must be measured. A case study of malaria control for mobile and migrant populations in the Greater Mekong Sub-region is shown in **Box 4.7.**

Box 4.7 Case study: The malaria containment project for seasonal workers in the Greater Mekong Sub-region *(133)*

In the malaria elimination project in the Greater Mekong Sub-region, mobile and migrant populations have been identified as the group at highest risk because of their activities and the difficulty of routine surveillance and response. Intervention packages tailored to diverse population profiles were used tcoordination and management. The stakeholders involved in delivering these interventions were:

- the mass media: education campaign through film, television and radio broadcasts, mobile broadcasting units;
- taxi drivers: trained to provide education on malaria and materials (ITNs) to mobile and migrant populations and to direct symptomatic passengers to health facilities;
- plantation and farm owners and managers: participated in surveillance of workers and in a scheme for lending ITNs to these populations and education;
- mobile malaria workers: behaviour change communication, diagnosis, treatment, malaria information systems; and
- local authorities: surveillance of mobile and migrant populations.

The MSA is also required in acquisition of information, which is essential for effective disease surveillance, prevention, early recognition and rapid response to epidemics and outbreaks. Rapidly developing information technology presents new opportunities for collaboration in information-sharing and management. Partners with information to be shared can collaborate to strengthen disease surveillance and monitoring. Three main information-sharing mechanisms are used in the VBD programmes:

- multidisciplinary collaboration to pool and share data, information and experience (on health, vectors, the environment, weather and others) on factors related to VBDs and ensure a holistic approach to prevention and control;
- international and regional collaboration to monitor vector distribution, disease incidence and population movements in order to forecast risks and changes in disease pattern; and
- exchange of information, experience and lessons among affected countries to increase understanding and capacity.

An example of cross-border collaboration for malaria control is shown in **Box 4.8.**

Box 4.8 Case study: Malaria elimination in the Ecuador–Peru border region *(134)*

The Ecuador–Peru coastal border region is historically endemic for *P. vivax* and *P. falciparum.* The Pan American highway links El Oro province in Ecuador to the Tumbes region of Peru, with significant cross-border migration. Local leaders in the two regions established unofficial binational collaboration for malaria control by strengthening surveillance and response. The collaboration included co-learning through operational research and exchange and sharing of case information and resources to stabilize the unpredictable supply chain and resource limitations. The collaboration resulted in greater exchange of relevant epidemiological information, including up-to-date maps of anopheline habitats in rural communities on the border, which were shared regularly. The presence of new cases in the border region was reported rapidly. A network of more than 140 public and private diagnostic laboratories was created for better surveillance and case management.

4.6.3 Domain 3: Resource mobilization

Insufficient resources is a common limitation of VBD control, and a major benefit of the MSA is enhanced resource mobilization. Governments can re-allocate internal funding and form partnerships with organizations and the private sector for sharing resources and for finding innovative financing mechanisms. Resources may be monetary or non-monetary. After evaluation of each sector's needs, collaborators can supplement each other's human, technical and financial resources. In emergency situations, human and material resources must be mobilized rapidly and used efficiently and in coordination. Examples of resource mobilization in multisectoral collaborations are given in **Boxes 4.9 and 4.10.**

Box 4.9 Case study: The Mectizan Donation Program *(135,136)*

The Mectizan Donation Program has been highly effective in controlling onchocerciasis in endemic countries of Africa and Latin America. The programme involves many heterogeneous partners, including the governments of endemic countries, GlaxoSmithKline, the Carter Center, Merck Executive Offices, the World Bank, WHO, the US Agency for International Development, the Bill & Melinda Gates Foundation, the United Kingdom Department for International Development, regional coordination programmes and international nongovernmental development organizations. While the programme is funded primarily by Merck, it has received additional support from GlaxoSmithKline, which donated albendazole to be co-administered with Mectizan, and committed financial resources from other donors. NGOs assist in implementation.

Box 4.10 Case study: The National Voucher Scheme in the United Republic of Tanzania *(137–139)*

The National Voucher Scheme is a mechanism for distributing LLINs, with the objective of increasing access to and use of LLIN by pregnant women and young children. They are given a discount voucher during attendance at a reproductive and child health facility, which can then be exchanged for an ITN or LLIN at a participating retail outlet at a greatly reduced price.

The National Voucher Scheme was a public–private partnership under the leadership of the Ministry of Health, with multilateral and bilateral development partners, NGOs, academic institutions and mosquito net manufacturers, wholesalers and retailers. The design and implementation of the scheme was financed by a round I grant from the Global Fund to Fight AIDS, Tuberculosis and Malaria in 2003–2011, by the US Agency for International Development through the President's Malaria Initiative in 2006–2013 and by the United Kingdom Department for International Development in 2011–2014.

4.6.4 Domain 4: Research

Research is the first step in evidence-based strategies and interventions for the prevention, diagnosis, treatment and emergency preparedness and response to VBDs. The involvement of several sectors and partners facilitates research through sharing of human resources, infrastructure, equipment, experience and financing. As VBDs disproportionally affect low- and middle-income countries, where resources are usually scarce, multisectoral collaboration ensures resources for research where the diseases occur, thus empowering local researchers and allowing better understanding of the diseases. Collaborative research encourages contextual learning, capacity-building, understanding of local pathogenesis, disease patterns and the local environmental and social situation, resulting in effective, feasible prevention and control strategies adapted to local conditions. It also provides an opportunity to explore innovative financing mechanisms and health system initiatives. An example of multisectoral research by public and private organizations to improve diagnostic capacity for some VBDs is given in **Box 4.11.**

Box 4.11 Case study: The Kamphaeng Phet– Armed Forces Research Institute of Medical Sciences Virology Research Unit *(140)*

In 1982, collaboration was initiated between the Kamphaeng Phet Provincial Hospital, the Thai Ministry of Public Health and the US Army Component of the Armed Forces Research Institute of Medical Sciences, with vaccine manufacturers and universities on studies to evaluate and use improved diagnostics for Japanese encephalitis, hepatitis A, dengue and influenza. The studies clarified the clinical and epidemiological features of these infections. Large clinical trials demonstrated > 90% efficacy of vaccines against Japanese encephalitis and hepatitis A viruses, and both vaccines were licensed, indicating that the research has supported vaccine development. The collaboration yielded approximately 80 publications.

- The Thai Ministry of Public Health provided expertise in disease surveillance and outbreak control and identified disease priorities.
- Investigators from the US Army contributed advances in diagnosis and vaccines, entomological support and study design.
- Vaccine manufacturers provided vaccines.
- University investigators conducted the research.

4.6.5 **Domain 5:** Advocacy and legislation

One means for coordinating VBD control programmes among government sectors is inclusion of management of the determinants of VBDs in legislation and regulations for other sectors, such as for water storage, disposal of used tyres for *Aedes* control, waste collection and building site maintenance. Written authority and clarification of roles and responsibilities in legislation and interagency agreements can promote action. Legislation, regulations and agreements or their modification require strategic advocacy and lobbying of policy-makers and relevant sectors for support and cross-sectoral, collective consultation. Advocacy and legislation are therefore another entry point for an MSA. A case study of the prevention and control of schistosomiasis in Suriname by enforcing laws in housing, agricultural and industrial sectors is a good example of use of the MSA **(Box 4.12).**

Box 4.12 Case study: Control of schistosomiasis and other neglected infectious diseases in Suriname *(141)*

Multisectoral collaboration was established in Suriname for the prevention and control of neglected infectious diseases, including leishmaniasis and schistosomiasis. The collaboration involved both Government ministries and nongovernment partners. Their main responsibilities were as follows:

MAJOR STAKEHOLDERS	RELEVANT TASKS
Ministry of Health	• Organization of the health system • Service delivery and access to health services • Health promotion and education • Monitoring, evaluation and surveillance of disease programmes • Environmental health (inspection and education)
Ministry of Public Works	• Solid waste management • Public environmental management (sanitation and hygiene) • Sewerage system • Housing and building legislation
Ministry of Natural Resources	• Drinking-water supply and distribution • Safe, potable drinking-water
Ministry of Labour, Technology and Environment	• General environmental issues
Ministry of Education	• School (health and education) projects • School health care services
Ministry of Social Affairs and Housing	• Free access to health and housing for people with low socioeconomic status
Ministry of Agriculture, Fisheries and Animal Husbandry	• Agricultural policy, food safety, food security and veterinary health
Ministry of Trade and Industry	• Laws, regulations and guidelines on importation of pharmaceuticals
Ministry of Regional Development	• Integrated government response for regional development and improvement of the environment in the interior district

4.7 Enabling factors

The key enabling factors for multisectoral collaboration are listed in **Table 4.3**; however, strengthening other relevant area also facilitates an MSA. Integration of the MSA for VBD prevention and control into national planning can ensure sustainability. Open, inclusive, informed discussion is recommended for common understanding, after defining what, when and how to communicate (channels, occasions, a common platform) and to whom. Each communication event should include at the planning stage a specific list of participating stakeholders. Further, predetermined timeline and frequency of communication events will allow valuable inputs. Transparency in sharing data and information is essential. Strategies to overcome hierarchical boundaries (e.g. clustering of expertise, strong engagement and orientation of visions and outcomes) are required for efficient collaboration.

Table 4.3 Factors in a successful multisectoral approach

High-level political support	• High-level commitment of national leaders, both central and by sector, to demonstrate commitment verbally, institutionally and financially. • Create enabling environment, mobilize stakeholders, facilitate legitimization of multisectoral actions, and ensure funds.
Shared vision, objectives and long-term outcomes	• Ensure, through effective communication and sensitization, common understanding of and agreement on the vision, perspective and objectives, with a long-term focus. • Harmonize coordination; establish sustainable mechanisms for planning, implementation and sustainable outcomes.
Clear mandate and institutionalized coordination mechanism	• Exert authority for action in certain areas, with clear definition of roles and responsibilities, and put in place supportive egislation for coordination. • Enhance accountability, and avoid power conflicts; optimize planning and implementation; avoid duplication of inputs and activities.
Identified incentives and co-benefits for partners	• Identify and align the interests of each partner; demonstrate economic benefit; create and show win–win situations. • Boost determination, and promote ownership.
Adequate human and financial resource mobilized and allocated	• Adequate skilled, trained staff for collaboration, with adequate funds earmarked through increased global financing, joint funding or new financing solutions • Guarantee execution of the mandate of the collaboration

Contextual design of programme	• Through credible, local, people-centred need and capacity assessments, design programmes that suit the local institutional, operational and cultural situation. • Maximize effectiveness, impact and value for money.
Implementation supported at policy level	• Establish joint or sectoral legislation and a regulatory framework that are shaped and influenced by multisectoral input and mainstream prevention and control of VBDs. • Enforce action by institutionalization, and guarantee sustainability and continuity.
Robust joint monitoring system	• Work collaboratively to plan joint monitoring activities with realistic, measurable indicators of input, process, output, outcome and impact. • Measure progress, supports ownership, ensure mutual accountability of outcomes, and encourage mutual learning.

Chapter 5

Coordination and institutional process

5.1 Coordination and implementation

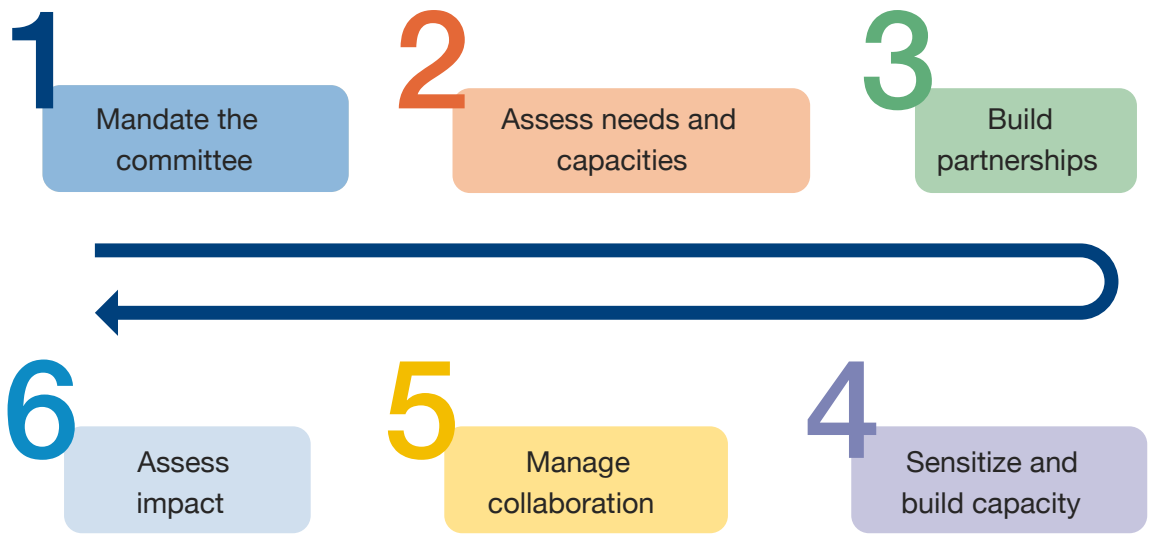
As discussed in Chapters 3 and 4, an efficient mechanism for coordination and implementation is essential for multisectoral collaboration. The coordination entity may be the health sector or the central government, or a designated agency or coordination committee may be established. The coordination body may include nongovernmental agencies. In a neglected tropical diseases project in Recife, Brazil, the integrated management committee involved municipalities, institutes and a bank *(142).* Collaboration could start within the health sector, then add the sectors that are most relevant to meeting the goals and priorities and progressively involve other sectors. New sectors should be added at the beginning of each phase of the project to ensure that they participate in planning. Implementation could be pilot-tested in certain districts and gradually scaled-up. Starting with short-term, achievable joint action will encourage buy-in and ownership of programme activities.

Coordination at national or higher level is facilitated by a coordination committee. Cross-border cooperation and joint approaches are sometimes required, especially where population movements are frequent. **If an existing coordination committee for another multisectoral project can be used, the necessary components could be added to ensure comprehensive coverage of VBDs.** For instance, the coordination committee for VBDs could include or overlap with that for national IVM, with Member States participating in the IVM strategic framework *(143).* While sectoral boundaries are less of an obstacle for local collaboration, partnership and collaboration should be reinforced by policy.

The centralized coordination is important, but leadership and ownership of projects may be different during each phase of implementation. In some countries and circumstances, a dictatorial approach may work in the short term, especially in emergencies, but is generally not sustainable. Collaborative, distributed leadership is required for effective governance of multisectoral actions.

The multisectoral coordination pathway shown in **Fig. 5.1** is proposed for designing national coordination.

Fig. 5.1 Theoretical pathway for coordination in an MSA



Step 1. Mandate a coordination or steering committee with defined terms of reference.

The first step is to ensure a mandated, committed group to assume the tasks and responsibilities of coordinating multisectoral activities. The committee may be built on the national VBD control team and should include government officials from relevant sectors.

Step 2. Assess needs and capacity for multisectoral VBD control.

The coordination committee consults all stakeholders, including communities and relevant experts that will be involved in the programme, defines the terms of reference for the needs and capacity assessments, and mandate the assessments as follows:

- Collect up-to-date data on the burden of each VBD.
- Include all VBDs relevant to the country, not only those that are highly prevalent but also those that pose risks due to displacement of populations from neighbouring countries.
- Identify key VBDs according to the country's priorities.
- Include a qualitative or quantitative analysis of links between the prevalence of VBDs and the activities of each key sector.
- Identify the most vulnerable populations, including mobile and migrant populations.
- Review the public's perceptions of VBDs.

- Evaluate the strengths and weaknesses of the health sector for the prevention and control of VBDs and the strengths and weaknesses of country's institutional capacity for an MSA according to policies, programmes, financial resource, infrastructure, human resource and socioeconomic and political situation.

- Identify existing structures and processes for cross-ministerial, multisectoral action and cooperation, and determine what worked, what did not work and why.

- Estimate the impact of policies and programmes in other sectors on the overall institutional capacity for an MSA for VBDs.

- Recommend first steps and actions to thecoordination committee.

Step 3. Partnership building

a. The coordination committee **builds a common vision** based on the assessment of needs and capacity. The initial partners identify commonly defined goals for partnerships, establish clear objectives and expectations and establish a vision of the MSA that is in line with and adds value to the work of each partner. If necessary conduct full SWOT (strengths, weaknesses, opportunities, threats) analysis, with a discussion of whether and how the collaboration could address any issues. **Box 5.1** lists some questions to be considered during multisectoral planning and implementation.

Box 5.1 Questions to guide multisectoral planning and implementation

- What are our priority VBDs, the determinants and relevant sectors?

- How can we reduce the burden of the target disease in a multisectoral partnership and in what domains can we plan multisectoral activities?

- Are there already multisectoral collaborations in the country, for VBDs or other health problems?

- How can different sectors integrate VBDs into their work and contribute their specific competence, skills and resources to the partnership, and what is their motivation?

- Do the health and other sectors have the necessary capacity for multisectoral collaboration for VBD control?

- In what areas should capacity be strengthened and how?

- Which donors are currently or used to provide support for the prevention and control of VBDs?

b. The committee **mandates a stakeholder analysis** to identify stakeholders by consultation with government sectors and groups with a clear view of potential partners; explore compatibility, convergence of interests and identify areas of aligned interests; map resources, and identify the sources and types of resources that stakeholders could contribute; make a plan for resource mobilization (who, what, where and with what resources), including policy; conduct a risk assessment and a plan for managing risks.

c. The committee **mandates an advocacy strategy** to prepare coherent messages for all relevant sectors; establish an inventory of existing cross-cutting advocacy materials and prepare advocacy for different stakeholders; and conduct orientation workshops to build the capacity of non-health sectors to deliver health.

d. The coordination committee **initiates dialogue with stakeholders,** convenes a meeting to discuss the current activities, location and funding of each sector, identify existing programmes that include VBDs, the priorities and challenges of each sector, and determine converging interests, potential joint objectives and activities, motivation and commitment, as well as the structure for coordination and possible grants. The initial meeting should not involve too many participants but only key decision-makers to facilitate engagement and political commitment. Both national and subnational representatives could be included, according to the context.

e. The coordination committee **prepares and agrees with all sectors on the coordination and implementation plan;** establishes other governing bodies (planning group, supporting committee, technical advisory committee, executive committee, thematic working groups) as necessary. The coordination committee mandates a body to outline the main activities, entry points, realistic timelines, communication channels, leading entity, governance structure (shared governance), focal points in each sector, roles and responsibilities of each partner, decision-making principles (participatory, accountable, responsive and inclusive), division of resources, exit strategy and monitoring and reporting mechanism.

f. **The coordination committee agrees on and signs a written agreement** on the protocols, standards and operating strategies and procedures to be followed at all provincial levels.

Step 4. Public sensitization and capacity-building for all partners

The capacity of all relevant stakeholders should be built, including communities. Gaps in knowledge and capacity should be identified with regard to the diseases addressed, particularly about the interventions and behaviour. Communication materials and training specific to the context will be used to change behaviour and maximize impact. A workshop should be conducted to strengthen partners' capacity to collaborate, which should include topics such as how to effectively complement each other in resources and expertise, how to maintain effective and transparent communication, and how to develop joint monitoring and evaluation plan.

Step 5. Management of collaboration by supporting providers or bodies

- **Design protocols and standards** for joint actions, assessment, learning, capacity-building, training, data collection, monitoring and evaluation.
- Discuss policy, and **institutionalize** the mechanism of collaboration.
- Set the main agenda, priorities and objectives.
- Implement the agreed joint and individual activities.
- Convene periodic meetings with all sectors.
- Ensure vertical continuity of the multisectoral task force at all levels of government.
- At different stages of the implementation, adjust the level and extent of integration and convergence of stakeholders according to their need and expertise.
- Establish a credit-granting reward system to recognize and celebrate collective achievements.
- Address differences in organizational priorities and objectives throughout the multisectoral programme.
- Cultivate champions by identifying influential leaders in non-health sectors who can attract engagement.
- To ensure the sustainability of collaboration, transform it or set up another collaborative arrangement at the conclusion of each project or activity, and identify resources to ensure continuing collaboration.

Step 6. Assessment of programme impact

The coordination committee mandates an assessment of the impact of the programme. Delays due to the lagging effect of activities are acceptable, although impact may not be seen if the delay is too long. Good practices and lessons should be shared. If the assessment is positive, the partnership can be further institutionalized and strengthened to ensure sustainability. An impact assessment is part of monitoring and evaluation, which is described in more detail in Chapter 7.

5.2 Roles of nongovernmental sectors and bodies

Nongovernmental sectors and bodies play vital roles in an MSA to VBD control by contributing specialized expertise, resources and networks. Their influence may help to leverage political will and action in public health. In low-income countries and those experiencing political instability, nongovernmental sectors often provide day-to-day leadership and influence decision-making.

5.2.1 Nongovernmental and international organizations

International organizations consist not only of specialized United Nations agencies but also those involved in donation and distribution partnerships, advisory groups, operational research and training partnerships. NGOs and international organizations may be included for financial and logistics support. Zhou et al. *(144)* stressed the importance of resource mobilization by international agencies and NGOs in response to disasters, especially for the prevention and control of malaria among internally displaced groups. NGOs and others with specific expertise and project experience can provide professional and technical assistance in programme governance, project management and implementation, including assessment, community education and awareness-raising, capacity-building and service delivery **(Box 5.2).** In countries that lack strong leadership, international organizations such as WHO can help to strengthen leadership capacity **(Box 5.3).** International organizations may also provide human resources and participate in joint planning and budgeting, research and innovation, building partnerships and promoting networking, monitoring and review, joint financial arrangements and engagement in policy dialogue and legislation.

Box 5.2 Enabling, coordinating and change-facilitating roles of NGOs and international organizations

- Leadership
- Project management
- Financial and human resources
- Service delivery
- Community mobilization
- Capacity-building
- Facilitate partnership-building and promote networking
- Policy dialogue

Box 5.3 Potential roles of WHO in an MSA to VBDs

- Advocate to national authorities for the rationale and importance of multisectoral collaboration for the prevention and control of VBDs, and sensitize national partners.
- Provide leadership in building collaborations and framing multisectoral actions.
- Support Member States in planning and implementing their multisectoral VBD programmes, including programme coordination, capacity-building and acquisition of good data; and assist in building partnerships with other United Nations organizations, donors, NGOs and academia.
- Provide leadership in improving countries' legal compliance in health by disseminating guidance and advice on norms and policy and assisting in development of legal instruments.
- Disseminate VBD-related toolkit and communication materials.
- Standardize indicators for monitoring and evaluation.
- Facilitate multisectoral policy dialogue.
- Shape the global research agenda; promote knowledge and evidence generation, sharing of experience and research on use of the MSA for VBD control and prevention.
- Promote use of best practices of the MSA for VBDs, and facilitate exchange among regions and countries.
- Convene global meetings on use of the MSA for VBD control and prevention, and provide platforms for multisectoral, international and regional dialogue.

5.2.2 Private sector

Efficient engagement of the private sector is a win–win solution for communities, health systems and companies. Public–private partnerships are useful in multisectoral collaboration for VBD control **(Box 5.4),** as the private sector is usually profit-driven for greater effectiveness and efficiency. Certain private entities have intangible assets and expertise that complement those of governments, such as project management, fiscal discipline and transparency, leadership skills, expertise in governance, communication, marketing, logistics and distribution.

The private sector can sometimes extend the reach of a government VBD programme and is willing and able to take risks, with a more flexible organizational structure. Partners in the private sector are of several types **(Box 5.5).**

Box 5.4 Aims of public–private partnerships for health

- Increase access
- Improve the quality of care
- Control excessive health care costs

Box 5.5 Categories of partners in the private sector

- Products and services for VBD prevention and control: private clinics, laboratories, private health practitioners, pharmaceutical companies, drug dispensaries, insecticide and chemical industry and other manufacturers of VBD prevention tools, such as mosquito nets;
- Private entities with the capacity and resources required for VBD control: private banks, water and waste management companies, business consulting and project management companies;
- Private entities affected by VBDs: large corporations or companies that operate in VBD-affected areas or whose business is vulnerable to VBDs, such as agricultural, mining and infrastructure development;
- Other private entities, NGOs and donors engaged in partnerships for VBD prevention and control;
- Private business coalitions with an interest in fighting against VBDs.

The involvement of companies and large corporations linked directly to determinants of VBDs or whose employees are exposed to the diseases is essential. In some of these industries, access to health care infrastructure is lacking or limited, while the motivation of the company is to maximize productivity by including health in business planning to reduce the impact of VBDs and increase corporate social responsibility. One such example in the history is the leadership of the rubber industry and railroad construction in Brazil in malaria control after the colonial period because of the susceptibility of migrant workers to malaria *(145).* Health care service provided by the private sector could cover workers left out by local community health programmes.

Domains to which the private sector can contribute (Box 5.6)

- Monetary or in-kind donations;
- Health impact assessments for VBDs;
- Involvement of business experts in devising an innovative model for health service delivery;
- Market incentives for developing new drugs and low-cost tools for VBD prevention and control;
- Incentive programmes to promote the willingness and ability of the populations to pay;
- Employment opportunities or innovative products;
- Data on absenteeism, health surveys of employees and families;
- Supplement existing public control interventions;
- Transparent, responsible engagement in public policy dialogue, rule-making and institution building;
- Centres of excellence.

Box 5.6 Private sector engagement framework – RBM *(146)*

In 2018, the RBM programme proposed an engagement strategy with the private sector to increase the scope of their involvement in the Partnership and their contribution to the strategic objectives of the End Malaria Work Plan and Budget for 2018–2020.

The principles for private sector engagement were:

- Strategic alignment to the Partnership's vision, mission and priorities
- Open, non-restrictive membership
- Appreciation of the value of diversity
- Add value to the global architecture of malaria control
- Focused results
- Fairness in all collaborations
- Transparency

Strategic recommendations:

- Prioritize collaboration with and support to existing regional and national networks for increasing private sector engagement.
- Prioritize opportunities for engaging with key private sector entities in malaria-endemic countries.
- Private sector engagement at global level is collaborative, with complementary networks and initiatives.
- Further develop reliance on RBM member organizations to add value to existing plans and strategic approaches that could increase private sector engagement.
- Broaden engagement with the private sector by reviewing RBM systems and resources for communication with the private sector, and strengthen RBM membership and recruitment systems.

Examples of activities of the private sector to reduce the prevalence of infectious diseases:

- Proper disposal of excreta, wastewater and domestic solid waste at work camps;
- Health surveillance and check-ups of work crews, especially migrant workers; prevent movement of workers with disease;
- Increase access to VBD diagnosis, treatment and care services; ensure coverage of undocumented workers, who tend not to seek health care **(Box 5.7);**
- Monitor potential vector breeding sites at construction sites, such as holes dug for sand and gravel;
- Train workers and farmers.

Box 5.7 Case study: AngloGold Ashanti Malaria Control Programme *(147,148)*

Since 2005, the gold mining company AngloGold Ashanti has been collaborating with the governments of Ghana and of the United Republic of Tanzania and with international donors in a comprehensive, integrated malaria control programme. The first phase of the project was implemented in Obuasi Municipal District in Ghana. The activities included vector control measures such as indoor residual spraying, targeted larviciding, human behaviour change, rapid case detection and distribution of ITNs. The project's management received day-to-day support from Obuasi mine managers. The mine was responsible for daily activities and for providing financial control, logistics management, laboratory facilities and strategic direction. All operations of the programme during this phase were funded by AngloGold Ashanti. The programme achieved a 75% reduction in reported malaria cases by December 2009, and the project was extended beyond AngloGold Ashanti's operating environment, supported by the Global Fund to Fight AIDS, Tuberculosis and Malaria.

5.2.3 Communities

As described in section 4.1, community engagement is vital in the fight against VBDs, as it can provide local, context-relevant solutions. Examples of ways in which communities can take part were listed previously. Their engagement leads not only to better decisions but also to better public understanding and support of the decisions, which in turn results in better implementation. A study in Myanmar demonstrated the feasibility of delivering effective interventions in an area of active conflict through trained volunteers *(117)*. Lima et al. *(98)* noted that the community should be engaged "not only as receivers of information but as active agents of vector control, and environmental management".

The roles of communities are to:

- ensure contextual design of programmes and interventions,
- build local partnerships,
- assist in service delivery and contribute to the VBD workforce,
- promote the ownership of a project and
- promote behaviour change.

5.3 Financing

The sources of financing for multisectoral collaboration depend on the country. In low- and middle-income countries, the main source is often external donors, as the tax revenue of governments and the budget allocations for health are less secure than in high-income countries. Other sources of financing include the private sector, regional and international organizations and civil society. Funding of one programme from different sources and administration of the funds is challenging, and the sectors involved in an MSA may have diverse financing sources and mechanisms. Programme leaders should be aware of any independent budgets and mechanisms for the funding flows of each stakeholder. Some activities of finance sectors are introduced in section 6.9. Preliminary questions to be raised for funding an integrated multisectoral programme for VBDs are listed in **Box 5.8.** Costs can be saved by efficient use of funds and avoiding overlapping interventions or resource allocation for different diseases from different sectors.

The main costs of multisectoral collaboration are for:

- Equipment and materials: medications, vaccines, chemicals, vector control materials and tools, medical and laboratorial devices, vehicles, office materials, education and training materials, reporting
- Salaries, compensation and incentives
- Logistics: travel costs, meeting venues and equipment, food, transport, insurance, communications
- Facilities: buildings, utilities
- Administration: legal fees, branding, registration

Box 5.8 Questions to consider in financing for universal health coverage

- Who is covered?
- Which services are covered?
- What proportion of costs is covered?

Funding mechanisms:

- Domestic financing: government (national, provincial, local); cost-sharing across vertical levels of government
- Bilateral and multilateral assistance
- International financing from donors and VBD programmes
- Monetary or in-kind contributions from partners, including private sector and nongovernmental donor partnerships
- Innovative funding mechanisms, such as taxes on certain financial transactions, and bonds

Key: Raise more funds, increase efficiency and sustainability!

Apart from increasing fundraising from different sources and increasing the share of health in government spending, more and better should be done for less and the efficiency and effectiveness of funds improved. Integrated methods, more informed, better coordinated work among partners and targeting key populations can make VBD financing more sustainable. To avoid conflict of interests, the coordination committee should be funded by the central government rather than international funds. A shift towards domestic funding will also foster country ownership and accountability. Innovative financing may be required to meet any budget gap, but use of any new mechanism should be negotiated between donors and recipients to ensure compatibility with the local context and sustainability.

5.4 Norms and legislation

As discussed in section 6.10, effective, sustainable implementation of multisectoral interventions is reinforced by appropriate regulation and legislation. Existing legislation and regulations might be unsuitable and have to be changed. New legal instruments relevant to determinants of VBDs will set the power, duties and procedures for action of all relevant sectors **(Box 5.9).** In the RBM Action and Investment to Defeat Malaria 2016–2030 *(16)*, the actions suggested for strengthening multisectoral policy include conducting rapid policy analyses, using civic by-laws as an entry point and introducing tax policies to limit bureaucratic barriers to investment in malaria.

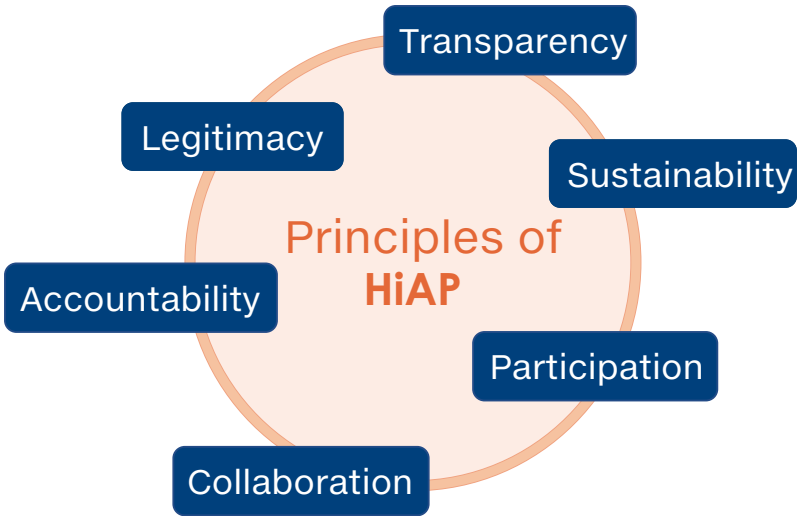
Box 5.9 Legal authorities used to support mosquito control in Washington DC and Puerto Rico *(149)*

- General public welfare and safety: broad powers used by states, counties and municipalities to authorize mosquito abatement.
- Public health authority: specific authority of a state or local agency or governing entity to protect the public from threats to public health, such as epidemics and nuisances.
- Statutory enabling authority regarding public nuisances: all states and counties have legal provisions for dealing with public nuisances, e.g. declaring a property a public health nuisance and requiring mitigation.
- Statutory enabling authority to establish and operate a mosquito control programme: legislation that allows a state, county or municipality to operate a mosquito control programme.
- Statutory enabling authority to establish mosquito control districts: state legislation authorizing creation of local districts for mosquito control.
- Statutory mosquito control programme with options for participation by county and municipal governments: regulations promulgated by a commission that prescribes parameters for control activities for counties and municipalities.

Two types of norm and policy are necessary in a multisectoral collaboration: infrastructural, to define the mission and administrative and functional structure of a partnership and the partners' roles and responsibilities; and interventional, to establish standards, norms, regulations and policies on specific actions. Interventional policies may be sectoral or multisectoral for joint actions.

WHO's International Health Regulations (2005) provide basic norms that are binding on all Member States, requiring countries to strengthen national surveillance and response capacities. The Regulations include general obligations for surveillance of vectors, and Annex 5 lists measures specific for VBDs *(150).* Other regulations and policies might be required, according to the context. The prevention and control of VBDs should be an integral part of national public health policy, and vector control should be integrated into the policies of non-health sectors. VBDs, sexually transmitted infections, chronic respiratory diseases and complex problems such as violence against women were identified as entry points for multisectoral action and Health in All Policies *(151)* **(Fig. 5.2).**

Fig. 5.2 Principles of Health in All Policies (HiAP) *(51)*



Project leaders must be aware of the regulations concerning chemicals used against VBDs. Mathews et al. *(152)* found that few WHO Member States had comprehensive legislation concerning public health pesticides and suggested that World Health Assembly resolutions reaffirm WHO's mandate to ensure appropriate strategies.

5.5 Coherence with existing institutional structures and multisectoral collaboration mechanisms

Most countries have already planned and developed multisectoral collaboration for health and non-health issues, and the dynamic power of these mechanisms has been proven. Examples include cholera elimination in the Democratic Republic of the Congo and Kenya, an MSA to HIV/AIDS in Commonwealth countries and in South Africa and multisectoral plans for a nutrition plan in Nepal, Rwanda and the United Republic of Tanzania. Lessons can nevertheless be learnt about collaboration governance. VBDs could be added to the terms of reference of an original partnership.

India is conducting tobacco control through an inter-ministerial task force, with members from the ministries of Labour, Commerce, Information and Broadcasting, Agriculture and Rural Development, from the departments of Revenue and Industrial Policy and Promotion, from the Food Standards and Safety Authority, the Drug Controller-General of India and civil society *(153)*. Coordination mechanisms have been established within joint sector reviews in some countries to bring together stakeholders from all government sectors and agencies to foster change in WaSH *(154).* Another example is the One WaSH National Programme of Ethiopia, in which the ministries of Water, Irrigation and Electricity, Health, Finance and Economic Development and Education contribute jointly to an integrated system for monitoring and evaluating WaSH *(155).* VBDs could be integrated into such mechanisms, in which several ministries are equally concerned, rather than creating a new parallel structure. The existing institutional framework should be assessed to determine existing collaboration and capacities. Incorporation of VBD projects into existing structures at national and local levels will ensure synergy with national and local health and development plans. Alignment of multisectoral VBD programmes with national strategic priorities and other relevant programmes will ensure efficient use of resources and impact.

Coordination is also required between VBD control programmes in the MSA and activities for specific circumstances, such as responses to outbreaks, epidemics or humanitarian crises.

5.6 Integration into global multinational and multisectoral work

Considerable global work has been done in fields related to VBDs, including environmental health, One Health and urban health. Discussions on VBDs are also related to the SDGs, as 15 of the goals are directed to environmental and socioeconomic determinants of VBDs **(Box 5.10)**. The prevention and control of VBDs extends beyond target 3.3, and global progress in VBDs benefits from advances towards other goals. Better integration of VBDs into national planning for achieving the SDGs will therefore result in progress in the control of VBDs.

WHO and UNEP initiated the Health and Environment Linkages Initiative to “promote and facilitate action in developing countries to reduce environmental threats to human health” *(156)*. The priorities include VBDs, water-related diseases, agro-chemical poisoning, the urban environment, air pollution

and climate change. National environmental health action plans are a comprehensive, holistic, multisectoral means for planning environmental health. In 2003, 80% of WHO Member States had a national environmental health action plan, which introduced MSAs *(157)*.

As mentioned in section 2.2, progress has been made in Africa in addressing the links between environment and human health, with inter-ministerial conferences on health and environment, adoption of the Libreville Declaration and the Luanda Commitment and Strategic Action Plan and establishment of the Health and Environment Strategic Alliance. African leaders who participated in these initiatives are encouraged to identify how existing institutions can be strengthened for VBD activities.

Box 5.10 Relations between the SDGs and control of VBDs *(41,158)*

- VBDs disproportionately affect economically disadvantaged and vulnerable societies.
- Eliminating VBDs will reduce poverty and increase economic prosperity.

- Populations affected by VBDs, who often have low socioeconomic status, have insufficient food and nutrition.
- Patients with VBDs need food to build their immune systems.
- Eliminating VBDs will improve nutrition and increase agricultural productivity.

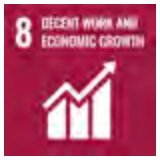
- VBDs are a major challenge to health and well-being.
- Reducing their incidence will contribute to achieving universal health coverage and maternal and neonatal mortality.

- VBDs affect school performance and children's future.
- Eliminating VBDs will improve school attendance and educational outcomes.

- Some VBDs disproportionately affect women or men because of their different roles and activities.
- Reducing their incidence will promote gender equality.

- The prevention and control of many VBDs are linked to water and sanitation.
- Increased access to safe water and sanitation will reduce the risk of VBDs.

- Construction of hydroelectric dams modifies the transmission of some VBDs.
- Engagement of the energy sector will ensure sufficient consideration of VBDs in development projects.



- VBDs cause illness and disability and result in stigmatization, which reduce the potential workforce, productivity and economic growth.

- Inadequate infrastructure contributes to VBD transmission.
- The risks of VBDs should be considered in infrastructure development.

- Vulnerability to VBDs is heterogeneous
- Eliminating VBDs will reduce inequality in health and economic outcomes.

- Unplanned urban development increases the risks of VBDs
- Eliminating VBDs will make cities safer.

- Adequate management of VBD-related solid waste will contribute to reducing their incidence.

- Climate change is associated with more outbreaks and a higher disease burden of many VBDs.
- Mitigating the impacts of climate change could reduce the incidence of VBDs.

- Alteration of the landscape influences vector abundance and diversity and transmission of VBDs.
- Terrestrial ecosystem management should include consideration of VBDs.

- A comprehensive VBD control programme requires joint commitment and coordination among partners in various sectors.

Health Poverty Action on the China–Myanmar border is an example for strengthening partnership and collaboration *(159)*. The Stop TB partnership also set priorities for multisectoral action against tuberculosis, with high-level advocacy and partnerships in countries *(160)*. Countries should also benefit from existing multinational collaborations and share information, surveillance data and regional and international risks, with strengthened coordination and communication with neighbouring countries.

Chapter 6

Sectoral guidance

6.1 Generic considerations and sectoral pathway

This chapter provides guidance to sectors on the prevention and control of VBDs. The guidance is designed not only for decision-makers in governments and other public sectors but also for institutions, the private sector, NGOs and others in a multisectoral programme. The chapter is organized according to discipline, each of which has stakeholder groups (public, private, NGOs, communities). The leadership of a multisectoral programme, usually in the government health sector, will nominate a coordination committee, which will identify all relevant sectors, including nongovernmental entities, to be involved in the collaborative plan and programme. All government entities in the programme are responsible for:

- mainstreaming VBD prevention and control into sectoral policies, plans and programmes;
- mobilizing resources (material, service, financial, human and policy);
- providing technical support; and
- participating in joint monitoring.

A theoretical **sectoral pathway** is proposed to assist the coordination committee in planning its work to achieve the targets in an MSA programme. This pathway is complementary to the coordination pathway outlined in section 5.1, which gives an overall picture of the coordination of a continuous MSA in all programmes. Implementation of each step of the sectoral pathway requires exchanges among the coordination committee and partners. In this chapter, “sector” refers to an entire discipline, including all its constituents, both within and outside government.

! Focus on the shared goal of prevention and control of vector-borne diseases!

The coordinating committee:

(Step 1) is nominated by the leadership (such as the government health sector) of the multisectoral programme, **identifies relevant sectors** and, in strategic discussions and consultations, **defines the vision** of the programme, what it is to achieve and the opportunities, input and expected outputs and outcomes;

(Step 2) commissions a review of the situation of VBDs, a **review of the impact** of the interventions and policies in each sector on VBD prevention and control and of priorities;

(Step 3) convenes **joint meetings** with relevant governmental and nongovernmental partners in each sector to develop a common vision and objectives and identify programme priorities;

(Step 4) convenes a **vertical consultation** with entities at lower levels of each sector;

(Step 5) coordinates **assessments of staff expertise and resources** (human, material, service, financial, political) in each sector, and identifies the type and amount of assets that can be shared or gaps that can be filled by the collaboration, both for interventions and for the MSA process (such as meetings and other logistics);

(Step 6) commissions a consultancy or review to determine how the **activities of each sector can be aligned for the MSA,** assess how they can be enhanced or modified for the purpose of the programme and identify any new interventions required;

(Step 7) commissions a consultancy to develop **sectoral plans**, with detailed objectives, expected outputs and outcomes, priority VBDs if applicable, activities and delivery channels, cost–return analysis (sector and health), strategies for resource mobilization and partnership building and a communication and dissemination plan for each sector, with a realistic timeline;

(Step 8) appoints **sectoral VBD focal** points and other staff for the multisectoral collaboration and outlines the skills and experience required for each role;

(Step 9) **mobilizes the necessary resources** in each sector, with partners;

(Step 10) **coordinates the implementation** of sectoral and joint actions from partners;

(Step 11) **liaises with the legislative sector** for policy analysis and development of evidence-based norms, standards, guidelines, regulations, policies and laws to enforce both sectoral and joint actions; and

(Step 12) commissions a consultancy for **sectoral monitoring and evaluation** through SMART (specific, measurable, achievable, realistic and time-bound) indicators to estimate sectoral gains and outcomes and programme quality and progress.

Within each government sector, the response to the call for inter-ministerial collaboration should result in collaboration within each discipline including with its own stakeholders and partners.
An example of the steps involved in implementing an MSA to malaria is given in **Box 6.1.**

Box 6.1 Five steps to becoming a "malaria-smart" sector *(59)*

1. **Own staff and their families:** it is of obvious benefit to a sector and its actors that its staff and their families are free of malaria, as it directly improves the productivity of the individual actor. The sectoral actors should promote malaria-safe behaviours and provide support and means for prevention, protection and treatment to their staff.

2. **Clients and their families:** it is also of obvious benefit to a sectoral actor if its clients (business relations, students, farmers, small-scale entrepreneurs etc.) and their families are free of malaria, as it will improve the overall sectoral productivity. The sectoral actors should promote malaria-safe behaviours, prevention, protection and treatment, and, if relevant, provide the support and the means.

3. **Malaria-producing activities:** the sector should review its ways of operation, practices, procedures and production systems to identify those that are potentially contributing to sustaining or increasing vector load, pathogen transmission or insecticide and drug resistance. The sector should develop and promote the use of approaches that do not produce malaria.

4. **Malaria-reducing potentials:** the sector should review its current activities to identify those that could be modified or added to have a malaria-reducing effect. Each sector will have some comparative advantages with respect to malaria control that can be released with no or limited additional costs.

5. **Socio-economic development for malaria and synergies with other sectors:** the sector should review its potential and role in addressing those determinants of malaria where concerted eff orts by multiple sectors are required. It should then actively engage nationally and locally in addressing the priority determinants, including defining indicators, and setting and reporting on targets.

Other generic considerations by each sector to support an MSA are as follows.

- Be responsive to the initiatives and activities of other sectors that provide opportunities for collaboration.
- Share the sector's work, achievements and lessons learnt with other partners.
- Consider the cultural context and acceptability of planned interventions.
- Add VBD-related messages to the sectoral advocacy document.
- Explore investment opportunities in areas highly endemic for VBDs.
- Set an agenda for research on more effective, efficient contribution of the sector to VBD prevention and control.

Guidance is provided below for nine sectors: health, environment, water and sanitation, agriculture and aquaculture, energy, housing, education and research, finance and legislation. The activities of some sectors may partially overlap, such as environment with water and sanitation, as well as housing. The health sector, with its special position in VBD control programmes, has a particular role in the MSA, and its objective of using the MSA in conducting VBD programmes is discussed, with potential partners within the sector. For each of the other sectors, the rationale for involving this sector is explained, as well as sectoral objectives and potential partners within this sector. Examples of specific multisectoral actions for each sector are presented with partners suggested who can contribute in those actions.

The tables list examples of activities that will benefit from the support of other sectors. Routine activities that could also benefit VBDs prevention and control but can be performed only by the particular sector are not listed. One example is strengthening animal husbandry, such as building biogas digesters for excreta and fencing animals away from infested watersheds and grasslands. As many activities require several partners, some activities are repeated for different sectors. Communities, the private sector, NGOs and other nongovernmental entities may be able to participate in activities in all government sectors (see section 5.2), as demonstrated in some activities.

"Where to start" lists actions to help sector leaders to initiate interventions. Each section is exemplified in a case study.

The list of sectors is not exhaustive; other sectors that could contribute to a programme could be included. For example, the communication and information sector is important to provide up-to-date information about the geographical spread and current outbreaks of VBDs to health care providers. Use of social media has facilitated information-sharing during outbreaks, especially in areas with poor health information systems. Other important sectors include tourism, transport and urban and rural planning **(Table 4.2).**

6.2 Health sector

6.2.1 Role of the health sector

The health sector usually leads in safeguarding a population's health through initiatives that include controlling transmission of VBDs; however, in multisectoral programmes that extend beyond the capacity of the health sector, its role may be to facilitate or catalyse rather than lead *(61,116,161).* It will continue to lead in understanding the roles of other sectors in influencing risk factors for VBDs, promoting strategies and facilitating actions.

Rasanathan et al. *(116)* described four types of collaboration, in which the health sector has different roles:

(i) as a leader, to deliver health interventions, such as use of rapid diagnostic tests for VBDs in communities, regular indoor residual spraying and monitoring drug efficiency;

(ii) as a multilateral partner, to find joint or "co-benefits" and to minimize the population's vulnerability to VBDs, e.g. through joint education campaigns in schools to raise awareness about VBDs;

(iii) as a supporting actor, to assist in an intervention that is the core business of another sector, e.g. support assessment and modification of a housing policy to include vector-proof installations, such as screening; and

(iv) as a minimal actor in interventions by other sectors that have a spill-over effect for VBD prevention and control, e.g. provision of safe drinking-water.

The role of the health sector in an MSA for health also depends on the political system and institutional hierarchies. The health sector, with the coordination committee, should therefore define its role and responsibilities in the collaboration.

In areas with few resources, the health sector may have to cover several diseases in its policy, planning and care delivery to ensure efficient use of resource. For instance, HIV-positive people are more susceptible to malaria, and malaria pathogens may persist longer in their blood and increase the viral load *(162).* People with lymphatic filariasis are at significantly increased risk of acquiring HIV *(163).* Tick-borne diseases such as Lyme disease have been associated with autoimmunity, which should be considered in differential diagnosis (*164,165).*

As mentioned in section 1.4, the robustness of a health system directly determines its capacity to protect the population from VBDs. As the determinants concern all six building blocks of a health system (leadership and governance,

health workforce, health information, essential medical products and technologies, service delivery and financing), the planning and implementation of VBD programmes should ensure adequate capacity in each block to identify gaps that could be strengthened or filled by non-health partners.

6.2.2 Objectives of the health sector in a multisectoral approach to the prevention and control of vector-borne diseases

- Reduce mortality and morbidity due to VBDs.
- Strengthen and fill the gaps in the health system building blocks and amplify the impact of current initiatives and programmes.
- Meet other health objectives, such as control of waterborne diseases.
- Mainstream VBD prevention and control into other sectors.
- Obtain additional funding, or use alternative sources.
- Enhance the sustainability of VBD projects.
- Advance progress towards SDG 3.

6.2.3 Examples of partners in the health sector

- Ministry of health and municipal health officers
- VBD control programme
- Division of environmental health
- Department of (communicable) disease control
- Department of epidemiology
- Hospitals, clinics, and health care centres, including traditional healthcare providers
- Department of primary health care
- Health care training institutions
- Health suppliers, including pharmaceutical companies and pharmacies
- Maternal and child care
- Specialists in public health and social sciences
- Experts in related sciences, such as virologists, immunologists, entomologists and pathologists

6.2.4 Examples of partners for multisectoral activities

PARTNERS IN ACTIONS LED BY THE HEALTH SECTOR	ACTIONS LED BY THE HEALTH SECTOR
Legislation	• Develop or refresh VBD control strategy and plan. • Standardize definitions, diagnostic methods and drugn prescription protocol • Analyse policies in health and non-health sectors to determine strengths and weaknesses with regard to VBDs, and ensure that the policies of other sectors integrate consideration of VBDs • Assist stakeholders in aligning their policy objectives and developing a shared policy agenda
Demography and migration	• Map local health care facilities and their coverage and capacity in VBD prevention and control, particularly for populations in remote areas, migrants and indigenous population. • Identify human displacements or movement to conduct a rapid diagnostic campaign • Establish mobile clinics in response to disasters or for mobile populations, and allocate health workers
Environment	• Map VBD hotspots, including along migration routes
Education and research (with support from communities)	• Conduct public education and advocacy on VBDs, including personal and household prevention and control strategies, elimination of vector habitats and correct use of materials for self-protection • Assemble a VBD focus group • Strengthen the capacity of local health workers in VBD prevention and control • Distribute materials for self-protection from vectors and kits for self-diagnosis and treatment, and monitor their durability and use • Conduct mass drug administration for lymphatic filariasis, schistosomiasis and onchocerciasi. • Conduct periodic active surveillance of the prevalence and incidence of VBDs

	• Conduct baseline and post-intervention assessments of knowledge, attitudes and practices, including among populations living in remote areas, migrants and indigenous populations • Research and develop innovative diagnostics, surveillance strategies and technologies and new drugs and vaccines • Test water for the presence of vectors and larvae
Private sector (with support from communities)	• Ensure adequate procurement and stocks of medications, vaccines, material for VBD diagnosis, prevention, treatment and care, including for self-protection • Conduct mass drug administration for lymphatic filariasis, schistosomiasis and onchocerciasis • Distribute materials for self-protection from vectors and kits for self-diagnosis and treatment, and monitor their durability and use • Conduct periodic, active entomological surveillance in households, work places, construction sites, agricultural environment and natural environment, and make recommendation for measures to be taken • Strengthen partnerships for the development of new drugs and vaccines
Finance	• Ensure adequate resources for VBD diagnosis, prevention, treatment and care • Ensure adequate resources for multisectoral activities, including operational expenses
All concerned sectors	• Assess the impact on VBDs (all or specific VBDs) of the policies and programmes of other sectors, and develop strategies for adaptation and improvement • Conduct periodic, active entomological surveillance in households, work places, construction sites, the agricultural environment and natural environments, and make recommendations for measures to be taken • Establish joint funding schemes with all relevant sectors (including those working on other SDGs) with support from the finance sector, by mainstreaming and aligning VBD prevention and control with other programmes
Media (with the support from communities)	• Strengthen information-sharing between communities and the health sector and with other sectors and district

6.2.5 Case study

Box 6.2 Case study: Malaria control programme in Sabang, Indonesia *(166)*

The Municipality of Sabang had one of the highest rates of malaria in Aceh Province. Although the country has set a deadline of 2030 for elimination of malaria transmission on the archipelago, Sabang had aimed to achieve elimination in advance, by 2013. The Ministry of Health launched the elimination programme in 2008. The District Health Office was appointed to design the technical approach to elimination in the district, and the national malaria control programme, WHO and **the United Nations Children's Fund** were consulted. The four activities were:

- Vector assessment: mosquitoes collected morning and night by human landing indoors and outdoors by aspirator; larval collection and characterization of larval habitats

- Map and database on malaria: household baseline data, household survey and routine surveillance data reviewed and incorporated into a GIS system. Database designed in consultation with a focus group including the District Planning Board, Civil Registration Office, District Health Office, Health Division of the Armed Forces, data and information centre and sub-district leaders.

- Residual foci of malaria transmission stratified and mapped by the Municipal Health Authority.

- Mass blood screening: thick and thin blood smears and blood spots were collected by Government or private practitioners from more than 15 000 individuals in 14 villages and examined by microscopy or molecular analysis with assistance from the Eijkman Institute in Jakarta. Confirmed cases were treated by community health staff at home. All cases detected were investigated by community and municipal health staff, and information was sent to the database.

- Since the launch of the programme, routine diagnostic capacity has been steadily strengthened, with rapid reporting and accurate information. A system of village volunteers for active case detection was established. Improved reporting, coordination with private physicians, active case detection and mapping of cases and mosquito habitats all contributed to a nearly 30-fold decrease in malaria incidence between 2008 and 2011.

6.3 Environment sector

6.3.1 Why the environment sector is necessary in the prevention and control of vector-borne diseases

The bionomics and behaviour of vectors, including the duration of their life cycle, density, population composition and reproduction rate, are closely linked to environmental conditions such as ambient temperature, humidity, abundance of surface water, temperature and chemical composition of water and soil moisture. Therefore, active engagement of the environment sector in VBD programmes is indispensable. As discussed in section 1.4, the development and transmission of VBDs are also associated with the environment because of the dependence of pathogens and their hosts on environmental factors. Section 2.4 highlighted the impact of environmental changes, including climate change, on VBD transmission **(Fig. 2.3).** Further, for many VBDs, modification of the environment can complement treatment.

Recognition of an overall disconnection between health and environment sectors led 22 countries in Africa to conduct situation analyses and needs assessments for implementation of the Libreville Declaration in 2015. Only one country (Mozambique) reported multisectoral coordination mechanisms for health and environment, while in all the other countries the two sectors operated under separate legislative frameworks, with ad hoc collaborations and arrangements *(167).* VBDs serve as an entry point for closer collaboration between the two sectors.

The environment sector has strong links with other sectors in natural and artificial environments, which, together, could play an important role in VBD prevention and control. The interconnected sectors include water and sanitation, agriculture, energy and housing, addressed below.

6.3.2 Objectives and incentives of the environment sector

- Advance environmental management, e.g. water resources, solid wastes, sanitation and landscape.
- Encourage environmental awareness.
- Minimize the adverse effects of land use modification and other environmental development on human health.
- Ensure that application of chemicals in VBD programmes is done in accordance with environmental safety standards, and minimize the impact of VBD control activities on the environment.
- Make wiser investments in the environment, e.g. targeted funds for areas with a high VBD burden.
- Ensure that VBD environmental policies are better informed.

6.3.3 Examples of partners in the environment sector

- Ministry of environment and municipal officers
- Division of environmental health
- Climate change
- Land use planning and management
- Forestry and watershed
- Ecology
- Environmental protection agencies
- Waste management
- Chemical (pesticide) management
- Environmental engineering firms

6.3.4 Examples of partners for multisectoral activities

PARTNERS IN ACTIONS LED BY THE ENVIRONMENT SECTOR	ACTIONS LED BY THE ENVIRONMENT SECTOR
Health	• Update and provide data on the environment,ecology, climate and weather relevant to vector breeding for monitoring and prediction of VBDs • Include consideration of VBDs in planning and assessing the impact of any environmental or infrastructural project, such as water resource management and others that alter land use • Develop or revise relevant environmental guidelines, regulations and standards to include consideration of VBDs • Strengthen waste management in all settings, with special attention to discarded containers, tins, tyres and other items that could serve as breeding sites • Survey, maintain and restore the natural environment to minimize risk factors for VBDs, such as restoring or draining swampland and clearing weeds • Identify (and destroy) the habitats of reservoirs of VBD pathogens, such as rodents
Water and sanitation (with the support from communities)	• Strengthen waste management in all settings, with special attention to discarded containers, tins, tyres and other items that could serve as breeding sites
Media	• Install notices and signalling of risk in the natural environment where there is human activity
Legislation	• Install fencing in the natural environment where there is human activity, if necessary • Develop or revise relevant environmental guidelines, regulations and standards to include consideration of VBDs

Education and research	• Include consideration of VBDs in planning and environmental impact assessment of environmental and infrastructure projects such as water resource management and others that alter land use. • Identify (and destroy) the habitats of reservoirs of VBD pathogens, such as rodents.
Agriculture	• Strengthen management of chemical use in vector control so as not to cause harm to people and environment.
Finance	• Assess the current and future availability of funds for joint VBD-related actions, and develop or revise resource mobilization and allocation strategy for VBD prevention and control.

6.3.5 Case study

Box 6.3 Case study: Control of *Ae. aegypti* breeding sites in a recycling programme, Quintana Roo, Mexico *(168)*

As part of a multisectoral campaign for a "Yucatan without dengue", a programme was launched in Quintana Roo in Mexico to encourage recycling in supermarkets. The programme was initiated by the local government through the health services, in cooperation with the ministries of Social Development, Urban and Environmental Development and Education. Collection centres for recyclable materials were installed, and incentives were provided, such as exchange of recyclable materials for food, free bus tickets and exchange of grocery shopping receipts for garbage bags. Analysis before and after implementation of the programme showed a significant reduction in containers and the risk of exposure to *Ae. aegypti.*

Where to start

- Use epidemiological information on VBDs to target or strengthen environmental services in areas with a high VBD burden, identify and implement adequate environmental control measures (such as removal and treatment of vector breeding habitats), and monitor compliance.
- Contribute to the coordination of VBD prevention and control by working with other stakeholders in joint situation analyses, planning and monitoring.
- Make an impact assessment and vector control compulsory in environmental projects such as landscape restoration, natural resource development, watershed rehabilitation, urban development, landfill and sanitation projects.

6.4 Water and sanitation sector

6.4.1 Why the water and sanitation sector is necessary in the prevention and control of vector-borne diseases

WaSH is critical throughout VBD prevention and control, including treatment and care. The VBDs with close links to the WaSH sector are listed in **Table 6.1** *(169).* Provision of safe WaSH is one of the main ways of combatting neglected tropical diseases *(170).* For example, adequate sanitation and protection of fresh water have long been deemed the most efficient strategies for controlling snail-transmitted schistosomiasis, and the breeding sites and habitats of *Culex, Anopheles and Aedes* mosquitoes, which are responsible for the transmission of malaria, dengue fever, lymphatic filariasis, chikungunya, Zika virus disease, yellow fever and Japanese encephalitis, are directly associated with water resource management and sanitation, draining and water container management. Safe WaSH is a necessity for the treatment and care of all diseases, particularly those result in wounds. For example, adequate WaSH in health care facilities is essential for wound management in patients with leishmaniasis, care for lymphoedema and hydrocoele surgery. The availability of a safe water source also reduces reliance on fetching water from sites infested by tsetse flies, which are responsible for the transmission of human African trypanosomiasis. Global strategies, resolutions and guidelines on reducing the transmission of VBDs such as schistosomiasis, dengue, malaria and leishmaniasis stress the active engagement of the water and sanitation sector.

Table 6.1 Associations between WaSH and infection prevention, treatment and care of diseases

VECTOR	DISEASE	WATER		SANITATION		HYGIENE	
		Infection prevention	Treatment and care	Infection prevention	Treatment and care	Infection prevention	Treatment and care
Mosquitoes	Malaria	●		●			
	Dengue	●		●			
	Lymphatic filariasis	●	●	●			●
	Japanese encephalitis	●		●			
	Yellow fever	●		●			
	Chikungunya	●		●			
	West Nile fever	●		●			
	Zika virus disease	●		●			
	Rift Valley fever	●		●			
Sandflies	Leishmaniasis		●[a]	●			●[a]
Tsetse flies	Human African trypanosomiasis	●					●
Blackflies	Onchocerciasis	●	●		●		
Triatomine bugs	Chagas disease	●	●		●	●[b]	●
Ticks	Tick-borne encephalitis					●	
	Lyme disease					●	
Snails	Schistosomiasis	●		●		●	

Source: reference *169*

[a] For wound management in cutaneous leishmaniasis

[b] For hygiene food preparation

6.4.2 Objectives and incentives of the water and sanitation sector

- Accelerate achievement of adequate, equitable access to safe water and sanitation in areas highly endemic for VBDs.
- Improve the access of remote, disadvantaged populations to safe drinking-water and sanitation.
- Measure the health impact of water and sanitation projects.
- Provide co-benefits for the prevention and control of other water-borne and water-related diseases.
- Provide incentives for decision-makers with public health as leverage.
- Enhance behaviour-change campaigns for safe WaSH.
- Build capacity in water management.
- Raise new funding, e.g. disease-specific investments.
- Advance progress towards achieving SDG 6, “clean water and sanitation”

> “For most NTDs, sustained elimination is possible only with full access to safe water, waste disposal and treatment, basic sanitation and improved living conditions. *(170)*

6.4.3 Examples of partners in the water and sanitation sector

- Ministry of water and sanitation and corresponding municipal officers
- Water companies and suppliers
- Sanitation service providers
- Water and wastewater treatment industry
- Irrigation authority
- River development authority

6.4.4 Examples of partners for multisectoral activities

PARTNERS IN ACTIONS LED BY THE WATER AND SANITATION SECTOR	ACTIONS LED BY THE WATER AND SANITATION SECTOR
Health	• Regularly monitor water quality and quantity and the functionality of the water supply facilities to ensure sufficient safe water for consumption and personal hygiene. • Survey, maintain and build water and sanitation infrastructure to minimize risk factors for VBDs, such as repairing or replacing dysfunctional water supply facilities, constructing drains and making latrines vector-proof. • Use epidemiological information to target or strengthen WaSH services to areas with a high disease burden. • Include consideration of VBDs in WaSH behaviour change campaigns. • Apply larvicide to water bodies after consultation with the health and environment sectors. • Strengthen WaSH services in health care facilities.

Education and research	• Include consideration of VBDs in WaSH behaviour change campaigns.
Legislation	• Use legislation to enforce measures to provide vector-free WaSH infrastructure. • Develop or revise guidelines, regulations and standards on water and sanitation with the inclusion of consideration of VBDs.
Environment	• Regularly survey standing water bodies that are potential vector breeding sites, including water storage buckets, bathtubs, down pipes, rainwater collection tanks, gutters, swimming pools, fountains, ditches, holes in construction sites), and clean, drain and other responsive actions. • Apply larvicide to water bodies after consultation with the health and environment sectors. • Remove vegetation from the edges of water bodies.
Private sector	• Conduct campaigns to promote local production, retail and use of water storage containers with tightly fitting lids, screen covers for water containers and ovitraps.
Finance	• Assess the current and future availability of funds for joint VBD-related actions, and develop or revise the resource mobilization and allocation strategy for VBD prevention and control.

6.4.5 Case study

Box 6.4 Case study: Integration of health and water and sanitation sectors to eliminate lymphatic filariasis and soil-transmitted helminthiasis in Guyana *(142)*

Georgetown, the capital of Guyana, had high burdens of lymphatic filariasis and soil-transmitted helminthiasis because of its vulnerability to flooding and inadequate waste disposal and sewage systems. In the Georgetown Sanitation Improvement Project, funded by the Inter-American Development Bank, the water and sanitation sector collaborated with the health sector to eliminate lymphatic filariasis as a public health problem in one of the 10 administrative regions and to control soil-transmitted helminthiasis in an integrated approach combining sanitation improvement and mass drug administration, in addition to a campaign to build public awareness about lymphatic filariasis and the project.

The sanitation intervention consisted of improving the city's sewage system by institutional strengthening of Guyana Water Inc., the public utility responsible for construction, operation and maintenance of the water supply and sewage systems. The project was coordinated by Guyana Water Inc. and the Ministry of Health and was implemented by partners in various disciplines, including engineers, sanitation specialists, community drug distributers, nurses and health officials. Guyana Water Inc. oversaw monitoring and evaluation of the health component with indicators of mass drug administration coverage, changes in public knowledge and attitudes and the prevalence and intensity of lymphatic filariasis and soil-transmitted helminthiasis. All relevant stakeholders were not initially involved. Their engagement in the second round of mass drug administration resulted in significant improvement in efficiency, greater coverage and eventually a decreased prevalence of lymphatic filariasis.

Where to start

- Use epidemiological information on VBDs to strengthen WASH services in areas with a high VBD burden.

- Contribute to coordination of VBD prevention and control, including a joint situation analysis and joint planning and monitoring.

- In areas with a high VBD burden, identify the highest risks for VDBs, introduce adequate WaSH, and monitor compliance. The activities may include improving drainage systems, encouraging safer water storage (e.g. behaviour change intervention or provision of safe containers), and improve WASH in health care facilities.

6.5 Agriculture and aquaculture sectors

6.5.1 Roles of the agriculture and aquaculture sectors in the prevention and control of vector-borne diseases

Agriculture and aquaculture influence land cultivation, vegetation type and cover and irrigation and can alter surface flooding and soil saturation, which are linked to the breeding of some mosquitoes, flies and snails *(171–173),* thus affecting VBD transmission patterns. Extensive irrigation in the cultivation of rice, wheat and sugarcane provides favourable breeding places for mosquitoes if there is no efficient drainage, and the distribution and prevalence of schistosomiasis has been linked to poorly planned water resource management during agricultural expansion. Some plantations, including oil palm and coffee, are associated with VBDs such as malaria, as they create suitable relative humidity for vector survival and exposure of plantation workers.

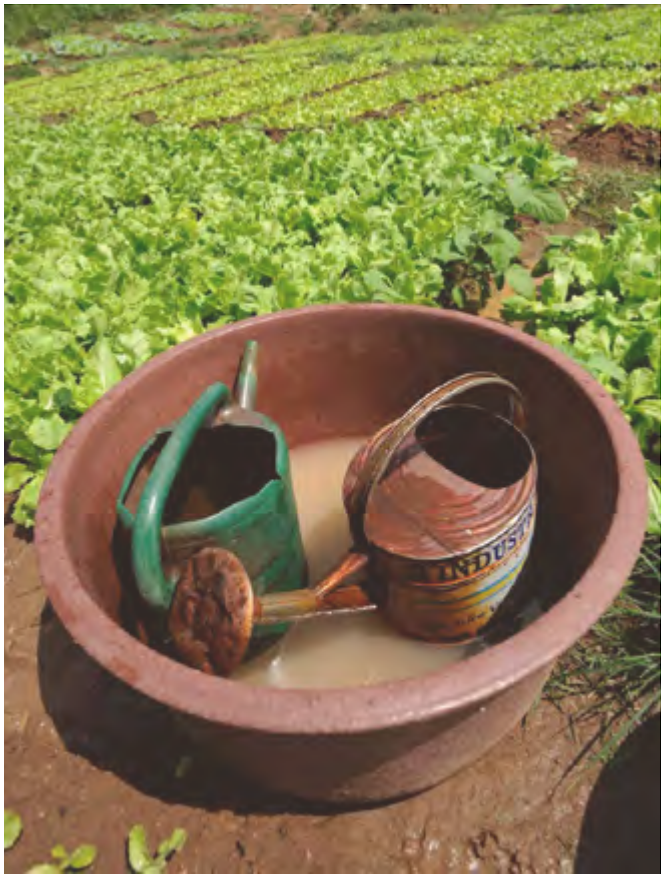
Properly managed aquaculture decreases the incidence of some mosquito- and snail-transmitted diseases by reducing their habitats. Deforestation for new farms and other purposes and upland farming alter local ecosystems and also change vector ecology. Both vector breeding and susceptibility to insecticides are influenced by agricultural use of pesticides, herbicides and fertilizers *(174).* When farmers are less vulnerable to VBDs and other diseases and are in general good health, agricultural and aqua-cultural productivity is increased. Agricultural development increases food production and enhances health, drives economic growth and improves living standards and well-being. Engagement with the agriculture and aquaculture sectors in VBD prevention and control programmes is therefore strongly recommended.

6.5.2 Objectives and incentives of the agriculture and aquaculture sectors

- Improve working condition and reduce risks of VBDs.
- Improve farming practices with innovative skills and tools.
- Increase agricultural and aqua-cultural yields.
- Decrease reliance on agrochemicals.
- Monitor the nutrient balance on agricultural land.
- Increase the sustainability of farming.
- Increase the health awareness of farmers.
- Raise new funds for agricultural commodities, materials and infrastructure.
- Strengthen animal husbandry.

6.5.3 Examples of partners in the agriculture and aquaculture sectors

- Ministry of agriculture and corresponding municipal officers
- Ministry of aquaculture and fisheries
- Livestock management
- Pest control
- Farmers and organizations such as farmers' unions and associations, landowners
- Irrigation and hydrology
- Plant protection
- Agricultural suppliers and services: manufacturers and distributers of fertilizers, pesticides and herbicides
- Other private sector partners in agro-industries such as traders and processors



6.5.4 Examples of partners for multisectoral activities

PARTNERS IN ACTIONS LED BY THE AGRICULTURE AND AQUACULTURE SECTORS	ACTIONS LED BY THE AGRICULTURE AND AQUACULTURE SECTORS
Education and research	• Conduct a workshop for farmers to raise their awareness of the links between VBDs and agricultural practices • Organize vector management activities for farmers in their agricultural and peri-domestic environments. • Design crop rotation methods with consideration of vector management • Identify effective, locally suitable vector control measures that can be integrated into routine agricultural practice • Review pesticide use, including larvicides and molluscides in irrigation channels • Assess the impact of agricultural projects (agricultural and aqua-cultural expansion and intensification, new crop planting and livestock husbandry, construction of irrigation systems) on VBD transmission, including consideration of creation of vector habitats, potential biodiversity alterations and changes in reservoir hosts.
Health	• Identify effective, locally suitable vector control measures that can be integrated into routine agricultural practice. • Review pesticide use, including use of larvicides and molluscides in irrigation channels. • Assess the vulnerability of seasonal agricultural workers to VBDs. • Survey, maintain and build vector-proof agricultural infrastructure, such as building bridges over canals or placing large stones in the water to avoid exposure of

	people and domestic animals, and disrupt vector habitats in rice fields (by flushing, intermittent irrigation, crop drying, dry belting and filling)
Legislation	• Improve integrated pest management policy • Develop or revise guidelines, standards and policies to regulate activities in agricultural projects with consideration of VBDs.
Water and sanitation	• Identify and reclaim abandoned fish ponds and any other unused water storage infrastructure.
Finance	• Assess the current and future availability of funds for joint VBD-related actions, and develop or revise the resource mobilization and allocation strategy for VBD prevention and control.

6.5.5 Case study

Box 6.5 Case study: Role of agriculture in schistosomiasis control in China *(175,176)*

China has been successful in controlling schistosomiasis. Although it was one of the most serious infectious diseases in 1949, towards the end of 2015, all previously endemic provinces had reduced transmission in both humans and livestock to a prevalence of < 1%. The agriculture sector has been involved in control programmes since the 1950s, backed by strong political will and high-level support. From the 1950s to the early 1980s, the strategy consisted of snail control by communities and the health sector. Subsequently, agricultural engineering and water conservancy approaches were used, such as reclaiming wetlands, digging new ditches and filling old ones and changing rice paddies into dry crops. The control strategy was changed to morbidity control with chemotherapy between the 1980s and mid-1990s, in line with WHO policy.

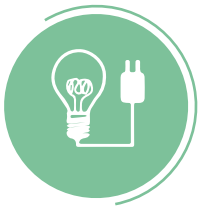
In the next stage, the agriculture sector worked to control livestock reinfection more sustainably. The interventions included changing from wet to dry crops or wet-dry switching, reforming infested low-yield crops, developing aquaculture in lowlands, confining livestock with planned grazing and water and sanitation development, including construction of digesters. The Department of Agriculture established a schistosomiasis task force to implement the integrated strategy in collaboration with stakeholders such as the Agricultural Reclamation Bureau and the Fisheries Division and with planning, finance, environment and energy sectors.

Where to start

- Review and strengthen maintenance and management of irrigation channels.
- Design a “smart” irrigation strategy, such as intermittent irrigation.
- Synchronize infection control in farmers’ households and livestock.
- Identify and destroy vector habitats and rodent reservoirs physically or chemically.

6.6 Energy sector

6.6.1 Why the energy sector is necessary in the prevention and control of vector-borne diseases



Energy production and consumption are frequently associated with alteration of natural resources and ecosystems, which in turn may affect transmission of VBDs. Energy exploration and exploitation involve deforestation and pollution of water sources in some regions. In other regions, construction of hydroelectric dams has increased the prevalence of VBDs such as schistosomiasis, and an epidemic of Rift Valley fever occurred after construction of a dam on the Niger River in Senegal. Consideration of VBDs should therefore be included in planning developments such as oil and gas infrastructure, which may create new habitat niches for disease vectors. The energy sector also plays an important role in the development of human settlements, human migration and other economic and demographic factors. Migration for labour exposes non-immune populations to VBDs, and the work environment at energy development sites, such as coal-mining and hydroelectricity, often favours the creation of suitable breeding habitats for vectors, thus increasing the exposure of workers to VBDs. Inadequate housing, water and sanitation facilities and insufficient access to health care often exacerbate the situation, which results in loss in working days and productivity.

As much of the energy sector is in the private sector, this latter could play a key role in the delivery of health services and universal access to health care to fight VBDs and other diseases that disproportionally affect populations with low socioeconomic status. In many resource-constrained areas, however, lack of reliable electricity poses harsh challenges to the provision of basic health care, such as lighting for medical check-ups and procedures and functioning of medical devices, such as refrigeration for samples and vaccines. Improved housing increases the access of communities to electricity and avoids deforestation, as firewood is no longer required for cooking. Electricity also gives better access to public health education and communication.

6.6.2 Objectives and incentives of the energy sector

- Amplify the positive impact of energy provision.
- Improve access of remote areas and communities to basic energy.
- Better identify where services should be introduced.
- Improve the health of energy sector workers, reduce absenteeism, and guarantee performance.
- Minimize the negative environmental and health impacts of energy projects.
- Collaborate in VBD prevention and control and realize social responsibility.
- Improve planning and management of energy projects.
- Improve workers' living and working conditions at project sites, including water, sanitation and housing.
- Advance progress towards SDG 7, "affordable, clean energy"; SDG8, "decent work in economic growth"; and SDG 12, "responsible consumption and production".

6.6.3 Examples of partners in the energy sector

- Ministry of energy and corresponding municipal officers
- Ministry of natural resources
- Energy producers (e.g. electricity, gas, fuel)
- Energy suppliers
- Transmission system operators
- Distribution system operators
- Other energy regulatory and mediating bodies

6.6.4 Examples of partners for multisectoral activities

PARTNERS IN ACTIONS LED BY THE ENERGY SECTOR	ACTIONS LED BY THE ENERGY SECTOR
Health	• Use epidemiological information to target or strengthen energy coverage to areas with a high disease burden. • Strengthen energy coverage in health care facilities in areas endemic for VBDs. • Include VBD health programmes for workers in energy development projects, and set up mobile clinics. • Survey project sites for VBD risks (including workers' dormitories), and apply larvicide or insecticide if necessary.
Education and research	• Train workers in VBD-related issues. • Assess the impact of energy development projects on VBD transmission, creation of vector habitats, potential alteration of biodiversity and change of reservoir hosts.
Water and sanitation	• Survey project sites for VBD risks (including workers' dormitories), and regularly drain and fill in ditches, monitor water flow rate in spillways and dams, and provide safe water and sanitation to workers.
Demography and migration	• Monitor the mobility of workers, and share the information with relevant sectors.
Legislation	• Develop or revise guidelines, standards and policies to regulate activities in energy development projects by including consideration of VBDs.
Finance	• Assess the current and future availability of funds for joint VBD-related actions, and develop or revise the resource mobilization and allocation strategy for VBD prevention and control.

6.6.5 Case study

Box 6.6 Case study: Partnerships between the Government and energy companies for malaria control, Equatorial Guinea *(177–179)*

China has been successful in controlling schistosomiasis. Although it was one of the most serious infectious diseases in 1949, towards the end of 2015, all previously endemic provinces had reduced transmission in both humans and livestock to a prevalence of < 1%. The agriculture sector has been involved in control programmes since the 1950s, backed by strong political will and high-level support. From the 1950s to the early 1980s, the strategy consisted of snail control by communities and the health sector. Subsequently, agricultural engineering and water conservancy approaches were used, such as reclaiming wetlands, digging new ditches and filling old ones and changing rice paddies into dry crops. The control strategy was changed to morbidity control with chemotherapy between the 1980s and mid-1990s, in line with WHO policy.

In the next stage, the agriculture sector worked to control livestock reinfection more sustainably. The interventions included changing from wet to dry crops or wet-dry switching, reforming infested low-yield crops, developing aquaculture in lowlands, confining livestock with planned grazing and water and sanitation development, including construction of digesters. The Department of Agriculture established a schistosomiasis task force to implement the integrated strategy in collaboration with stakeholders such as the Agricultural Reclamation Bureau and the Fisheries Division and with planning, finance, environment and energy sectors.

Where to start

- Private energy companies could collaborate with health and environment professionals and entomologists to add vector control to project planning and site inspection and monitoring.

- The energy sector could strengthen monitoring of the health of energy sector workers and facilitate access to basic health care, with VBDs as a priority, including for the families of workers and surrounding communities.

- The energy sector could strengthen the energy coverage in areas with high disease (VBDs) burden, and ensure a stable, sufficient electricity supply for health care centres in these areas.

6.7 Housing sector

6.7.1 Why the housing sector is necessary in the prevention and control of vector-borne diseases

Communities living in poor-quality housing with unplanned peri-domestic development have a heavy burden of VBDs. Such settings are important risk factors for the transmission of malaria, dengue, yellow fever, chikungunya, Zika virus disease, Chagas disease and leishmaniasis. Rapid urbanization and displacement of populations increase the pressure on habitat development and housing in many low- and middle-income countries. As the capacity of many of these countries to respond to the demand is weak, urban and peri-urban settlements are poorly planned and designed and sometimes illegal, with occupants who have no recognized resident status. Such unplanned housing does not comply with planning or building regulations, and these informal settlements pose significant health risks to the inhabitants. Poor water, sanitation, cooking and heating facilities and food storage expose them to a wide range of pathogens, indoor pollution and other negative health outcomes. Improving housing is therefore an opportunity to address numerous diseases simultaneously.

Certain specific housing characteristics are linked to specific VBDs. For example, cracks in the ground and in mud walls may be breeding sites for sandflies, resting sites for *Anopheles* mosquitoes and hiding places for triatomine bugs, which transmit Chagas disease in Latin America, where they are associated with dwellings made from mud and wattle or mud bricks. Fleas also breed in animal and pet shelters close to places where humans rest and sleep. Plastering walls and cracks with lime or mud has been shown to reduce the density of visceral leishmaniasis vectors in houses *(180).* Mosquito-proofed housing and environment management were claimed to be responsible for the major reduction in the prevalence of malaria in Europe in the early twentieth century and for a large part of the success in eliminating malaria in high-income countries *(181).* Another example of housing-related actions against VBDs is indoor residual spraying, which became one of the main tools of the Global Malaria Eradication Programme *(182).*

6.7.2 Objectives and incentives of the housing sector

- Improve housing conditions and the well-being of populations by making houses vector-proof and comfortable.
- Increase the safety of living places.
- Build better houses to attract more business.
- Explore innovative, sustainable building design, with new materials and reduced cost, and stimulate investment in innovations.
- Create jobs.
- Advance progress in achieving SDG 9, “industry, innovation and infrastructure”, and SDG 11, “sustainable cities and communities”.

6.7.3 Examples of partners in the housing sector

- Ministry of housing and corresponding municipal officers
- Architects and designers
- Urban and rural planners
- Real estate developers
- Infrastructure, construction and maintenance providers and contractors
- Building engineering companies
- Property management entities
- Housing equipment, suppliers and vendors
- Housing development bank

6.7.4 Examples of partners for multisectoral activities

PARTNERS IN ACTIONS LED BY THE HOUSING SECTOR	ACTIONS LED BY THE HOUSING SECTOR
Health	• Survey and maintain housing, such as raising buildings off the ground, screening and coating, repairing cracks in walls, fitting ceilings, installing air conditioning or fans where necessary, installing mosquito, flea or rat traps as necessary, replacing mud floors with cement, exchanging palm thatch for tiled or corrugated metal roofs and reducing or destroying domestic and peri-domestic larval niches.
Legislation	• Integrate vector control into housing compliance, building codes and other guidelines, standards and policies.
Private sector	• With the health sector, convene workshops on making housing vector-proof for real estate development partners, especially for housing close to forests and bush. • Establish surveillance of potential vector breeding sites at housing development construction sites. • Evaluate cost-effective materials for vector-proof building and furnishing.
Education and research	• Evaluate cost-effective materials for vector-proof building and furnishing.
Finance	• Assess the current and future availability of funds for joint VBD-related actions, and develop or revise the resource mobilization and allocation strategy for VBD prevention and control.

6.7.5 Case study

Box 6.7 Case study: Housing improvement programme for control of Chagas disease in Rio Grande do Sul, Brazil *(183)*

A programme to improve housing for the control of Chagas disease was initiated in Rio Grande do Sul State in 2001 by increasing the resilience of communities to the disease by improving their domestic and peri-domestic environments. The main interventions were painting and renovation; some houses were given more than one coat of paint. Timber battens were used to close gaps; boards that were in poor condition were changed; foundations were reinforced, and cracks were filled. Houses that were severely damaged were replaced by new brick buildings with tile flooring and asbestos-cement roof tiles. In hen houses and storerooms, board planks were changed, and screens were repaired and placed around empty spaces under the sheds. After these renovations, none of the residents reported triatomine bugs in their houses.

Where to start

- Collaborate with the health sector in intervening for prioritized VBDs by targeting vectors *(181):*

VECTORS TARGETED	INTERVENTIONS
Aedes, Anopheles and *Culex* mosquitoes, sandflies and some triatomine bugs	Screening of windows, doors and eaves
Aedes and some *Anopheles* mosquitoes	Reduction of aquatic habitats and breeding sources around houses (e.g. improved water supply and water storage, removal of open gutters)
Aedes and some *Anopheles* mosquitoes	Fitting ceilings
Triatomine bugs, *Anopheles* mosquitoes and sandflies	Filling cracks and crevices in walls, floors and roofs

- Review housing standards, and include vector-proofing installations into the standards.
- Develop legislation and policies for house building and rental to ensure safe housing.
- Collaborate with the government to provide safe housing for all, which can eliminate some VBDs.

6.8 Education and research sectors

6.8.1 Why the education and research sectors are necessary for prevention and control of vector-borne diseases

The education sector can increase awareness, strengthen knowledge, influence risk perceptions and attitudes to promote behaviour change, inform decision-making and reinforce policies and governance in relation to VBD prevention and control. Different education programmes target different audiences, including the general public, stakeholders in different sectors and decision-makers. As community participation is one of the three pillars of an MSA to VBD prevention and control, raising awareness and increasing knowledge through education are crucial. The more knowledgeable a community is about the transmission, determinants, prevention, control and impact of VBDs, the more likely it is to perceive the relevance of activities and to participate actively and meaningfully. Schools can be involved in VBD control projects. In a TDR research programme in Cambodia, schools and neighbouring communities adopted socio-ecological systems and resilience strategies in dengue vector control *(184).* Dengue education in schools and community participation in vector surveillance and control were led by schoolteachers. They increased community awareness by transmitting messages to students, who transmitted them to their parents and the rest of the community. In an MSA, education of communities and adequate training in diverse disciplines are essential. A tailored sensitization programme is often required to provide stakeholders and decision-makers with essential knowledge and to empower them to design, plan and implement informed VBD control programmes.

As noted in sections 1.5 and 2.3, there is little information on many VBD ecosystems, and research should be conducted on the links between VBD transmission and their determinants, on the contribution and role of an MSA in VBD prevention and control, costs and return and contextual studies to inform planning and programme design **(Table 6.2)**.

Table 6.2. Research disciplines that should be integrated for studying VBDs

DISCIPLINE	TOPICS
Entomology	• Biology (phenotypic and genotypic characterization) of vectors, susceptibility to pathogens, insecticide resistance, vector mapping and links between vectors and landscape, hydrography, vegetation, seasonality
Biomedical sciences	• Phylogeny of pathogens, diagnostics, drugs, vaccines
Epidemiology	• Transmission dynamics, disease burden, pathogen population structure, impact of human mobility
Implementation and operation	• Strengths and weaknesses of the health system; effectiveness of interventions and means to optimize them; optimal combinations of interventions; technological innovations; digital and mobile tools; innovative financing models; cost–effectiveness studies; scaling-up of successful local interventions; better links with programmes and policy-makers.
Science of integration	• Role and contribution of the MSA to each sector; cost and return; local stakeholders and partnership models, case studies, coherent integration of VBDs
Impact assessment	• Impacts of activities, policies, programmes, current and new VBD projects and the MSA
Social sciences	• Comprehensiveness and effectiveness of current policies; policy options; human behaviour; gender studies; impact of political and social institutions on VBD transmission
Climate change	• Meteorological changes, extreme events and their impact on VBD transmission

Education programmes must be adapted to their audiences, who should include health care workers, donors, researchers, policy-makers in health and non-health sectors, staff of civil society organizations, the general public, teachers, community leaders and volunteers, the private sector and students, according to their background, interests, roles and expected outcomes. Capacity-building should be provided to ensure that each group has the required competence.

Table 6.3 presents examples of the priorities of programmes for different stakeholders. For example, active syndromic surveillance can be used to detect outbreaks earlier than traditional surveillance, especially in areas with frequent displacement of populations. Therefore, training in recognition of the clinical signs and symptoms of VBDs is a priority for community health care workers and potentially the general public, including differential diagnoses of types of VBD.

Table 6.3 Examples of education programmes and targeted audiences

EDUCATION PROGRAMME	AUDIENCE
• Use of ITNs, LLINs, larvicides and other household and self-protection tools	**Communities**
• VBD transmission, role of vectors and personal hygiene, disease determinants, including local context and relevance, essential prevention and control methods, e.g. breeding site elimination, self-protection	**Community health workers**
• Links between VBD transmission and the activities of each non-health sector	**All relevant non-health stakeholders**
• Training in vector biology and ecology, host–pathogen interactions, drug resistance, clinical management of severe cases	**Health professionals**
• Inclusion of VBDs in policies	**Relevant stakeholders in legislation sector**
• The MSA for VBD prevention and control, including key competence, such as for effective engagement of a diverse group of stakeholders, communication of the shared benefits and mediation and management of relationships	**Government decision-makers**

Communication for behaviour change is a specific type of education. The insufficiency and inefficiency of some campaigns to motivate residents to change their behaviour have been attributed to lack of active community involvement and difficulty in determining whether printed materials were read *(185).* The accessibility and availability of material does not guarantee its use. Education campaigns for behaviour change must identify the interests and incentives of the targeted population. Practical guidance that is easy to follow and solutions to improve the accessibility and affordability of tools will help populations to translate knowledge into positive attitudes towards behaviour change.

6.8.2 Objectives and incentives of the education and research sectors

Education

- Improve the literacy of parents and other community members.
- Improve understanding of VBDs.
- Build the capacity of teachers.
- Support and promote effective behaviour change.
- Provide a platform for organization of educational campaigns.
- Build new educational skills and tools.
- Improve the health of students and ensure high-quality development in learning environments.
- Reduce absenteeism, improve students' school performance and increase school completion rates.
- Improve contact with students who are not attending school.
- Raise new funding for school commodities, materials and infrastructure.
- Enhance equity.
- Advance progress in achieving SDG 4, "quality education".

Research

- Better understand VBD systems.
- Find adapted, adequate solutions and tools.
- Enhance research capacity, especially in VBD-affected areas.
- Increase the relevance and context of research agendas, align research with demand to inform decision-making.
- Find alternative funding sources.
- Facilitate data-sharing.
- Enhance research collaboration.

6.8.3 Examples of partners in the education and research sectors

- Ministry of education and corresponding municipal officers
- Ministry of research, science, innovation, technology
- Schools, training centres and universities
- Research centres, institutes and laboratories
- Professionals in VBD-related disciplines, e.g. epidemiology, entomology, parasitology, vaccinology, diagnostics, zoology, drug and insecticide development, environmental health and social sciences
- Professional networks and associations related to VBDs
- Innovation centres
- Education funding council

6.8.4 Examples of partners for multisectoral activities

PARTNERS IN ACTIONS LED BY THE EDUCATION AND RESEARCH SECTORS	ACTIONS LED BY THE EDUCATION AND RESEARCH SECTORS
Media (with support from communities)	• Disseminate VBD-related information through various channels, in health care facilities, schools, kiosks, community notice boards, bus and train stations, radio and TV programmes, door-to-door, and mobile broadcasting units, addressing special language and literacy needs. • Train community influencers and leaders (youth and women's groups, teachers, religious leaders, tribe leaders, teachers, community leaders, volunteers) to disseminate education messages.
Health (with support from communities)	• With the health sector, design locally relevant, culturally understandable and acceptable education materials for different audiences. • Develop online training modules suitable for local needs and context • Conduct workshops in schools, with the participation of parents and other community members. • Establish school VBD programmes, regularly monitor VBD incidence in schoolchildren, and establish referral systems with local health facilities. • Include basic content on VBDs in primary and secondary school curricula. • Evaluate the current curricula of health professionals and students, and improve them with regard to VBDs to strengthen the capacity of the future health workforce. • Set or revise the VBD research agenda with research institutions. • Establish mechanisms for research uptake and translation. • Develop VBD-related research activities and networks.

Environment	• Mobilize students in school environmental management and vector control campaigns.
Legislation	• Establish a mechanism for research uptake and translation.
Finance	• Assess the current and future availability of funds for joint VBD-related actions, and develop or revise the strategy for resource mobilization and allocation for VBD prevention and control.

6.8.5 Case study

Box 6.8 Case study: improving access to early treatment of malaria by engaging primary schoolteachers, Nzema East, Ghana *(186)*

Because of insufficient access to health services in most rural and remote parts of Ghana and to address inequality in access to health services, a collaboration was established between the health and education sectors to improve the health of schoolchildren in rural communities. An intervention study was conducted to determine the feasibility of using trained primary schoolteachers in early detection and management of acute episodes of presumptive malaria.

Primary schoolteachers were trained in diagnosing and treating uncomplicated malaria and in recognizing and referring cases of severe disease for appropriate treatment. The teachers were instructed in diagnosing malaria with an adaptation of the WHO diagnostic algorithm designed for training community health workers. The training included taking a clinical history and performing a simple clinical examination in order to arrive at a diagnosis. The concepts of signs and symptoms of disease were explained. They were also trained in malaria chemotherapy with treatment protocols (age group and dosage) designed for the programme. Each school was provided with a first aid box and copies of the diagnostic algorithm and guidelines for treating malaria.

Almost all (93%) cases of fever diagnosed as presumptive malaria by trained teachers met the case definition. The study therefore demonstrated the feasibility of such a programme and suggests that collaboration with the education sector can ensure early diagnosis and treatment of malaria.

Box 6.9 Case study: TDR-IDRC research initiative on VBDs and climate change *(184,187,188)*

The aim of a research initiative on VBDs and climate change was to generate evidence for development of innovative strategies to reduce the vulnerability of humans and animals to VBDs and to increase resilience to the related threats to health in a changing climate. The initiative extended knowledge and research capacity, strengthened transdisciplinary and multisectoral collaboration and developed decision support and policy advice. Alignment with the Libreville Declaration and the Strategic Plan of Action (see section 2.2) was pursued. Research projects shed light in areas such as the impact of climate change on VBDs, early warning systems and the vulnerability and resilience of Maasai communities. A meeting on research uptake included policy-makers from the ministries of Health and the Environment. Policy briefs with actionable strategies and recommendations were issued.

Where to start

- Organize sustainable VBD programmes in schools for schoolchildren of different ages.
- Organize training workshops, and prepare materials for different audiences.
- Improve vector-proofing of school campuses.
- Set a research agenda adapted to local conditions and needs.

6.9 Finance sector

6.9.1 Why the finance sector is necessary for prevention and control of vector-borne diseases

VBDs have a negative impact on macroeconomic performance and on long-term economic growth. The economy thus improves when the prevalence of VBDs is decreased. As the prevention and control of VBDs is complex and requires multisectoral collaboration, with mobilization of various actors and a wide range of activities, the financial resources required may be significant, and the contribution of a single sector might be insufficient. In the most affected countries, therefore, funding for multisectoral VBD prevention and control should be included in the regular national budget, which is usually managed by the finance ministry. This sector will also be in charge of finding capital, mobilizing resources, allocating resources and quantifying and optimizing the value of investment.

When the transmission of VBDs has been significantly decreased, as in some countries, funding may be withdrawn, resulting in a resurgence of disease and exposure of vulnerable populations. To avoid disruption in VBD control, financial support must be adjusted regularly to ensure sustainable provision of services and interventions and a resilient health system.

In countries with a high burden of VBDs and a poor, fragile economy, the aim of resource mobilization will be predictable, sustained domestic and external funding. Non-traditional, innovative financial solutions are required for a comprehensive VBD programme for the most vulnerable populations, who often have low economic status. Price and tax measures have been found to be effective for promoting behaviour changes in previous programmes for VBDs and other public health and development programmes.

6.9.2 Objectives and incentives of the finance sector

- Explore innovative multisectoral financing schemes.
- Increase the efficiency and equity of revenue use.
- Generate additional revenue for the government, e.g. by increasing tax collection and improving the efficiency and equity of revenue collection.
- Minimize the negative impact of VBDs on the country's economy.

6.9.3 Examples of partners in the finance sector

- Ministry of finance and corresponding municipal officers
- District development fund
- International, regional, national and local funding agencies
- Multilateral and bilateral development agencies
- Banks
- Private donors

6.9.4 Examples of partners for multisectoral activities

PARTNERS IN ACTIONS LED BY THE FINANCE SECTOR	ACTIONS LED BY THE FINANCE SECTOR
Energy	• Create incentives for State-owned companies such as natural resources companies (oil, gas) to invest more money in VBD prevention and control
Education and research	• Study and test innovative funding models, such as development impact bonds, elimination bonds, pay-for-performance instruments and blended finance • Study targeted funding mechanisms for "VBD-smart" development in relevant sectors • Evaluate value for money, and attribute outcomes to policy interventions
Private sector (with support from communities)	• Generate funds through community-led projects such as income-generating activities *(45,131)* • Explore funding opportunities from public–private partnerships • Build business cases to sustain donor mobilization, maintain existing donors, and improve harmonization of donor activities • Create incentives for the private sector to invest in and generate more resources for VBD prevention and control • Increase means for voluntary contributions from individuals or corporations.
Health	• Develop targeted funding mechanisms for the most vulnerable and remote populations • Collect robust data and analyse them to determine the impact of financial policies on VBD control • Monitor and evaluate the efficiency and equity of use of funds for VBD prevention and control
All relevant sectors	• Explore financing across sectors

More suggestions on how countries can modify their financing system to achieve universal health coverage are provided by WHO in Health system financing: the path to universal coverage *(189)*.

6.9.5 Case study

Box 6.10 Case study: M2030 – Asia–Pacific Leaders Malaria Alliance *(190)*

To mobilize business leaders and funding to eliminate malaria in Asia by 2030, the Asia–Pacific Leaders Malaria Alliance launched M2030 – Defeating Malaria Together, for business leaders to use their brand visibility, influence and finance to sustain political interest, provide services and campaigns and call for urgent action. "Corporate partners can use the brand for campaigns or for branding select projects and services. In return, they pledge funds to fight malaria in the countries where the money was raised." The initiative brings together health organizations, the private sector and consumers to eliminate malaria by 2030. Its current partners include Tahir Foundation, DT Families Foundation, Dentsu Aegis Network, Shopee, Yoma, Outdoor Channel Asia, Pun Hlaing Siloam Hospital and Wave Money. The implementing partners are the Global Fund and Population Services International.

Where to start

- Conduct situation and financial assessments, and prepare a resource mobilization strategy.
- Explore several innovative financing models to increase revenue and the efficiency and equity of revenue allocation and use.
- Develop a strategy to engage corporations and individuals in the private sector.
- Make business cases to demonstrate wise, effective, efficient use of funding for the control of VBDs.
- Promote recognition of VBDs as a national development issue, and include funding for multisectoral action for VBD prevention and control in the regular national budget.

6.10 Legislation sector

6.10.1 Why the legislative sector is necessary for prevention and control of vector-borne diseases

Legislative bodies play an enabling and facilitating role in an MSA for VBD prevention and control. Well-functioning regulatory bodies and coherent regulations and laws can facilitate enforcement of interventions and improve service delivery and efficiency. The commitments of governments and providers can be reflected and formalized in legislation, which can provide an incentive for or enforce compliance. Addressing the diverse determinants of VBDs may require reconciliation of health regulations with legislation in other sectors **(Table 6.4).** Engagement of non-health sectors is often challenged by diverging interests, priorities and operational mechanisms, and legislation can facilitate mainstreaming and embedding of VBD prevention and control in non-health sectors by institutionalizing actions, establishing or strengthening regulatory and legislative control and improving the accountability of leaders in policies for health impacts. As more sectors are engaged, it becomes more important to ensure coherence among the policies of different ministries *(16).* A well-established legislative framework safeguards the sustainability of implementation and guarantees that actions will be continued even if authorities change. Recognition of new actions as social norms is facilitated by direct participation of communities, although legislation alone is not enough: messages must be internalized and stakeholders motivated to act in coordination.

6.10.2 Objectives and incentives of the legislative sector

- Facilitate or enforce rules and activities for the MSA.
- Identify health impact of legislation in non-health sectors, gaps in legislative coverage and inconsistencies in legislation in different sectors on issues concerning VBDs and their determinants.
- Harmonize, coordinate and implement health actions in all relevant sectors.
- Eliminate barriers to policy implementation.
- Increase health incentives for regulations in non-health sectors.
- Facilitate policy development, implementation and evaluation.
- Facilitate fund-raising.

Table 6.4 Examples of sectoral regulations that can benefit both the sector and VBD prevention and control

• Regulations on compliance with rules for managing breeding sites around houses, maintenance of drains, water courses, swamps and canals and rubbish collection
• Facilitation of immediate access to premises for indoor residual spraying
• Recommended risk assessment for VBDs
• Mandatory declaration of suspected and confirmed cases of VBDs within a defined time
• Recommended (mandatory during epidemics) that owners and occupiers of premises take measures to prevent VBDs within a defined time
• Recommended that large infrastructure and energy development projects include VBD diagnostic and treatment facilities or a referral system
• Inclusion of education on VBDs in school curricula
• Template legal agreement for information-sharing among sectors

6.10.3 Examples of partners in the legislative sector

- The legislative, executive and judicial branches of government at each level, e.g. parliamentary bodies
- Technical officers of ministries in charge of sectoral policies, regulations, standards and guidelines
- International, regional and national cross-sectoral, inter-jurisdictional policy-making forums

6.10.4 Examples of partners for multisectoral activities

PARTNERS IN ACTIONS LED BY THE LEGISLATION SECTOR	ACTIONS LED BY THE LEGISLATION SECTOR
Health	• Identify gaps and inconsistencies among sectors and at different levels of government, and identify priorities for legislative reform to include VBDs and indicators in relevant policies based on knowledge, evidence and research. • Use legislation to formalize institutional arrangements for multisectoral collaboration, such as defining roles and responsibilities, developing strategic plans with clear guidance for coordination and integration and joint monitoring and evaluation. • Align national VBD polices with global policies, and facilitate international collaboration.
Education and research	• Improve the efficiency of policy review, approval and registration of VBD research and the development of new tools, technologies and approaches.
All sectors	• Facilitate access to the judicial system and legal expertise for VBD prevention and control. • Create incentives for the participation of nongovernmental partners in policy-making, including individuals, civil society groups and community leaders, to promote agreement and increase support.
Private sector (with support from communities	• Consult the private sector and communities in setting policy.
Media	• Encourage high-level promotion of new and amended policies and regulations.

6.10.5 Case study

Box 6.11 Case study: Evolution of schistosomiasis policies in China *(191–194)*

The prevention and control of schistosomiasis in China has evolved over the years. The aim is to eliminate the sources of infection and to control the disease on the basis of up-to-date data from annual field surveys and monitoring. Scaling-up of schistosomiasis programmes and enlarging the control strategy has required cooperation among diverse sectors, including the Government, finance, medicine, culture and social security.

YEAR	POLICY AND LEGISLATIVE FRAMEWORK
1951	• Draft regulation for the management of infectious diseases: Central People's Government. • Prevention and control strategy for *Schistosoma japonicum:* national conference on prevention of epidemics
1955	• Law on management of infectious diseases passed by the National People's Congress, with addition of schistosomiasis • A multidisciplinary leadership group ("nine-person group") established by the Central People's Government
1956	• 1956–1967 Outline of national agricultural development passed by the Political Bureau of the Central People's Government, which included the prevention and control of schistosomiasis and other infectious diseases • Scientific and Technological Development Vision Plan 1956-1967 by the State Council prioritized research on the prevention and control of schistosomiasis and other infectious diseases, particularly on chemicals, drugs and Chinese medicine
1957	• Directives of the State Council for Schistosomiasis Elimination and a notice on implementing the directives. The Central People's Government required that all provincial and municipal Party Committees in areas endemic for schistosomiasis and Party groups in relevant departments under the State Council ensure execution of the State Council's instructions.

1963	• 1963–1967: Five-year Plan for Scientific Research on the Prevention and Control of Schistosomiasis. The State Council emphasized research on snails, their control and treatment methods for patients with late-stage disease.
1987	• 1987–1990: National Schistosomiasis Prevention and Control Planning by the State Council
1988	• The General Office of the State Council (No. 49, 1988) specified the responsibilities of each ministry and sector in the prevention and control of endemic diseases and promoted integrated control.
1990	• Notice of the State Council on Strengthening Work of Schistosomiasis Control (No. 18, 1990)
1991	• Eighth Five-year National Plan for Comprehensive Control of Schistosomiasis. State Council: schistosomiasis control integrated into overall planning of economic and social development at various levels of government • Eighth Five-year National Plan for Scientific Research on Schistosomiasis. State Council: further strengthened scientific research on schistosomiasis control
1992	• National Schistosomiasis Control Health Education Planning: added health education to the plan for schistosomiasis control to mobilize society and change behaviour
1997	• Ninth Five-year National Plan for Comprehensive Control of Schistosomiasis. State Council: emphasized the roles of science and technology
2001	• Tenth Five-year National Plan for Comprehensive Control of Schistosomiasis. State Council: provided subsidies in poor areas

Box 6.11 (continued)

2004	• Compendium of mid- and long-term national plans for schistosomiasis prevention and control (2004–2015). General Office of the State Council (No. 59, 2004) jointly developed by the Ministry of Health, National Development and Reform Commission, Ministry of Finance, Ministry of Agriculture, Ministry of Water Resources and Ministry of Forestry: established a mechanism to provide basic preventive medication to farmers without charge and to reduce or waiver the treatment fee for poor farmers. • Notice of the State Council on Further Strengthening of Work on Schistosomiasis Control. State Council (No. 14, 2004) • Amended Law on the Prevention and Control of Infectious Diseases. National People's Congress: increased the national priority of schistosomiasis by moving it from class C to B.
2005	• Technical guidance for water conservation and schistosomiasis prevention. Ministry of Water Conservancy
2006	• National Regulations for Schistosomiasis Control passed by the State Council (No. 463, 2006): focus on prevention and management of transmission sources • Criteria for control and elimination of schistosomiasis (GB15976-2006). Standardization Administration • National specifications on schistosomiasis prevention and control: for scientific, standardized implementation of schistosomiasis control

Where to start

- Analyse general health sector policies, including those related to VBD control, and policies in non-health sectors to identify gaps.
- Liaise with relevant sectors in VBD programmes to identify opportunities and priorities for improving policy.
- Propose new legislation and regulations to facilitate implementation of multisectoral programmes.

Chapter 7

Conclusion

7.1 Monitoring and evaluation

Monitoring and evaluation during and after implementation are essential to guide planning and implementation, identify areas for improvement, evaluate efficiency, effectiveness, impact and integrated resources and document experience for future projects. Monitoring and evaluation also provide incentives and maintain the dynamic of implementation. Without support and encouragement, the benefits of community interventions may be forgotten, behaviour change reversed to old habits and use of tools discontinued.

Monitoring occurs periodically at the program level to identify strengths and weaknesses in implementation, while evaluations are intermittent assessments at global level to determine whether the program is successful or failing *(195).* Monitoring and evaluation should be continuous to capture the evolution of a programme and use the results to improve the programme. In a multisectoral programme, monitoring and supervision are jointly planned and executed and may extend beyond the implementing parties to other stakeholders, such as those affected by the project. The method, including data collection frequency, should be decided jointly by the partners. Indicators and milestones should be designed to reflect **both sectoral and multisectoral** performance and should be specific, measurable, achievable, relevant and time-bound (SMART) in order to measure progress in five areas *(196)* **(Table 7.1):**

- **Input:** resource, strategies, policy and institutional arrangement
- **Process:** resource allocation, human resources, organization and management, planning and implementation, capacity-building and communication
- **Output:** knowledge, service delivery, practice
- **Outcome:** direct results, such as coverage, use, vector control, disease determinants (related to pathogens, vectors, the health system and environmental, agro-ecological, economic and social factors)
- **Impact:** reduction of disease burden

The monitoring and evaluation strategy should be revised regularly to ensure the relevance of indicators. “Needs” may be redefined periodically according to changes in outcomes and the available resources throughout multisectoral collaboration.

Table 7.1 Examples of indicators in monitoring and evaluation of a multisectoral VBD control programme

Type of indicator	Indicator	Secoral or join
Input	• Number of sector staff joining the secretariat • Amount of resources allocated to the MSA • Letter of endorsement and support from the government	• Sectoral • Sectoral/joint • Joint
Process	• Availability of sectoral process indicators used in monitoring and evaluation • Availability of a steady source of detailed, accurate information to inform programme design • Number of joint meetings convened per year • Number of non-health sectors included • Level of government officials participating in joint meetings • Degree of integration (estimated by methods such as scores or regression technique) • Establishment of mechanism to institutionalize multisectoral coordination	• Sectoral • Sectoral/joint • Joint • Joint • Joint • Joint • Joint
Output	• Number of sectoral policies revised to include VBDs • Number of joint training programmes planned • Number of ministries that assessed the impact on VBDs • Multisectoral action plan developed	• Sectoral • Joint • Joint • Joint
Outcome	• Number of houses with frames coated with insecticide-impregnated paint • Number of pregnant women reported to be using LLINs • Number of leaking pipes detected and repaired • Breteau index: number of positive containers per 100 houses inspected • Proportion of population with better understanding of VBDs • Availability of VBD diagnosis and treatment services at mining sites	• Sectoral • Sectoral • Sectoral • Sectoral • Joint • Joint
Impact	• Total number of confirmed outpatient cases of malaria per year • Size of population that benefited from an MSA	• Joint • Joint

7.2 Revision and evolution of this document

This guidance will follow a “test–improve” life cycle according to its use by stakeholders. Its dissemination and use and the outcomes will reflect continuous, participatory learning. Countries are encouraged to adapt the conceptual framework outlined above according to their own VBD situation and context and at different levels, from local to national. Decision-makers will design their MSA according to their institutional arrangements, will test and assess its effectiveness and efficiency and share their experiences. TDR encourages all users of this guidance, in all sectors, to send feedback and comments so that TDR can make any necessary changes for the next version, which will be published in about 5 years. The benefits and limitations of the system will be used to update the guidance. The next version will include a robust monitoring and evaluation tool with a comprehensive list of indicators from which implementers can choose those most relevant for their contexts.

The document can be used by sectors to prepare more detailed sectoral strategies and action plans. TDR will start integrating one of the key sectors, WaSH, into its research. Potential activities include: strengthening the focus on WaSH in the document and dissemination at global and regional events; preparing a training package on multisectoral actions to strengthen WaSH-related VBD prevention and control; supporting countries in conducting research on use of multisectoral activities to prevent and control VBDs, with a focus on WaSH; and conducting training workshops and online courses. A platform documenting collaboration and partnerships for VBD prevention and control will provide a database of models of collaboration and coordination for countries.

7.3 Recomendations for a successful multisectoral approach to the prevention and control of vector-borne diseases

The complexity of the prevention and control of VBDs requires a collective response from health and non-health sectors of government and other partners, such as NGOs, public and private institutions and companies. Multisectoral planning and collaboration at a high level are necessary for a long-lasting, sustainable VBD programme. Advocacy within and outside the health sector is essential. Once the agenda for prevention and control is set, all relevant sectors and stakeholders should be empowered to participate effectively according to their capacity, under the coordination committee. As demonstrated in the **"BET" framework** (Fig. 3.3), a robust multisectoral programme with solid government commitment, coordination of all relevant sectors and the participation of communities will have a large pool of resources and expertise for comprehensive VBD prevention and control.

High-level political support, commitment, a shared long-term vision, a clear mandate, identification of incentives and co-benefits, adequate resources, contextual design, policy support and robust monitoring and evaluation will ensure a successful multisectoral programme. VBD measures must be integrated into routine sectoral activities to maximize the use of resources and to realize co-benefits. Designing, planning and implementing an effective, efficient multisectoral programme for the prevention and control of VBDs will require time and resources. Continuous monitoring and evaluation will improve the approach at all stages and provide evidence for other implementers.

Because of the multiple determinants of VBDs in different countries and contexts, the links among different sectors involved in VBD prevention and control will vary. This guidance document should therefore be seen as flexible and should be adapted to each context.

7.4 Inmediate next steps

First, the “BET” framework should be tested and validated. For the best use of this framework, decision-makers (such as central government) who wish to use an MSA to one or more VBDs should liaise with the health sector, initiate dialogue with other relevant sectors, advocate for the MSA to the prevention and control of VBDs and identify existing multisectoral mechanisms in their context. Other sectors that take an active part in any collaboration for VBD control and prevention should ensure that their roles are clearly defined.

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Annex 1. Glossary

All of the following definitions are from WHO terminology[2] , unless otherwise noted.

Community	• A specific group of people, often living in a defined geographical area, who share a common culture, values and norms, are arranged in a social structure according to relationships which the community has developed over a period of time. Members of a community gain their personal and social identity by sharing common beliefs, values and norms which have been developed by the community in the past and may be modified in the future. They exhibit some awareness of their identity as a group, and share common needs and a commitment to meeting them
coverage	• A general term referring to the fraction of the population of a specific area that receives a particular intervention
disability-adjusted life year (DALY)	• Population metric of life years lost to disease due to both morbidity and mortality
endemic area	• An area in which there is an ongoing, measurable incidence of malaria infection and mosquito-borne transmission over a succession of years
environmental management	• Modification or manipulation of environmental factors with a view to preventing or minimizing vector propagation and reducing human-vector-pathogen contact
equity	• The absence of avoidable or remediable differences among populations or groups defined socially, economically, demographically or geographically
exposure	• Contact of a chemical, physical or biological agent with the outer boundary of an organism (e.g. through inhalation, ingestion or dermal contact)

[2]The terminologies are from the following WHO documents:
WHO/HPR/HEP/98.1, WHO/HTM/GMP/2016.6, ISBN 9789241565370, WHO/HTM/NTD/VEM/2016.02, ISBN 9789241507981, WHO/CDS/TB/2019.15

framework	• A framework provides an overview and structure of essential components and subcomponents, and the relationships between them
Health in All Policies (HiAP)	• An approach to public policies across sectors that systematically takes into account the health implications of decisions, seeks synergies and avoids harmful health impacts in order to improve population health and health equity. It improves accountability of policy-makers for health impacts at all levels of policy-making. It includes an emphasis on the consequences of public policies on health systems, determinants of health and well-being
health outcomes	• A change in the health status of an individual, group or population which is attributable to a planned intervention or series of interventions, regardless of whether such an intervention was intended to change health status
health sector	• Organizations that are held politically and administratively accountable for the health of the population at various levels: international, national, regional and local
household	• The ecosystem, including people and animals occupying the same house and the accompanying vectors.
indoor residual spraying (IRS)	• Operation procedure and strategy for malaria vector control involving spraying interior surfaces of dwellings with a residual insecticide to kill or repel endophilic mosquitoes
infectious	• Capable of transmitting infection, a term commonly applied to human hosts
Insecticide-treated net (ITN)	• Mosquito net that repels, disables or kills mosquitoes that come into contact with the insecticide on the netting material. There are two categories of ITN: conventionally treated nets and long-lasting insecticidal nets (LLINs)
integrated vector management (IVM)	• Rational decision-making for optimal use of resources for vector control
larval source management	• Management of aquatic habitats (water bodies) that are potential larval habitats for mosquitoes, in order to prevent the completion of development of the immature stages

Low-income country[3]	• Low-income economies are defined as those with a GNI per capita, calculated using the World Bank Atlas method, of $1,025 or less in 2018
mass drug administration	• Administration of antimalarial treatment to all age groups of a defined population or every person living in a defined geographical area (except those for whom the medicine is contraindicated) at approximately the same time and often at repeated intervals
Middle-income country[3]	• Lower middle-income economies are those with a GNI per capita between $1,026 and $3,995; upper middle-income economies are those with a GNI per capita between $3,996 and $12,375, calculated using the World Bank Atlas.
pathogens	• Disease-causing organisms (e.g. bacteria, helminths, protozoa or viruses)
policy[4]	• A principle or course of action adopted or proposed as desirable, advantageous, or expedient; esp. one formally advocated by a government, political party, etc. Also as a mass noun: method of acting on matters of principle, settled practice. (Now the usual sense.)
regulations[4]	• A rule or principle governing behaviour or practice; esp. such a directive established and maintained by an authority
stakeholder	• A person, or group of persons, who have an interest or concern in a particular process or issue due to direct or indirect involvement. Examples include government ministries, politicians, non-government organizations, religious organizations, research institutes, labor unions, professional associations and businesses
surveillance	• Continuous, systematic collection, analysis and interpretation of disease-specific data and use in planning, implementing and evaluating public health practice

[3]According to the World Bank Country definitions for the fiscal year of 2020.

[4]Oxford English Dictionary.

universal health coverage (UHC)	• The goal of universal health coverage is to ensure that all people obtain the health services they need without suffering financial hardship when paying for them. This requires: a strong, efficient, well-run health system; a system for financing health services; access to essential medicines and technologies; and a sufficient capacity of well-trained, motivated health workers
vector control	• Measures of any kind against malaria-transmitting mosquitoes, intended to limit their ability to transmit the disease
vector surveillance	• Collection of entomological dataused to plan and assess anti-vectormeasures. Includes preliminary surveys, regular or trend observations, spot checks and focal investigations
whole-of-government	• A whole-of-government approach refers to the coordinated efforts of two or more sectors within government to improve health outcomes. This can include working across different levels of government such as district, provincial and national jurisdictions. Joined-up government and healthy public policies are similar terms used in the HiAP literature.

Annex 2. Examples of relevant alliances and partnerships for multisectoral coordination

- Access and Delivery Partnership
- Agriculture and Health Research Platform
- African Leader's Malaria Alliance
- Asia Pacific Leaders Malaria Alliance
- Asia Pacific Malaria Elimination Network
- Asia Pacific Observatory on Health Systems and Policies
- Dengue Vaccine Initiative
- The Elimination 8 Initiative
- Focusing Resources on Effective School Health
- Gavi, the Vaccine Alliance
- Global Alliance to Eliminate Lymphatic Filariasis
- Global Fund to Fight AIDS, Tuberculosis and Malaria
- Global Network for Health in All Policies
- Health and Environmental Strategic Alliance
- Innovation to Impact
- Nongovernmental Development Organization - Coordination Group for Onchocerciasis Elimination
- Onchocerciasis Elimination Program for the Americas
- Pan African Tsetse and Trypanosomiasis Eradication Campaign
- Programme Against African Trypanosomiasis
- Towards Elimination of Malaria Programme
- Roll Back Malaria Partnership to End Malaria
- UHC 2030

Annex 3. List of commissioned reviews

- Abdul-Ghani R. A systematic review and meta-analysis of the impact of population displacement on the transmission and outbreaks of *Aedes*-transmitted arboviral diseases. 2017.
- Jones RT, Tusting LS, Smith HMP, Segbaya S, Macdonald MB, Bangs MJ, et al. Multi-sectoral approaches for the prevention and control of malaria and emerging arboviral diseases: the impact of industrial activities on vector-borne disease transmission. 2017.
- Videnza Consultores. Integrated strategies for the prevention and control of VBD within the context of eco-bio-social approaches. 2018.
- Antonio CAT, Bermudez ANC, Cochon KL, Roxas EA, Salamat MSS. Inter-sectoral collaborations for the prevention and control of vector-borne diseases: a scoping review. 2017.
- Naing C, Whittaker, MA, Tanner M. Landscape analysis of multi-sectoral approaches for the prevention and control of malaria among the displaced people: A Systematic Review. 2017
- Herdiana, Sari JFK, Whittaker MA. Intersectoral collaboration for the prevention and control of VBDs to support the implementation of a global strategy: A systematic review. 2017


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