

# Implementation of Integrated Vector Management

*Report of the Regional Meeting  
Chiang Mai, Thailand, 27–30 September 2010*



**World Health  
Organization**  
Regional Office for South-East Asia

SEA-CD-222  
Distribution: General

# Implementation of Integrated Vector Management

*Report of the Regional Meeting  
Chiang Mai, Thailand, 27–30 September 2010*



© World Health Organization 2011

All rights reserved.

Requests for publications, or for permission to reproduce or translate WHO publications – whether for sale or for noncommercial distribution – can be obtained from Publishing and Sales, World Health Organization, Regional Office for South-East Asia, Indraprastha Estate, Mahatma Gandhi Marg, New Delhi 110 002, India (fax: +91 11 23370197; e-mail: [publications@searo.who.int](mailto:publications@searo.who.int)).

The designations employed and the presentation of the material in this publication do not imply the expression of any opinion whatsoever on the part of the World Health Organization concerning the legal status of any country, territory, city or area or of its authorities, or concerning the delimitation of its frontiers or boundaries. Dotted lines on maps represent approximate border lines for which there may not yet be full agreement.

The mention of specific companies or of certain manufacturers' products does not imply that they are endorsed or recommended by the World Health Organization in preference to others of a similar nature that are not mentioned. Errors and omissions excepted, the names of proprietary products are distinguished by initial capital letters.

All reasonable precautions have been taken by the World Health Organization to verify the information contained in this publication. However, the published material is being distributed without warranty of any kind, either expressed or implied. The responsibility for the interpretation and use of the material lies with the reader. In no event shall the World Health Organization be liable for damages arising from its use.

This publication does not necessarily represent the decisions or policies of the World Health Organization.

Printed in India

# Contents

	<i>Page</i>
Acronyms.....	v
1. Background .....	1
2. Objectives .....	2
3. Opening session .....	3
4. Proceedings of the meeting.....	3
4.1 Introduction to the IVM principles and approaches.....	3
4.2 IVM implementation at global level.....	4
4.3 Country presentations.....	5
4.4 Implementation of IVM: The planning cycle .....	12
4.5 Monitoring and Evaluation .....	12
4.6 Capacity-building and Vector Control Needs Assessment (VCNA) for IVM .....	13
4.7 Public Health Pesticide Management Policy in SEA Region .....	16
4.8 Operational Research Needs .....	17
4.9 Field visit .....	19
5. Conclusions of Group Work .....	19
6. Recommendations.....	29

## Annexes

1. Agenda.....	31
2. List of participants.....	32
3. Message from Dr Samlee Plianbangchang, Regional Director, WHO South-East Asia.....	35
4. Vector control methods adopted by Member States.....	38



## Acronyms

COMBI	communication for behavioural impact
BCC	behavioural change communication
BTI	<i>Bacillus thuringiensis israelensis</i>
CBO	community-based organization
CVC	comprehensive vector control
DDT	dichloro diphenyl trichloroethane
DEC	diethyl carbamazine
HMIS	health management information system
IPVM	integrated pest and vector management
IRS	indoor residual spray
ITN	insecticide-treated net
IVC	integrated vector control
IVM	integrated vector management
JE	Japanese encephalitis
KAP	knowledge, attitude and practice
LLIN	long-lasting insecticidal net
MDA	mass drug administration
NGO	nongovernmental organization
POP	persistent organic pollutants
PSI	Population Services International
SAICM	strategic approach to international chemicals management
SEA	South-East Asia
SEARO	South-East Asia Regional Office
SVC	selective vector control

TDR	Tropical Diseases Research
VBD	vector-borne diseases
VCNA	vector control needs assessment
VEM	Vector Ecology and Management
WHA	World Health Assembly
WHO	World Health Organization

## 1. Background

The major vector-borne diseases (VBDs) in the South-East Asia (SEA) Region are malaria, lymphatic filariasis, dengue, chikungunya, Japanese encephalitis and visceral leishmaniasis (kala-azar). The VBDs have not only adversely affected the health of the people in the region, but also impeded overall socioeconomic development. Simultaneously, developmental activities without adequate attention to the environment have increased the scope and scale of transmission of VBDs.

The failure to effectively reduce the burden of VBDs has resulted from many factors—human, technical, operational, ecological and economic. The costs, resistance and environmental concerns associated with the use of insecticides have necessitated a shift towards more rational vector control measures, including the use of insecticide-treated bed nets, improvement in housing conditions, environmental management and biological control.

Conventional approaches to the control of individual VBDs have almost always worked in isolation from one another. There are many situations in which efforts can be organized and action managed for effective control of vectors of two or more VBDs at the same time. The need for integrated vector control (IVC) was recognized in the early 1980s and envisaged as a unified plan that included the use of one or more compatible methods of control. The concept of selective vector control (SVC) emerged in the early 1990s and entailed the “application of targeted, site-specific and cost-effective activities to reduce malaria morbidity and mortality”. Later there arose the concept of comprehensive vector control (CVC), which entailed the “control of vectors of two or more co-prevalent diseases through a unified managerial structure using similar or different methods”.

The Fiftieth World Health Assembly (WHA 50.13, 1997) recommended reducing the reliance on the use of insecticides for the control of VBD through the promotion of integrated pest management approaches in accordance with WHO guidelines, and through the development and adaptation of viable alternative methods of vector

control. The Stockholm Convention on Persistent Organic Pollutants (POPs) (2001) recommended phasing out DDT and 11 other POPs, and also reducing reliance on pesticides for vector control in general.

WHO (2004) issued the integrated vector management (IVM) strategy on the premise that effective control is not the sole preserve of the health sector but requires the collaboration of various public and private agencies and community participation. IVM is described as “a rational decision-making process for the optimal use of resources for vector control”.

A regional framework for an IVM strategy for the SEA Region was developed in 2005 to advocate and help implement the IVM approach in the Member States. The Revised Malaria Control Strategy of the SEA Region (2006–2010) includes the application of IVM. The WHO Regional Office for South-East Asia organized a regional workshop in Puducherry, India, in 2006 to promote the implementation of IVM in the Region. The WHA (60.18, 2007) called for support to develop country capacities in expanding the use of effective interventions for malaria control, including the use of an IVM approach. The “Framework for implementing IVM at district level in the SEA Region: A step-by-step approach” was developed in 2008 to provide guidance to develop and implement the IVM approach at the district or equivalent levels, as well as to monitor and evaluate its impact.

A regional meeting on the implementation of IVM was organized at Chiang Mai, Thailand from 27 to 30 September 2010 to discuss the various issues related to the implementation of IVM in the Member States and also to arrive at practical methods for expanding the strategy. The meeting was attended by 31 participants from 10 Member States of the Region. The agenda and the list of participants are presented in Annexures 1 and 2, respectively.

## **2. Objectives**

The objectives of the regional meeting on the implementation of IVM held at Chiang Mai, Thailand were:

- To share information on and review the status of IVM implementation in the Member States
- To identify constraints, issues, and training and research needs

- To prepare follow-up actions for implementation and scaling up of IVM in Member States.

### **3. Opening session**

Dr Tasana Lewsaree, Director of Disease Control, Chiang Mai, welcomed the participants and highlighted the importance of coordination of activities between the Member countries for VBD control.

The Regional Director's message was read out by Dr A.P. Dash, Regional Adviser, Vector-Borne and Neglected Tropical Diseases Control. The Regional Director had pointed out that there were still a number of challenges in the way of successful expansion of IVM implementation among the Member States of the region. He hoped that the meeting would provide an ideal opportunity to discuss these challenges and take steps for achieving the goals of the VBD control programmes. The full text of the Regional Director's message is given in Annexure 3.

The meeting was chaired by Mr Abdul Hameed Ali, Director General, Centre for Community Health and Disease Control, the Maldives and co-chaired by Dr P. Jambulingam, Director, Vector Control Research Centre, Puducherry, India. Dr W.A.S. Settinayake, Director, Anti-Filariasis Campaign, Sri Lanka and Dr Wannapa Suwonkerd, Technical Officer (Senior Entomologist), Chiang Mai, Thailand were the rapporteurs.

### **4. Proceedings of the meeting**

#### **4.1 Introduction to the IVM principles and approaches**

Dr A.P. Dash gave an overview of the IVM principles and approaches. The overview included a historical perspective of various vector control measures, as well as a summary of the transition from the IVC strategy to IVM. He stressed the need for a sound public health pesticide management system to prevent selection of insecticide resistance in the vectors of public health importance. He described the key elements of IVM, its planning cycle and the steps in its implementation. The important issues to be addressed in vector control were elucidated by Dr Dash. The training plans

for programme managers proposed to be conducted in 2011 by the Vector Control Research Centre, Puducherry, India were also highlighted. The curriculum and modules for the training have already been prepared. Various studies which have shown the economic impact of VBD were also discussed.

## **4.2 IVM implementation at global level**

Dr Raman Velayudhan, Vector Ecology and Management (VEM), WHO headquarters, gave a presentation on the implementation of IVM at the global level. The goal of IVM is to make a significant contribution to the prevention and control of VBD. The main problems in the implementation of IVM are suboptimal targeting, non-adaptation of methods to local circumstances, missed opportunities for integrating diseases, other sectors and communities creating conditions which increase the risk of VBD, and increasing insecticide resistance. IVM should not be used as a separate programme, but as an approach in the transformation of the existing system.

The requirements for implementation include an institutional arrangement, regulatory framework and decision-making criteria and skills. There is a need for reform of the health sector to promote capacity-building for analysis and decision-making at peripheral levels. The benefits of decentralization include motivation of district staff and extension of the reach of services, which would result in synergies and cost savings. Embedding IVM within health services increases the sustainability of vector control (e.g. budget allocation). Effective coordination is required where vertical programmes continue to exist in parallel to a decentralized IVM model.

There are some sectors which may place people at risk of disease by promoting vector breeding. Partnership in IVM is needed so that risks are addressed in each sphere of influence. Funds are required to support the existing system as it attempts the transformation to the IVM approach, both in terms of start-up costs and recurrent costs. Health sector funds for IVM may become available if synergies and cost savings are made well known. A national policy is needed for making funds available from other sectors, with the identification of the roles and responsibilities of each sector in vector control. Linking vector control to economic progress could help to

generate private sector funds, for example, from business, mining zones, plantations and tourist areas.

### 4.3 Country presentations

#### ***Bangladesh***

The major VBDs of public health importance in Bangladesh are malaria (13 districts), kala-azar (34 districts), lymphatic filariasis (32 districts) and dengue (metropolitan cities and a few districts). Indoor residual spray (IRS) has been discontinued in the country, except for the control of outbreaks, and the distribution of long-lasting insecticidal nets (LLIN) is being scaled up. Bed nets are also being treated with deltamethrin. The target for LLIN is to provide 100% coverage in three hill tract districts and 80% coverage in the remaining 8 high endemic districts by 2012.

The Dhaka City Corporation, which covers a population of about 15 million, uses Temephos and malaria oil every 3 days in alternate wards for the reduction of mosquito nuisance and control of disease. Support for source reduction drives is obtained from ward commissioners (elected representatives) and local communities.

IVM was piloted in two districts with high malaria endemicity (one an agricultural region and the other with tea estates) in Sreemongal Upazila of the Moulvi Bazar district. The results showed a declining vector density and parous rate, high community acceptability and multisectoral involvement (agriculture, education, environment and forest, fisheries and livestock, local government and NGOs). Encouraged by the success of this pilot project, the country plans to expand the IVM strategy to more districts and a border area in Haluaghat Upazila in the Mymensingh district. The major activities will include: (i) workshops on planning at the district and upazila levels with the involvement of various sectors, (ii) situation analysis, (iii) health card distribution to collect data on insecticide-treated nets (ITN)/LLIN, (iv) epidemiological and entomological surveys, and (v) a community drive for detection and mapping of breeding sources for environmental management and intensive behaviour change communication (BCC).

### **Bhutan**

Bhutan has been endemic for malaria for a long time, but dengue and kala-azar have started occurring from 2004 and 2006, respectively. The number of malaria cases is decreasing steadily and only 973 cases were reported in 2009. The main strategy for the control of malaria is the distribution of LLIN and the coverage achieved in the endemic districts is more than 90%. The treatment of bed nets with Cyfluthrin is restricted to developmental project sites. IRS has been conducted since 2004, twice a year, on the basis of epidemiological trends and vector prevalence. No vector resistance to insecticides has so far been detected in the country. Monthly bio-assay tests are carried out on LLIN and sprayed walls. The country has initiated integrated pest and vector management (IPVM) in one block and it is planned to expand it to more areas endemic for malaria.

### **India**

India is endemic for malaria, lymphatic filariasis and visceral leishmaniasis (kala-azar). Outbreaks of dengue, chikungunya and Japanese encephalitis occur every year in many parts of the country. About 1.5 million cases of malaria are reported annually, with a *Pf:Pv* ratio of about 50:50. Nine species of anophelines have been identified as vectors of malaria in different parts of India. The proportion of malaria cases in urban areas is also steadily increasing.

Kala-azar is endemic in 52 districts of 4 states (Bihar, Jharkhand, West Bengal and Uttar Pradesh). Approximately 130 million people live in districts endemic for kala-azar. There has been a decrease in reported cases in the past few years. *P.argentipes* is the vector of kala-azar in India. About 24 000 cases of kala-azar were reported in 2009.

Japanese encephalitis (JE) has been reported from 135 districts in 14 states of the country, with about 330 million people living in these endemic districts. In 2009, 4482 cases of acute encephalitis syndrome (AES)/JE were reported in India, with 774 deaths. The *Cx. tritaeniorhynchus* and *Cx. vishnui* group of mosquitoes are the vectors of JE in India.

During 2009, a total of 15 538 cases of dengue/dengue haemorrhagic fever (DHF) were reported, with 96 deaths. The National Capital Territory of Delhi is at present in the midst of a dengue outbreak. A massive

chikungunya outbreak occurred in India in 2006. It involved many states and there were more than a million suspected cases. Smaller outbreaks have since been reported every year from different parts of the country.

A population of about 600 million, living in 250 districts of 20 states/union territories, is at risk for lymphatic filariasis. *Cx. quinquefasciatus* is the vector for Bancroftian filariasis and *Mansonia spp* for Brugian filariasis.

Insecticide resistance studies are carried out at various sites for different vectors and there is concern that *An. culicifacies* is developing resistance to all three insecticides used for IRS, namely DDT, malathion and synthetic pyrethroids. LLINs were introduced for use in 2009 under the national malaria control programme and 2 235 000 LLINs have been distributed so far. Treatment of conventional nets with synthetic pyrethroids will be continued till universal coverage with LLIN is achieved. At present, LLINs are procured under projects supported by the World Bank and GFATM and are likely to be scaled up through domestic funding. The use of larvivoracious fish for biological control of malaria vectors is also being promoted. Public-private partnership and community involvement are encouraged for vector control activities.

### **Indonesia**

Indonesia is endemic for malaria and lymphatic filariasis. Outbreaks of dengue occur frequently and chikungunya cases are also reported. There has been a steady decline in the incidence of malaria in the country over the past decade, whereas the incidence of dengue is gradually increasing. A total of 337 districts are endemic for lymphatic filariasis. Twenty-two anopheline species are known to transmit malaria and 24 species of vector mosquitoes transmit lymphatic filariasis.

A total of 1 436 740 LLINs were distributed during the period of March 2008 to February 2009 in ten provinces of Sumatra Island and six provinces of East Indonesia. Annual surveys carried out in various provinces showed that the use of LLINs among pregnant women and children of 1–5 years of age during the previous night was 56.1% and 67.6%, respectively.

Bendiocarb, cyhalothrin and etofenprox are used for IRS and pyriproxyfen and BTI are used as larvicides for malaria control. Malathion,

cypermethrin and pirimiphos-methyl are used for adult dengue vector control and pyriproxyfen for larval control. Insecticide resistance studies of various malaria vectors and *Aedes aegypti* are done regularly. There is evidence of *An. sundaicus* and *An. barbirostris* developing resistance to cypermethrin.

It is proposed to develop national guidelines on IVM and Minister of Health decree on Vector Control (including emergency vector control). A training of trainers workshop on IVM Guidelines and Management of Public Health Pesticide is planned. It is also planned to standardize public health pesticide monitoring and strengthen the monitoring and evaluation of the use of pesticides.

Social mobilization has been undertaken for source reduction of the dengue vector. Partnerships have been established with NGOs, the Ministry of Agriculture, the Ministry of Interior and the education sector, involving school children. For pest control, private companies, including the tourism agency (which?) and hotel industry, have been involved. Intermittent irrigation and fish breeding have been used for effective control of *An. aconitus* in the rice fields of West and Central Java.

### ***The Maldives***

No indigenous malaria cases have been reported in the Maldives since 1984. A few imported cases are reported almost every year. The threat of reintroduction of malaria from other countries exists. The vector has also not been found since 1990. Surveillance and mosquito control activities are being continued at airports and sea ports.

Transmission of lymphatic filariasis has been interrupted for the past seven years, even though the vector is still present in the country. Sporadic cases are reported from expatriate workers.

The first dengue outbreak in the country was reported in 1979. At present, cases are reported from all over the country. A chikungunya outbreak occurred in 2006.

Deltamethrin is used for fogging and BTI as larvicide for vector control. Communication for behavioural impact (COMBI) activities have been introduced for IVM since 2006. Monthly entomological monitoring is

done in the islands and urban regions. No studies are being carried out for testing vector susceptibility to insecticides.

### **Myanmar**

About 68.34% of the country's population was living in malarious areas in 2009. The malaria morbidity rate was 10 per 1000 population and the mortality rate was 1.64 per 100 000 population. *P. falciparum* is the predominant species, contributing to over 73% malaria cases in the country. Dengue cases occur in the entire country, except in the state of Chin. There has been a steady increase in dengue cases in the country, with 24,285 dengue cases and 181 deaths reported in 2009. Forty-five of the 65 districts in the country are endemic for lymphatic filariasis. Sporadic occurrence of JE cases has been reported from a few states. During the period 2007–2009, about 400 000 LLINs were distributed in Myanmar. Household coverage in 2009 was 25%. More than 1 million nets were treated with KO tab in 2009. DDT, malathion and alphacypermethrin are used in IRS. *An. culicifacies*, *An. aconitus*, *An. annularis* and *An. hyrcanus* have shown resistance and *An. dirus* tolerance to organochlorine insecticide.

### **Nepal**

The VBDs of public health importance in Nepal are malaria, kala-azar, JE, dengue and lymphatic filariasis. About 22.5 million people are at risk of malaria in 65 of the 75 districts in the country. The number of malaria cases decreased by 31% in 2009 as compared with that in 2004. The annual parasite incidence is 0.16. The proportion of imported malaria is on the rise, having increased from 12% of the total cases in 2004 to 27% in 2009. Twelve districts are endemic for kala-azar and the population at risk is about 5.5 million. A population of about 12.5 million is classified to be at moderate to high risk of JE. A JE vaccination campaign was started in high-risk districts in 2006. A population of about 25 million, living in 60 districts, is at risk of lymphatic filariasis. An increase in dengue cases has been reported in recent years.

LLIN coverage has been scaled up to provide coverage for about 90% of the population living in high-risk areas. Thirty per cent of the population in high-risk areas is given coverage with IRS. Alphacypermethrin is the

insecticide currently being used for IRS. Pyrethroid resistance has not been documented in any of the studies conducted so far.

Community-based female health volunteers are involved in IPC to disseminate information on VBDs and measures to control them. Activities for raising awareness are implemented in coordination with community-based organizations (CBOs) and schools at the local level. The media is also utilized for raising awareness and advocacy. Partnership has been established with Population Services International (PSI) to support the distribution of LLINs and dissemination of information on how to use them effectively. Printed information, education and communication (IEC) materials have also been developed and distributed to promote the use of LLINs. The monitoring and evaluation (M&E) tool kit for IRS developed by Tropical Diseases Research (TDR) is being piloted in 12 districts.

### ***Sri Lanka***

There has been a dramatic decline (99.7% reduction) in malaria cases in Sri Lanka. The number of cases fell from 210,039 in 2000 to 558 in 2009. At present, the high API localities are covered with IRS and intermediate API localities with ITN. Currently, cyfluthrin and bifenthrin are being used for IRS, in rotation. Adult mosquito control is supplemented by larviciding and bio-environmental methods.

The highest number of dengue cases was recorded in 2009, when there were 35 007 cases and 346 deaths. For dengue control, temephos and larvivorous fish are used for larval control in water storage tanks and aerial spraying is used for adult mosquito control. A Presidential Task Force has been formed for dengue control activities, with participation of government and nongovernmental organizations (NGOs). The Ministry of Defence has also been involved. Wide coverage is given to dengue control in the media and efforts are also being made at social mobilization. Legal action is taken on a limited scale.

Mass drug administration (MDA) with diethyl carbamazine (DEC) and albendazole for lymphatic filariasis was carried out in endemic districts from 2002 to 2006 and the country is now in the post-MDA phase. Visceral leishmaniasis was first reported in 1992 and since then, the incidence has

gradually increased and the disease is considered to be now well established in the country.

### ***Thailand***

About 32 million people in the country live in areas at risk of malaria. A total of 23 229 malaria cases were reported in 2009. Even though 8 million people live in areas at risk of lymphatic filariasis, the number of cases recorded in 2009 was only 11. A total of 56 651 cases of dengue and 52 057 cases of chikungunya were reported in 2009. The reported number of cases of JE was 36.

During 2009, a total of 180 076 LLINs were distributed and 395 931 bed nets were treated with synthetic pyrethroids. Larvivorous fish were also used for vector control to cover a population of more than one million. Deltamethrin, bifenthrin and cypermethrin were used for IRS. Insecticide resistance studies showed that anophelines are susceptible to synthetic pyrethroids, whereas *Aedes* mosquitoes showed resistance to various insecticides.

IVM is managed by the Bureau of VBD. A situation analysis of IVM was done in 2009. Guidelines on the implementation of IVM by the local administration are being developed this year.

### ***Timor-Leste***

The country is endemic for malaria, with the morbidity and mortality rates being 103 per 1000 and 1.04 per 1000 population, respectively. Nearly 1 million people live in areas at high risk for malaria. Dengue cases are also reported from most of the districts in the country.

A total of 195 000 LLINs have been distributed in 2010, bringing the coverage of children under 5 years of age and pregnant women to 98%. Cyhalothrin is used for IRS and about 14 000 houses have been sprayed in 2010. No resistance has been reported for any of the insecticides tested against mosquito vectors so far. Temephos is used as a larvicide in dengue vector control, along with ULV spray with malathion.

The Ministry of Health is in charge of the control of VBD and the Ministry of Environmental Health is responsible for dengue control. During outbreaks, the Ministry of Administration State is involved in clean-up and community mobilization. The Ministry of Infrastructure makes arrangements for the maintenance of drains. IEC activities are carried out by the media, churches and schools, and through group talks by women's organizations.

The vectors and control methods in the above countries are summarized and presented as a table in Annexure 4.

#### **4.4 Implementation of IVM: The planning cycle**

Dr Rajpal S. Yadav, VEM, WHO/HQ, gave a presentation on the planning cycle for the implementation of IVM. The following stages in the planning cycle were discussed.

- Review of policy framework and institutional capacity
- Situation analysis
- Vector management needs assessment
- Setting goals and objectives
- Implementation process
- Stratification of targeted areas
- Decision-making criteria
- Choosing appropriate interventions
- Advocacy and social mobilization
- Building inter/multisectoral collaboration
- Capacity-building activities
- Monitoring and evaluation

#### **4.5 Monitoring and Evaluation**

Dr P. Jambulingam, Director, Vector Control Research Centre, Puducherry, India gave a presentation on the monitoring and evaluation of IVM. Various indicators of the monitoring and evaluation of IVM were discussed. The

input indicators include human and financial resources; the process indicators include the area/population covered, evidences generated and the number of tools identified and analysed; and the output indicators are the identification of the diseases to be targeted, tools, and the strategy and documentation of risk factors. The impact indicators are reduction in morbidity and mortality due to VBDs and changes in health and socioeconomic status.

#### **4.6 Capacity-building and Vector Control Needs Assessment (VCNA) for IVM**

Dr Raman Velayudhan, VEM, WHO headquarters, gave a presentation on VCNA for IVM. The components of capacity-building include human resource development, organizational development, and an institutional and legal framework. The available options for capacity-building in IVM are long-, intermediate- and short-term courses. Distance learning can also become a reality. Various training courses in IVM are offered by institutions in different countries, viz. Cuba, India, Malaysia, Pakistan, Singapore and Sudan. There is a need to develop a career pathway for new entomologists and absorption capacity at all levels. Linkages are required to be established with departments of agricultural entomology and the life sciences departments of universities.

VCNA should be carried out to assess the VBD situation, review the existing policy framework for vector control, and for planning and implementation of IVM. There is a need to develop relevant community mobilization strategies and inter-sectoral coordination mechanisms for vector control. The following should be considered while performing VCNA.

##### ***Organization of Vector Control***

- Is control of various VBDs integrated in a single unit?
- Is there a national vector control core group or task force that can provide policy and technical support?
- Is there a relationship between vector control and environmental health programmes?

### ***Organization of Vector Control Programme***

- Is there a policy on decentralization?
- Is vector control intervention decentralized?
- Is there a policy for tax exemption for public health insecticides and bednets?

### ***Human Resource Development Plan***

- Are there career opportunities for vector control staff?
- Is there in-service training and upgrading of vector control personnel?
- Are teaching materials and guidelines available for training?
- Are there opportunities for post-graduate training in medical entomology or vector control within the country?
- What proportion of those who have been trained in the past have been retained by the malaria or other vector control programmes?

### ***Research***

- What are the research institutions or universities involved in vector biology and control that have linkages with VBD programmes?

### ***Financial Support***

- Is budget allocation for insecticides adequate?
- What are the sources of funds?
- What is the status of availability of application equipment?
- Are funds available for the implementation of vector control operations?
- Are funds available for monitoring and evaluation of vector control activities?

### ***Supervision, Monitoring and Evaluation***

- Is there systematic supervision of vector control programmes at the provincial or municipal level?
- Are entomological surveillance activities conducted on a regular basis?
- Is there regular communication and exchange of data between/among the different levels of implementation?
- Is there support for supervision at different levels?
- Is there support for monitoring and evaluation of vector control activities?

### ***Regulatory Policies***

- Does the country have a national regulatory body for public health use of insecticides?
- Are there registration requirements for public health insecticides?
- Are there regulations for the storage, distribution and sale of public health insecticides?

### ***Quality Control and Assurance***

- Are there facilities for ensuring the quality of insecticides?
- Is there any quality control of bed nets and insecticides?

### ***Prevention and Exposure to Insecticides***

- Are warehouse facilities available at different levels?
- Do the personnel at different levels have skills for understanding and implementing safe use and disposal of insecticides?
- Are protective clothing and supplies available for vector control staff?
- Are there adequate facilities for the management of insecticide exposure?

## 4.7 Public Health Pesticide Management Policy in SEA Region

Dr Rajpal S. Yadav, VEM, WHO headquarters, gave a presentation on the public health pesticide management policy in the SEA Region. The reasons behind formulating the policy are as follows:

- Human health and environmental risks
- Depleting arsenal of less hazardous and cost-effective public health pesticides
- Increasing use of pesticides for vector and nuisance pest control
- Inadequate regulation of public health pesticides and pest control products
- Challenges associated with decentralized health systems
- Inadequate national capacity—registration, regulation and judicious use (unclear)
- Sub-standard and counterfeit products
- Problems with safe transportation and storage
- Safe disposal of waste and containers
- Lack of awareness among policy-makers

The policy is required to cover all aspects of the management of public health pesticides, namely, production/import, registration and regulation, transportation, storage, application, disposal of insecticide wastes and containers, medical intervention in cases of poisoning, and quality control, including laboratory assessment.

The enabling policies are as follows:

- International instruments
  - Stockholm, Rotterdam and Basel conventions
- International Code of Conduct
- Strategic approach to international chemicals management (SAICM - 2006)
- WHA Resolution 63.26 (2010)

- SEARO policies
  - Healthy public policy framework
  - IVM policy and judicious use of pesticides

The processes involved in the development of the public health pesticide management policy in the SEA Region are as follows.

- Meeting in the SEARO—November 2009
- Preparation of the draft policy
- SEARO expert consultation—April 2010
- Publication and dissemination of the document—September 2010
- The SEA regional IVM meeting in Chiang Mai—September 2010

The next steps for the Member States will be:

- To establish a national public health pesticide management policy and develop an action plan for its implementation
- Capacity development

WHO will provide advocacy and technical support to the Member States. The progress will be reported to WHA 2011 after the recommendations of the SEARO Regional Committee.

## 4.8 Operational Research Needs

Dr P. Jambulingam made a presentation on the operational research needs. Operational research should cover all the key elements of IVM.

### ***Advocacy, social mobilization and legislation***

- Regulatory mechanisms affecting vector control
- Development of effective legislation and enforcement
- Behavioural studies—KAP on acceptance and participation

- Community structure and social mobilization—methods of promotion and sustainability of IVM implementation and role of other sectors
- Enabling policy framework

#### ***Collaboration within the health sector and with other sectors***

- Assessing the impact of management practices of other sectors (agriculture, livestock, water management, pesticides) on vector proliferation, vector resistance and vector control
- Role of private sector in IVM
- Mechanisms of intra-sectoral and inter-sectoral collaboration and coordination to undertake and sustain vector control

#### ***Integrated approach***

- Effect of intervention(s) on multiple diseases
- Optimizing integration of vector control measures
- Incremental effects of individual interventions and impact of combination of interventions—modelling and validation
- Integration of vector control in other sectors
- Integration of vector control with other health measures, e.g. MDA

#### ***Evidence-based decision-making***

- New vector control products and tools, evaluation and integration
- IVM and management of insecticide resistance
- Mapping of vector distribution and IVM
- Land use, environmental management and conservation practices, climate change and vector ecology
- Response to insecticide application—resistance
- Vector response to IVM

### **Capacity-building**

- Assessment of training needs
- Quality improvement
- System changes

## **4.9 Field visit**

The participants made a field visit to the Vector-Borne Disease Control Centre, 10.4 Chiang Mai, Mae Rim district on 27 September 2010. Mr Tein Boonti, the vice chief of the centre, made a presentation on the VBD situation in the province. The province is low endemic for malaria. The various vector control measures which are implemented were discussed.

This was followed by a visit to the Ban Chang Subdistrict Administrative Organization, Aor-Bor-Tor, where the governor of the subdistrict, Mr Dej Sorn-Ngai, made a presentation on various activities for VBD control, giving details of community participation. Mr Kitipat Aung-Boonta, the head of the Health Centre (which?) briefed the participants on dengue control activities and social mobilization.

The field visit concluded with a visit to the Ban Chang Learning Centre, near which an *An. minimus* breeding site in slow moving stream was shown.

## **5. Conclusions of Group Work**

The participants were divided into three groups and worked on the following issues to arrive at conclusions, which formed the basis of the final recommendations of the regional meeting:

Group I: Road map for implementation of IVM at country level

Group II: Monitoring, evaluation, capacity-building and operational research needs

Group III: Social mobilization, partnership, advocacy and legislation

## **Group I: Road map for Implementation of IVM at Country Level**

### ***Policies***

- Developing and promoting healthy public policies and legislations for IVM should be the mainstay. To start with, the Member countries of the SEA Region, through their ministries of health as the lead agencies, need to decide on the basis of consensus with other stakeholders to adapt the IVM national guidelines and strategies.
- The IVM strategies need to include, wherever possible and feasible, a “health risk assessment” related to the VBD burden in the country that may be a useful tool for advocacy, policy and strategic actions by the government authorities.
- The IVM policy and strategic components should be included in and aligned with the objectives of the existing strategic plans for VBD (malaria, kala-azar, dengue, JE and others). Inter-sectoral collaboration with other ministries, institutions and organizations, including NGOs and the private sector, should be promoted at all levels.
- Intercountry collaboration should be achieved, and technical support from WHO and financial assistance from the development partners will be needed to secure IVM implementation at the country level.

### ***Member States***

The Member States should have the following responsibilities.

- They should develop an IVM strategic document which is endorsed by the competent national authority and incorporates the essential components of IVM policies and legislations. A national steering committee may be constituted to provide strategic directions for implementing IVM at the country level.
- An intersectoral workshop should be organized for building a consensus and defining the roles and responsibilities of other sectors for IVM implementation.

- A road map should be developed for IVM implementation at the national, state, provincial and district levels with the fullest collaboration of the related sectors and stakeholders. Necessary budgetary provisions should be made from the national programmes under the fiscal plans of the ministries of health in each country.
- The existing pesticide regulations should be updated and modified guidelines developed for pesticide use under IVM policies in line with the WHOPES guidelines.

### **WHO**

WHO should play the following role

- It should provide technical support for the development/ updating of the IVM policy and strategic document, including advocacy for IVM at the regional and national levels.
- It should promote intercountry collaboration and foster sharing of the expertise and resources available in the Region.
- WHO collaborating centres can be used for capacity-building, technical back-up support and research in IVM technical issues.

### **Collaboration**

National vector control programmes in the Member States should collaborate within health sector (with other programmes in the health sector) and with other ministries, institutions and organizations for IVM on the following areas in particular:

- Capacity-building
- Monitoring and evaluation
- Cross-border issues related to disease control; information-sharing and networking; synchronization of IVM interventions; potential research for development of new tools, etc.

### **Member States**

- The Member States should develop a perspective human resource development plan for IVM implementation at the national and sub-national levels.
- A career planning scheme for key staff (entomologists and other technical staff) should be developed for sustained technical capacity for IVM at the central and peripheral levels.
- The monitoring and evaluation tools should be updated and core indicators for IVM should be incorporated in the health management information system (HMIS).
- A cross-border mechanism for sharing of information and inter-country collaboration should be established and wherever possible, resource sharing should be promoted.

### **WHO**

- To provide technical support for the development of a training curriculum and entrust a centre of excellence or collaborating centre with the task of providing training to core staff from the Member States.
- To provide technical support for the development or updating of monitoring and evaluation tools aligned with the national HMIS.
- To provide technical support for fostering cross-border collaboration.

### **Pesticide management**

#### **Member States**

The Member States should take the following steps to improve pesticide management.

- Countries should develop a healthy public health policy and regulatory mechanism for procurement, supplies, storage and safe use of pesticides for IVM implementation.

- IVM can create an enabling environment for the safe use of pesticides and ensure the reduction of the use of chemical insecticides for vector control by promoting environment-friendly methods at each operational level.
- Countries should develop a mechanism for the safe disposal of worn-out ITN/LLIN, empty used insecticide containers and date-expired stocks of insecticides in line with WHO recommendations. Protecting spraymen from occupational exposure should be considered by the programmes.

## Group II: Monitoring, Evaluation, Capacity-Building and Operational Research Needs

Activity	Indicators	Methods of evaluation	Assumption/ Risk	Resources required
Stratification of areas according to disease burden and identification of epidemiological, entomological, ecological and socioeconomic factors responsible for transmission	<b>Epidemiological</b> API, case incidence, Mf prevalence rate, endemicity, proportion of imported cases	Data abstraction, data analysis	Completeness of data, reliability of data	Human and financial resources
	<b>Entomological</b> Vector prevalence, density and breeding sites	Entomological survey and data analysis	Inadequate surveys and shortage of resources	Establishment of sentinel sites and budget
	<b>Ecological</b> Number of breeding sites in each ecological setting, forest areas, coastal areas irrigation areas, etc.	Ecological survey and GIS mapping	Limited entomological and GIS expertise	Establishment of sentinel sites and budget
	<b>Socioeconomic</b>	KAP survey	Limited expertise	Human and financial resources
Identification of role and extent of need for vector control in each stratum	Number of districts with high mortality and morbidity in different socioeconomic and ecological situations	Survey and data analysis	Inadequate data and shortage of resources	Expertise and other resources
Identification of priority VBD, assessment of disease burden and vectors involved	Incidence rate, mortality rate, prevalence rate, drug resistance (%), insecticide resistance (%)	Epidemiological data, sentinel survey for therapeutic efficacy	Lack of complete data and quality of data	Epidemiological team, technical support, clinical support, research

Activity	Indicators	Methods of evaluation	Assumption/ Risk	Resources required
				information, insecticide resistant data (data on insecticide resistance?)
Identification and mapping of major determinants of VBD and communities at risk	Maps of communities at risk	Maps of vector distribution and abundance, case distribution, socioeconomic and anthropological survey, climate data, mobility of human population pattern	Reliability of data, mapping is very time-consuming	Money, technical support, GIS software, access to existing maps
Development of sustained surveillance system	Vector density per unit time (weekly/ monthly), prevalence rate of cases	Analysing VBD pattern in endemic areas, identified targeted areas	Completeness of data, information of cases (?)	Lack of resources, shortage of time
Establishment of information system	Regular recording and reporting of data	Abstraction of reporting system	Delay in reporting, unreliable data and lack of coordination	Human resources, lack of MIS
Identification of impending outbreaks of VBD	Presence of vector, disease pattern, vector density	Entomological and epidemiological data analysis	Data quality (reliability and validity)	Existing data
Development of rapid assessment tools for vector control need	Vector identification, prevalence and breeding sites	Adult and larval survey	Lack of baseline information	Identification keys, expert needs
Vector surveillance and behaviour	Vector density, parous rate, pupal and larval indices, number of positive breeding sites	Animal baits, hand collection, resting collections, light trap collections, larval collections	Shortage of resources (manpower, money, equipments)	Sentinel sites, entomological team, regular flow of funds
Insecticide resistance	Percentage mortality of each vector species	WHO susceptibility tests	Vector density and impregnated paper supply	Entomologists, entomological assistants, laboratory support and shortage of budget

### **Capacity-building**

The following recommendations were made for capacity-building.

- All the countries should have a data base/data bank of the public health/medical entomologists attached to the various sectors of the government.
- They should map out the existing entomological/vector control training institutions.
- The need for entomologists/vector control personnel in the country should be assessed.
- There should be coordination and collaboration between the training programmes within the country and within the Region, and the programmes should be harmonized.
- Training opportunities should be provided for entomologists/vector specialists. These could be long-term (Masters, PhD, diploma) or short-term training courses, as well as distance learning programmes.

### **Operational Research**

The recommendations in the sphere of operational research were as follows.

- (1) The impact of IRS or ITN/LLIN on vector prevalence and disease transmission should be studied in the following situations:
  - Efficacy of IRS and LLIN for vector control in different eco-epidemiological situations
  - Use of LLIN in various socio-anthropological situations
- (2) The impact of space spraying and the use of repellents for vector control should be studied.
- (3) The impact of biological control methods and larvicides on vector control should also be studied.
- (4) The appropriateness of source reduction in various eco-epidemiological situations should be evaluated.

- (5) The role of community participation in vector control should be analysed.
- (6) The role of GIS mapping in IVM needs to be studied.

### **Recommendations**

The following were the recommendations of Group II.

- (1) A working group of medical entomologists/VBD control personnel should be established in the SEA Region for sharing information and strengthening entomological role (the role of entomologists) in public health.
- (2) Capacity-building of medical entomologists/VBD personnel should be well coordinated.

### **Group III: Social Mobilization, Partnership, Advocacy and Legislation**

There is a need to identify the various stakeholders for active community participation in IVM, for example:

- Village leaders
- Farmers
- Local political leaders
- Local authorities/village development committees
- Religious leaders
- Women's associations/mothers' groups
- CBOs and NGOs
- Teachers
- Insecticide retailers

The prime movers and community health workers should be empowered to undertake local situation analysis and take evidence-based management decisions through a participatory approach to deal with local situations. They should be given orientation/training to identify the burden of the diseases, breeding sites and interventions so that they can take the best decisions for VBD control.

Advocacy efforts should be made for establishment/strengthening of legislative and regulatory control. These may include the following:

- In the existing public health legislation or bye laws, there should be a provision so that the owners of the households or heads of institutions in whose premises mosquito breeding is found are held accountable and punitive action including imposing a financial penalty is taken under the law;
- Health impact assessment of development projects should be a pre-requisite in developing planning in order to mitigate the possible adverse effects of such development relating to vector-borne diseases;
- Raising public awareness on the risk caused by inappropriate use and use of substandard and counterfeit pesticides in both public health and agriculture for human health and the environment;
- Strengthening capacity of regulatory authority for monitoring and regulation of public health pesticides for quality control and risk reduction;
- Regulation of pest control operators.

There is a need for inter-sectoral collaboration with public sector and with private sector and also civil society agencies viz.

- Corporate Social Responsibility of industries i.e. to undertake Vector Control in their respective areas as part of vector-borne disease control interventions;
- NGOs and Civil society to mobilize the community;
- Pesticide industry associations for stewardship efforts;
- Association of builders and construction managers to design building that do not support mosquito proliferation;
- Local government/council/ district administration
- Water resources development and irrigation department
- Forestry department
- Fishery department

- Tourist agencies to educate on mosquito preventive and personal protective measures
- Road and transport agencies
- Agriculture department
- Education department
- Port authority (airport, seaport and ground crossing) for environmental management measures
- Mass Media

Farmer Field School approach of agriculture may be utilized for

- Use of intermittent irrigation
- Reduced use of pesticides to promote natural predators of mosquito larvae
- Elimination of breeding sites
- Safe disposal of pesticide waste and used insecticide containers
- Safe use of insecticides/pesticides (use of mask, boots, gloves, jackets, goggles etc)
- Health education at community level

Developing materials for advocacy, sensitization and participation for different levels of implementation

- Develop materials in local languages
- IEC materials – design, development and distribution
- Guidelines for promotion and inclusion of IVM at different levels by different stakeholders
- Create messages about safety measures during storage, spraying operation, handling and disposal empty containers
- Utilize all types of media including electronic and print media
- Use of Community volunteers, village leader, religious leader, woman/mothers group, boy/girls scout, teacher, CBO, FBO and NGO
- Screening of houses for mosquito protection

- Environmental and personal protection measures at household level
- Promotion of insecticide treated materials for use as window curtains and screens (Private sector)

### **Recommendations**

#### **For Member States**

- Advocacy effort should be stepped up to raise awareness of the policy makers on the importance of IVM as the cost-effective and sustainable approach not only for the control of VBD, but also for the safe and judicious use of public health pesticides and sustained environmental health;
- Case studies on successes of IVM at country level should be documented
- Member States should allocate adequate budget for effective implementation of IVM to control VBD.

#### **For WHO**

- To provide technical support to Member States for implementing of IVM and exchange of experts /experiences within the region.

## **6. Recommendations**

- (1) The Member states should develop institutional arrangements and an implementation plan for IVM, including an M&E component, and legislation wherever applicable. A national IVM policy framework, including public health pesticide management, should be developed.
- (2) The Member States should strengthen entomological capacity for the implementation of IVM. WHO should coordinate and harmonize training programmes (including curriculum) for medical entomologists/vector control personnel at the regional level.

- (3) The Member States should establish a mechanism for advocacy and intersectoral collaboration for the development of an effective IVM package.
- (4) The Member States should create and consolidate cost-effective evidence-based IVM approaches through operational research.
- (5) WHO should provide support to the Member States for strengthening capacity for IVM implementation and promote intercountry collaboration and sharing of expertise on IVM.

## **Annex 1**

### **Agenda**

- (1) Inauguration and opening session
- (2) IVM principles and approaches
- (3) Country situation
- (4) Issues in implementation of IVM
- (5) Group work
- (6) Field visit
- (7) Presentation of group work
- (8) Conclusion and recommendations
- (9) Closing session

## Annex 2

# List of participants

### Bangladesh

Dr Md. Golam Faruque  
Upazila Health & Family Welfare Officer  
Naria, Shariatpur  
BANGLADESH

Mrs Entazar Ferdous  
District Entomologist  
Civil Surgeon Officer  
Chittagong, BANGLADESH

Dr Capt (Rtd.) A.B.K.M. Julfiqar  
Assistant Health Officer (Central)  
Health Department  
Dhaka City Corporation  
Dhaka, BANGLADESH

### Bhutan

Mr Rinzin Dukpa  
Malaria Technician  
Samtse Hospital  
Samtse, BHUTAN

Mr Rinzin Namgay  
Senior Entomologist  
VDCP  
Gelephu, BHUTAN

Mr Tshering Wangchuk  
Health Assistant  
Chuzergang BHU  
Sarpang, BHUTAN

### India

Dr A.C. Dhariwal  
Director  
National Vector Borne Disease Control  
Programme  
22, Shamnath Marg  
Delhi-110054  
Contact No.: 09968070427  
(Mob.); 091-11-23918576 (O), 23968329 (Fax)  
E-Mail: nvbdcp-mohfw@nic.in,  
dr\_dhariwal@yahoo.co.in

Mr Jyotirmoy Nandi  
Assistant Research Officer  
National Vector Borne Disease Control  
Programme  
22, Shamnath Marg  
Delhi-110054  
Contact No.: 91-011-23967745, 23967780  
E-Mail: nandi.nvbdcp@gmail.com

Mr Ravindra Nath Talukdar  
Assistant DHS (Entomology)  
District Nalbari  
Assam

Mr B.M. Varun  
District Malaria Officer  
O/o District Malaria Officer  
Mandla  
Madhya Pradesh

### Indonesia

Acep Effendi  
Program Manager  
Vector Control from NTT Province  
Jakarta, INDONESIA

Dr Bangkit Hutajulu  
Head of Sub Directorate Arbovirosis  
Jakarta, INDONESIA

Dr Supratman Sukowati  
Researcher  
NIHRD  
Jakarta, INDONESIA

Drs Winarno  
Head of Sub Directorate Vector Control  
Jakarta, INDONESIA

### Maldives

Mr Abdul Hameed Ali  
Director General  
Centre for Community Health and Disease  
Control  
MALDIVES  
Email: hirifinolu@hotmail.com

Ms Fathimath Rasheeda  
Public Health Programme Officer  
Centre for Community Health and Disease  
Control  
MALDIVES  
E-mail: frashy@hotmail.com;  
f.rasheeda@health.gov.mv

Mr Ibrahim Waheed  
Administrator  
Centre for Community Health and Disease  
Control  
MALDIVES  
Email: ibr\_waheed@hotmail.com

#### **Myanmar**

Ms Aye Aye Myint  
Entomologist  
Vector Borne Diseases Unit  
Department of Health  
Nay Pyi Taw  
MYANMAR

Dr (Mrs) Marlar Soe  
Malariologist  
National Malaria Control Program  
Department of Health  
Nay Pyi Taw  
MYANMAR

Ms Mar Mar Win  
Entomologist  
Vector Borne Diseases Unit  
Department of Health  
Nay Pyi Taw  
MYANMAR

#### **Nepal**

Mr Purushottam Gautam  
Entomologist  
Epidemiology & Disease Control Division  
Ministry of Health and Population  
Teku, Kathmandu, NEPAL

Mr Bijaya Jha  
Chief  
District Public Health Office  
Mahotari, NEPAL

Dr Shyam Raj Upreti  
Chief  
Vector Borne Diseases Research and Training  
Center (VBDRTC)  
Ministry of Health and Population  
Teku, Kathmandu, NEPAL

#### **Sri Lanka**

Dr Subashini Ariyaprema  
Entomologist/Western Province  
PDHS Office  
Colombo, SRI LANKA

Dr W A S Settinayake  
Director  
Anti Filariasis Campaign  
Ministry of Health  
Colombo 10, SRI LANKA

Dr Indira Weerasinghe  
Entomologist  
Medical Research Institute  
Colombo 8, SRI LANKA

#### **Thailand**

Mr Boonserm Aumaung  
Public Health Technical Officer  
Senior Professional Level  
Bureau of Vector-borne Diseases  
Ministry of Public Health  
Tivanond Road  
Nonthaburi 11000, THAILAND

Dr Wongwat Liulak  
Director  
Communicable Disease Control Division

Department of Health  
173 Dinso Road, Phra Nakhon,  
Saochingchar, Bangkok 10200, THAILAND

Dr Wannapa Suwonkerd  
Technical Officer (Senior Entomologist)  
Vector Borne Disease Section  
Office of Disease Prevention and Control, 10  
Ministry of Public Health  
18 Boonruangrit Rd., Muang District  
Chiang Mai 50200, THAILAND  
Tel : + 66-53-221529 ext: 216  
Fax: + 66-53-212389

Mrs Saowanit Vigaikadga  
Public Health Technical Officer  
(Professional Level)  
Deputy Director  
Bureau of the Vector-Borne Diseases  
Department of Disease Control  
Ministry of Public Health  
Tivanond Road, Nonthaburi 11000, THAILAND

**Timor-Leste**

Mr Ivo Cornelio Lopes Guterres  
National Vector Control Officer  
Environmental Health Department  
Dili, TIMOR-LESTE

Mr Jose Monis  
Environmental Health District Public Health  
Officer  
Environmental Health Department  
Dili, TIMOR-LESTE

Mr Raul Sarmento  
Project Manager and Senior Entomologist  
of Malaria Programme  
Dili, TIMOR-LESTE

**Temporary Adviser**

Dr P. Jambulingam  
Director  
Vector Control research Centre  
Medical Complex  
Indira Nagar  
Puducherry – 605006, INDIA  
Phone: +91 413 2272396 / 2272397  
E-mail: pcsaja@yahoo.com

**WHO Secretariat**

Dr Rajpal Singh Yadav  
VEM, WHO/HQ  
E-mail: yadavraj@who.int

Dr Raman Velayudhan  
VEM, WHO/HQ  
Email: velayudhanr@who.int

Dr A.P. Dash

Regional Adviser, Vector-borne and Neglected  
Tropical Diseases Control  
E-mail: dasha@searo.who.int

Dr Abdul Mannan Bangali  
National Professional Officer (VBN)  
WHO Country Office, BANGLADESH  
Email: bangalim@searo.who.int

Dr A. Gunasekharan  
National Professional Officer (CDS)  
WHO Country Office, INDIA  
Email: gunasekharana@searo.who.int

Mr Chawalit Tantinimitkul  
National Professional Officer (CDS)  
WHO Country Office, THAILAND  
Email: chawalit@searo.who.int

Mr Brijesh Kumar  
Administrative Clerk  
Vector-borne and Neglected Tropical Diseases  
Control Unit  
WHO/SEARO  
E-mail: kumarb@searo.who.int

### **Annex 3**

## **Message from Dr Samlee Plianbangchang, Regional Director, WHO South-East Asia**

Vector-borne diseases, such as malaria, dengue fever, chikungunya, Japanese encephalitis, kala-azar and lymphatic filariasis, cause a significant fraction of the global infectious disease burden. These diseases profoundly restrict socioeconomic status and development in countries with the highest rates of infection. Many of these countries are located in the tropics and subtropics. Vector-borne diseases cause approximately 1.4 million deaths per year worldwide. Most of these infections are both an effect of, and contribute to, poverty.

In recent years, vector-borne diseases have emerged as serious public health problems in the South-East Asia Region. In particular, dengue fever, Japanese encephalitis and malaria now occur in epidemic forms almost on an annual basis, causing considerable morbidity and mortality. Dengue is spreading rapidly to newer areas, with outbreaks occurring more frequently and explosively. Chikungunya has re-emerged in India after a gap of more than three decades. Outbreaks have also been reported from the Maldives, Sri Lanka and Thailand. The risk factors that play a key role in spread and transmission include globalization, unplanned and uncontrolled urbanization, poor environmental sanitation, human behaviour relating to water collection, lifestyles, widespread travel and human migration, the use of insecticides and drug resistance. At the same time, there are decreased resources for surveillance both within countries and across borders. The recent outbreaks of dengue and chikungunya have been widely reported in the electronic and print media.

From the perspective of infectious diseases, vectors are the transmitters of disease-causing organisms that carry the pathogens from one host to another. The transmission of vector-borne diseases to humans depends on three important factors: the pathologic agent; the arthropod vector; and the human host. But the vectors remain the common denominator. Vector control is considered the most generally effective measure to prevent the transmission of vector-borne diseases. And for some

diseases, no vaccine or medication is available, leaving vector control as the only option.

Actions to reduce vector-borne diseases can result in major health gains in poor environments. The present institutional structures tend to promote a narrow, sectoral approach to interventions for individual diseases. Intersectoral and interdisciplinary approaches can help control vector-borne diseases while maintaining ecosystem equilibrium. Actions taken to reduce the transmission of infectious diseases often have effects on other ecosystems services. Integrated vector management (IVM) permits a coordinated response both to health and the environment. IVM strategies use targeted interventions to remove or control vector breeding sites, disrupt vector life cycles and minimize vector-human contact, while minimizing the effects on other ecosystems services. IVM is widely viewed as a useful approach and is being increasingly promoted by the World Health Organization.

Environmental management and biological and selective chemical interventions can be highly cost-effective and entail very low environmental impacts. Potential interventions include insecticide-treated bed nets, selective indoor residual spraying and larviciding, and the use of fish, biolarvicides, etc.

IVM will be most effective when integrated into development approaches that also improve socioeconomic status. There is strong evidence that poverty and malnutrition increase vulnerability to the effects of vector-borne disease. An improvement in socioeconomic status facilitates the purchase of bed nets and other forms of personal or household protection for malaria and other vector-borne diseases. Better housing conditions are associated with reduced transmission of some vector-borne diseases. Disease control measures should, therefore, be part of integrated development strategies.

Public awareness forms an increasingly important component of the management of programmes (check). Aside from directly impacting disease control, health education gives individuals greater control over their lives and, therefore, promotes control programmes.

New “cutting-edge” interventions, such as transgenic techniques to reduce or eliminate the capacity of some vector species to transmit

infectious diseases, could be available within the next five to ten years. However, consensus is lacking in the scientific community on the technical feasibility and public acceptability of such an approach.

There remain a number of challenges to the successful expansion of IVM implementation among the Member States of our Region. There are social, cultural and epidemiological factors that impede successful programme performance. Improved capacity, intersectoral collaboration among government agencies and appropriate local bodies, social mobilization and community involvement would all contribute to greater control of vector-borne diseases. Research monitoring and evaluation are also essential.

This meeting provides an opportunity to discuss these challenges and offer your advice and guidance on achieving the goals of the programme.

### Annex 4

## Vector control methods adopted by Member States

Country	VBD	Vector	Vector control method	Insecticide used	Resistance
Bangladesh	Malaria ( <i>P. falciparum</i> , <i>P. vivax</i> )	<b>Primary vectors</b> <i>An. baimai (dirus)</i> , <i>An. minimus</i> , <i>An. philippinensis</i> , <i>An. sundaicus</i> <b>Secondary vectors</b> <i>An. aconitus</i> , <i>An. annularis</i> , <i>An. vagus</i> , <i>An. maculatus</i> (suspected), <i>An. willmori</i> (suspected)	ITN and LLIN (No IRS)	NA	
	Kala-azar	<i>P. argentipes</i>	Environmental sanitation		
	LF	<i>Cx. quinquefasciatus</i> , <i>Mansonia</i> spp.	Environmental sanitation		
	Dengue	<i>Ae. aegypti</i> <i>Ae. albopictus</i>	Larval control	Temephos Malaria oil	
Bhutan	Malaria ( <i>P. falciparum</i> , <i>P. vivax</i> )	<i>An. culicifacies</i> , <i>An. pseudowillmori</i> , <i>An. annularis</i>	IRS  Space spray  Biological	Cyfluthrin  Deltamethrin  <i>Danio rerio</i> <i>Danio dangila</i> <i>Puntius vittatus</i>	
	Kala-azar	<i>P. argentipes</i>	Environmental sanitation		
	Dengue	<i>Ae. aegypti</i> , <i>Ae. albopictus</i>	Fogging	Deltamethrin	
	Scrub typhus	Not known			
DPR Korea	Malaria ( <i>P. vivax</i> )	<i>An. sinensis</i> , <i>An. yatsushiroensis</i> , <i>An. lesteri</i> , <i>An. sineroides</i> , <i>An. lindesayi japonicus</i> , <i>An. loreiens</i>	IRS  ITN/LLIN		
India	Malaria ( <i>P. vivax</i> , <i>P. falciparum</i> , <i>P. malariae</i> )	<i>An. culicifacies</i> , <i>An. stephensi</i> , <i>An. minimus</i> <i>An. fluviatilis</i> , <i>An. sundaicus</i> , <i>An. dirus</i> <i>An. annularis</i> , <i>An.</i>	ITN and LLIN  IRS	DDT 50% Malathion Synthetic pyrethroids	<i>An. culicifacies</i> resistant to DDT, malathion and synthetic pyrethroids in many sites; <i>An. annularis</i> resistant to DDT

Country	VBD	Vector	Vector control method	Insecticide used	Resistance
		<i>varuna</i> , <i>An. philippinensis</i>			and malathion and tolerant to synthetic pyrethroids and <i>An. stephensi</i> resistant to DDT and tolerant to malathion
	Kala-azar ( <i>L. donovani</i> )	<i>P. argentipes</i>	IRS Environmental sanitation	DDT	<i>P. argentipes</i> resistance to DDT and synthetic pyrethroids recorded
	Cutaneous leishmaniasis ( <i>L. tropica</i> , <i>L. donovani</i> )	<i>P. papatasi</i> (?), <i>P. sergenti</i> (?), <i>P. longiductus</i> (?)	IRS		
	LF ( <i>W. bancrofti</i> , <i>B. malayi</i> )	<i>Cx. quinquefasciatus</i> , <i>Mansonia</i> spp.	Environmental sanitation		<i>Cx. Quinquefasciatus</i> resistant to synthetic pyrethroids
	Dengue and chikungunya	<i>Ae. aegypti</i> , <i>Ae. albopictus</i>	Fogging Larval control	Malathion Temephos BTI	
	JE	<i>Cx. tritaeniorhynchus</i> , <i>Cx. vishnui</i> group	Fogging Larval control	Malathion Intermittent irrigation	<i>Cx. vishnui</i> resistant to malathion
Indonesia	Malaria ( <i>P. falciparum</i> , <i>P. vivax</i> , <i>P. malariae</i> , <i>P. ovale</i> )	<i>An. aconitus</i> , <i>An. balabacensis</i> , <i>An. bancrofti</i> , <i>An. barbirostris</i> , <i>An. flavirostris</i> , <i>An. farauti</i> , <i>An. karwari</i> , <i>An. koliensis</i> , <i>An. punctulatus</i> , <i>An. ludlowi</i> , <i>An. letifer</i> , <i>An. leukosphyrus</i> , <i>An. maculatus</i> , <i>An. minimus</i> , <i>An. nigerrimus</i> , <i>An. parengensis</i> , <i>An. sundiacus</i> , <i>An. subpictus</i> , <i>An. sinensis</i> , <i>An. umbrosus</i> , <i>An. vagus</i> , <i>An. tessellatus</i>	IRS ITN and LLIN Larval control	Bendiocarb L-Cyhalothrin Etofenprox  Pyriproxyfen	<i>An. barbirostris</i> , <i>An. subpictus</i> , <i>An. sundiacus</i> tolerant to bendiocarb; <i>An. sundiacus</i> , <i>An. maculatus</i> tolerant to permethrin; <i>An. sundiacus</i> , <i>An. barbirostris</i> resistant to cypermethrin
	LF ( <i>W. bancrofti</i> )	<i>Ma. indiana</i> , <i>Ma. uniformis</i> , <i>An. aconitus</i>	Environmental sanitation		

Country	VBD	Vector	Vector control method	Insecticide used	Resistance
		<i>An. subpictus</i> , <i>An. bancrofti</i> , <i>An. koliensis</i> <i>An. farauti</i> , <i>An. punctualis</i> , <i>Cx. fatigans</i> , <i>Cx. annulirostris</i> , <i>Cx.</i> <i>bitaeniorrhyncus</i> , <i>Ae. kochi</i> , <i>Ae. obsturbans</i>			
	LF ( <i>B. malayi</i> , <i>B. timori</i> )	<i>Ma. boneae</i> , <i>Ma. dives</i> , <i>Ma. annualata</i> <i>Ma. indiana</i> , <i>Ma. uniformis</i> , <i>Ma. annulifera</i> <i>An. barbirostris</i> , <i>An. nigerrimus*</i> , <i>An. peditaeniatus*</i> , <i>An. vagus*</i> , <i>An. subpictus*</i> (* potential vector)	Environmental sanitation		
	Dengue and chikungunya	<i>Ae. aegypti</i> , <i>Ae. albopictus</i>	Adulticide  Larval control	Malathion Cypermethrin Pirimiphos methyl  Pyriproxyfen	
	JE	<i>Cx. tritaeniorhynchus</i> , <i>Cx. gelidus</i>			
The Maldives	LF ( <i>W. bancrofti</i> )	<i>Cx. quinquefasciatus</i>	Fogging  Larvicide	Deltacide (deltamethrin + S-bioallethrin + piperonyl butoxide)  Bti	
	Dengue and chikungunya	<i>Ae. aegypti</i> , <i>Ae. albopictus</i>	Fogging  Larvicide	Deltacide (deltamethrin + S-bioallethrin + piperonyl butoxide)  Bti	
Myanmar	Malaria ( <i>P. falciparum</i> , <i>P. vivax</i> , <i>P. malariae</i> , <i>P. ovale</i> )	<i>An. minimus</i> , <i>An. dirus</i> , <i>An. culicifacies</i> , <i>An. sundaicus</i> , <i>An. annularis</i> , <i>An. aconitus</i>	ITN/LLIN  IRS	DDT 75% Malathion Alphacypermethrin	<i>An. culicifacies</i> , <i>An. aconitus</i> , <i>An. annularis</i> , <i>An. barbirostris</i> and <i>An. hyrcanus</i> resistant and <i>An. dirus</i> tolerant to organochlorine
	LF ( <i>W. bancrofti</i> )	<i>Cx. quinquefasciatus</i>	Environmental sanitation as		

Country	VBD	Vector	Vector control method	Insecticide used	Resistance
			complement to mass drug administration		
	Dengue (all 4 serotypes of virus) and chikungunya	<i>Ae. aegypti</i>	Adulticide Larvicide Biological	Malathion Temephos Larvivorous fish in some applicable areas	
	JE	<i>Cx. tritaeniorhynchus</i>	Space spray Environmental sanitation	To control outbreak As routine measure	
Nepal	Malaria ( <i>P. vivax</i> , <i>P. falciparum</i> )	<i>An. fluvialis</i> , <i>An. maculatus</i> , <i>An. annularis</i>	LLIN IRS	Synthetic pyrethroids	No resistance to synthetic pyrethroids so far
	LF ( <i>W. bancrofti</i> )	<i>Cx. quinquefasciatus</i>	Environmental sanitation		
	Kala-azar	<i>P. argentipes</i>	Environmental sanitation		
	Cutaneous leishmaniasis (a few cases reported)				
	Dengue	<i>Ae. aegypti</i>			
	JE	<i>Cx. tritaeniorhynchus</i>			
Sri Lanka	Malaria ( <i>P. vivax</i> , <i>P. falciparum</i> )	<i>An. culicifacies</i> , <i>An. subpictus</i> , <i>An. annularis</i>	ITN and LLIN IRS	Synthetic pyrethroids	
	LF ( <i>W. bancrofti</i> )	<i>Cx. quinquefasciatus</i>	Environmental sanitation		
	Cutaneous leishmaniasis ( <i>L. donovani</i> )	<i>P. argentipes</i> , <i>Sergentomyia zeylanica</i> (?)			
	Dengue	<i>Ae. aegypti</i> , <i>Ae. albopictus</i>	Fogging Larval control (elimination of breeding sites by community mobilization)	Malathion Synthetic pyrethroids Temephos Bti Larvivorous fish	
Thailand	Malaria	<i>An. dirus</i> , <i>An. minimus</i> , <i>An. maculatus</i> , <i>An. epiroticus</i> , <i>An. aconitus</i> , <i>An. pseudowillmori</i>	IRS ITN and LLIN Larvivorous fish	Deltamethrin Bifenthrin Alpha-cypermethrin	<i>An. dirus</i> and <i>An. minimus</i> tested and found susceptible
	LF	<i>Mansonia</i> spp., <i>Ae.</i>	Environmental		

Country	VBD	Vector	Vector control method	Insecticide used	Resistance
	( <i>W. bancrofti</i> , <i>B. malayi</i> )	<i>nevius</i>	management		
	Visceral leishmaniasis	<i>P. argentipes</i> (?)	Environmental management		
	Dengue and chikungunya	<i>Ae. aegypti</i> , <i>Ae. albopictus</i>	Source reduction Larvicide Biological control Space spraying	Temephos   Deltamethrin	<i>Ae. Aegypti</i> resistant to most synthetic pyrethroids, carbamate and malathion
	JE	<i>Cx. gelidus</i> , <i>Cx. fuscocephala</i> , <i>Cx. tritaeniorhynchus</i>	Source reduction Environmental management		
Timor-Leste	Malaria	<i>An. barbirostris</i> , <i>An. subpictus</i> , <i>An. sundaicus</i>	LLIN IRS Larvivorous fish Personal protection	Lambdacyhalothrin  <i>Aplochilus panchax</i>	
	LF ( <i>W. bancrofti</i> , <i>B. malayi</i> , <i>B. timori</i> )	<i>An. barbirostris</i> , <i>Cx. quinquefasciatus</i>	Environmental sanitation		
	Dengue	<i>Ae. aegypti</i> , <i>Ae. albopictus</i>	Fogging Larval control Container management	Malathion  Temephos Lambdacyhalothrin Methoprene	

Note: The species of organisms that cause malaria and lymphatic filariasis in the respective countries are given in brackets.

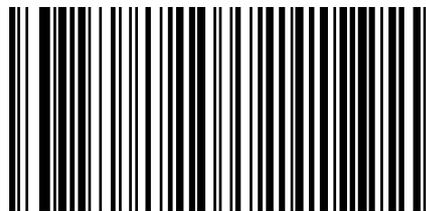
In recent years, vector-borne diseases (VBDs) like malaria, dengue, Japanese encephalitis, lymphatic filariasis, kala-azar and chickungunya have emerged as important public health problems in the South-East Asia Region. The common denominator of all these diseases is vectors. Integrated vector management (IVM) is one of the key elements of the revised malaria control strategy in the SEA Region, which was endorsed at the 2007 Regional Committee meeting. IVM strategies use targeted interventions to remove or control vector breeding sites, disrupt vector life cycles and minimize vector-human contact, while minimizing the harmful effects of synthetic insecticides on the ecosystem. There is a need to develop a national policy on the IVM strategy for prevention and control of these diseases. This regional meeting reviewed implementation plans for scaling up IVM in the Member States. Recommendations include strengthening capacity for IVM implementation, coordinating and harmonizing training programmes, promotion of intercountry collaboration and sharing of expertise on IVM.



**World Health  
Organization**

**Regional Office for South-East Asia**

World Health House  
Indraprastha Estate,  
Mahatma Gandhi Marg,  
New Delhi-110002, India



SEA-CD-222