



Ministry of Health and Family Welfare  
Government of India



GUIDELINES ON

# MOSQUITO AND OTHER VECTOR CONTROL RESPONSE

National Vector Borne Disease Control Programme

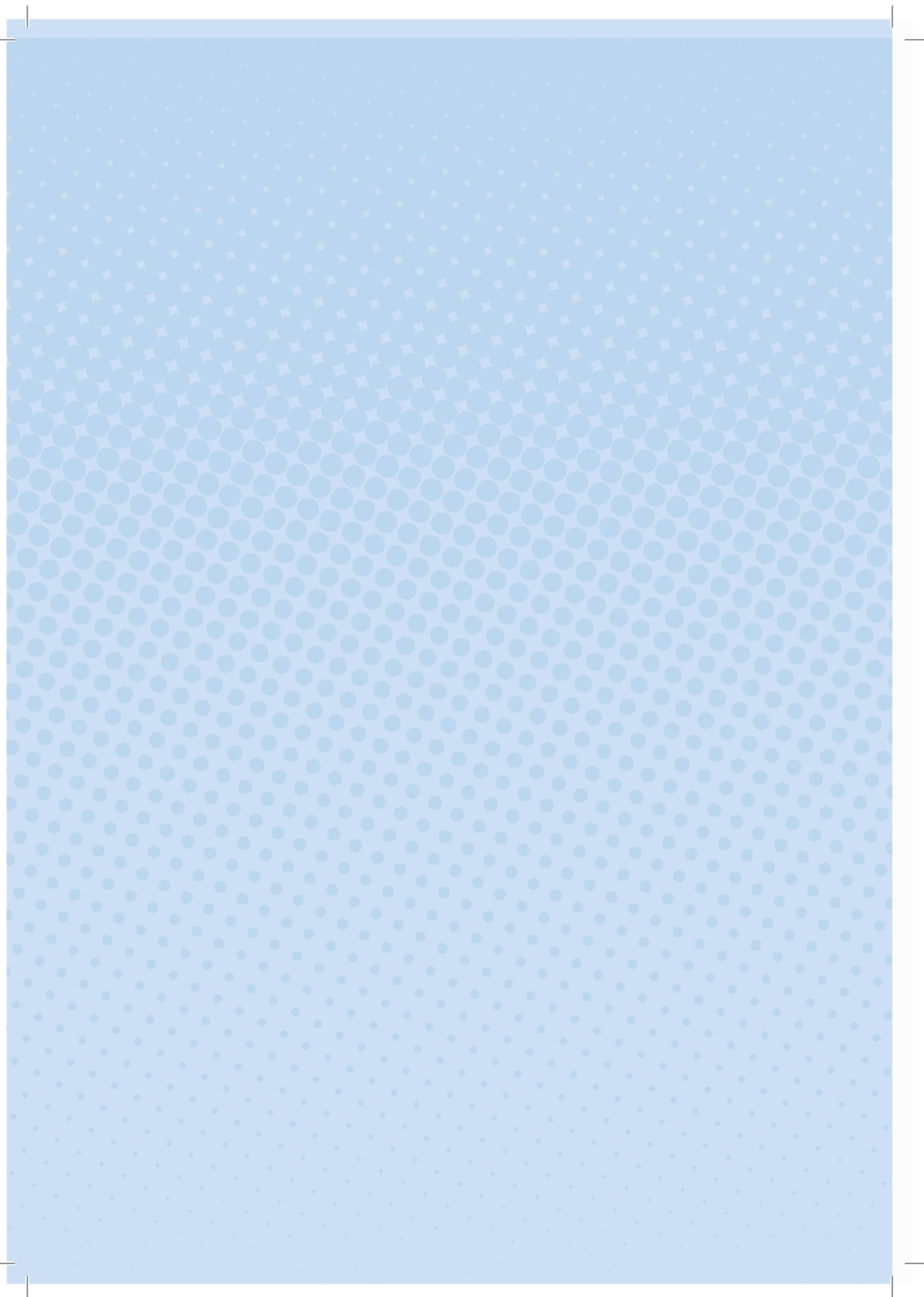


GUIDELINES ON

# MOSQUITO AND OTHER VECTOR CONTROL RESPONSE

2020







सबका साथ, सबका विकास,  
Sabka Saath, Sabka Vikas, Sabka Vishwas

## डॉ हर्ष वर्धन Dr Harsh Vardhan

स्वास्थ्य एवं परिवार कल्याण, विज्ञान और प्रौद्योगिकी  
व पृथ्वी विज्ञान मंत्री, भारत सरकार  
Union Minister for Health & Family Welfare,  
Science & Technology and Earth Sciences  
Government of India



### MESSAGE

Growing burden and threat of vector borne diseases is one of the biggest public health challenges in the country. The climatic conditions of India are congenial for transmission of many tropical diseases, including those transmitted through mosquitoes and other vectors. Among these, Malaria, Kala-azar, Japanese Encephalitis and Lymphatic Filariasis afflict the marginalized population and pose challenges to economic development due to the associated poverty. Rapid urbanization, concurrent population growth, climate change, diminishing potable water and increased population movement have triggered the spread of dengue and chikungunya to newer geographical locations. Besides, recent years have witnessed emergence or re-emergence of many vector borne diseases, like ZIKA virus disease, scrub typhus etc.

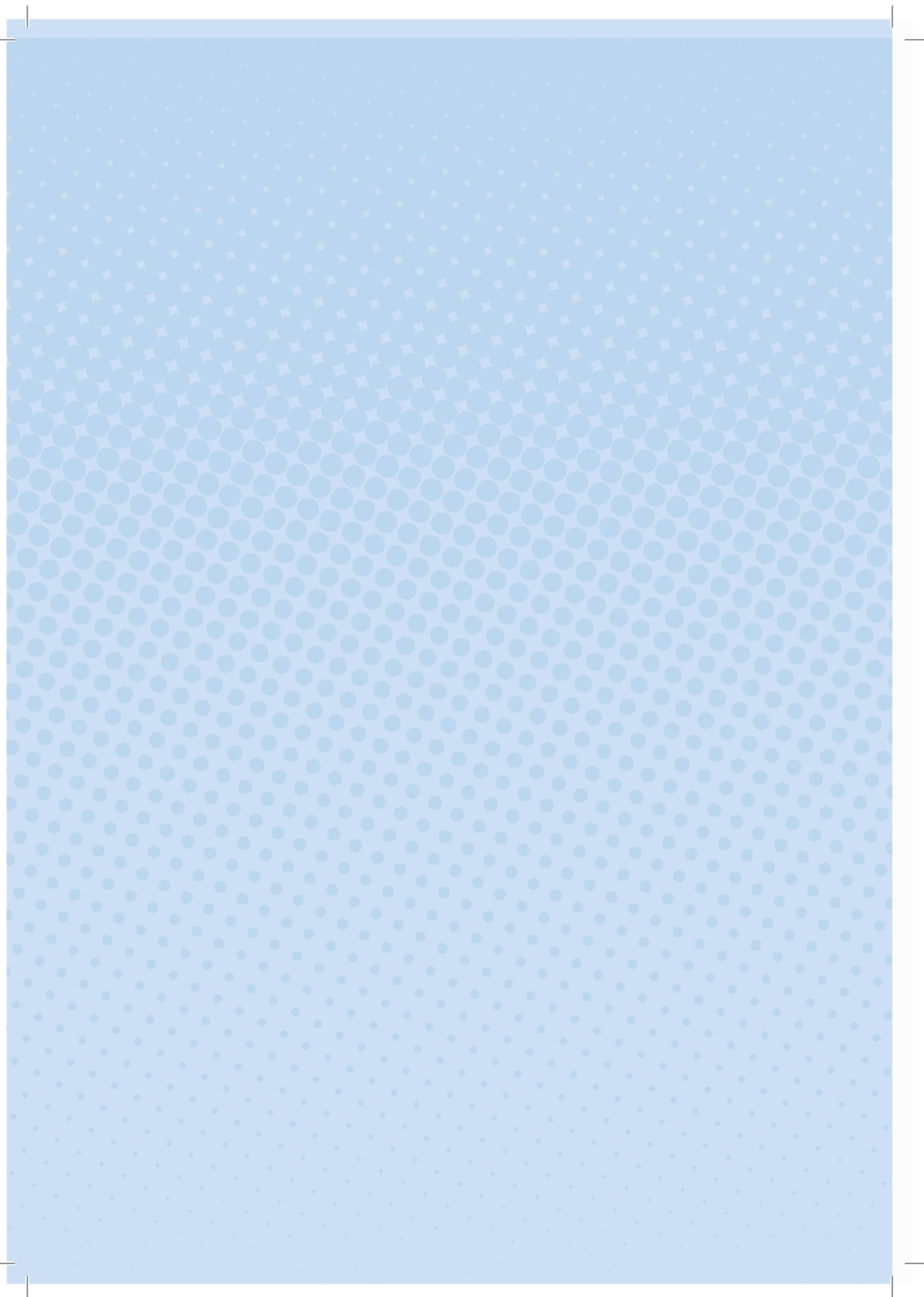
2. Aligning with the global targets, India is committed to eliminating Malaria, Kala-azar and Lymphatic filariasis. For achieving these goals and sustaining the efforts subsequently, role of vector management would be pivotal. Timely implementation of vector control measures and management of outbreaks are crucial for reducing the morbidity and mortality due to vector borne viral diseases.

3. I hope that the Guidelines on Mosquito and other Vector Control Response by National Vector Borne Disease Control Programme will be a strong pillar in these endeavors. It sets out a holistic approach involving newer technology, additional thrust with the strengthening of existing infrastructure, involvement of community and other stakeholders to make vector control more effective and sustainable.

(Dr. Harsh Vardhan)

कार्यालय: 348, ए-स्कंध, निर्माण भवन, नई दिल्ली-110011 • Office: 348, A-Wing, Nirman Bhawan, New Delhi - 110011  
Tele: (O) : +91-11-23061661, 23063513 • Telefax: 23062358 • E-mail: hfwminister@gov.in  
निवास: 8, तीस जनवरी मार्ग, नई दिल्ली-110011 • Residence: 8, Tees January Marg, New Delhi - 110011  
Tele: (R) : +91-11-23794649 • Telefax: 23794640







अश्विनी कुमार चौबे  
Ashwini Kumar Choubey

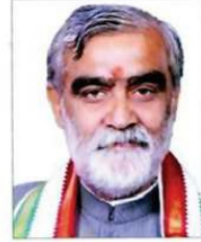


सर्वसन्तु निरामया



स्वास्थ्य एवं परिवार कल्याण राज्य मंत्री  
भारत सरकार

MINISTER OF STATE FOR  
HEALTH & FAMILY WELFARE  
GOVERNMENT OF INDIA



### संदेश

वैक्टर जनित बीमारियां और उनका प्रसार एवं प्रभाव भारतवर्ष सहित विश्व में एक गंभीर चिंता का विषय है। इन बीमारियों के रोकथाम एवं नियंत्रण पर और अधिक विशेष ध्यान केंद्रित करने की आवश्यकता है। समाज पर वैक्टर जनित बीमारियों का आर्थिक बोझ भी ज्यादा है। इन रोगों के समय पर नियंत्रण के लिए, राष्ट्रीय वैक्टर जनित रोग नियंत्रण कार्यक्रम ने मच्छर और अन्य वैक्टर के नियंत्रण प्रक्रिया पर दिशा-निर्देश विकसित किए हैं। इनसे मौजूदा एंटोमोलॉजिकल आधारभूत व्यवस्था को मजबूत करके वैक्टर जनित रोगों में कमी हेतु वैक्टर नियंत्रण को सुदृढ़ किया जा सकता है। मैं दिशा-निर्देशों के विकास में टीम को उनके प्रयासों के लिए बधाई देता हूं।

मुझे पूर्ण विश्वास है कि ये दिशा-निर्देश मलेरिया, काला-जार, लिम्फेटिक फाइलेरिएसिस (हाथीपांव) के उन्मूलन के लक्ष्य को प्राप्त करने में सहायक होंगे। साथ ही डेंगू, चिकुनगुनिया और जापानी इंसेफेलाइटिस की रोकथाम की रणनीति को अधिक प्रभावी बनाने में कारगर सिद्ध होंगे।

(अश्विनी कुमार चौबे)

नई दिल्ली

Office : 250, 'A' Wing,  
Nirman Bhavan, New Delhi-110 011  
Tel. : 011-23061016, 011-23061551  
Telefax : 011-23062828  
E-mail : moshealth.akc@gov.in

Residence :  
30, Dr. APJ Abdul Kalam Road,  
New Delhi-110003  
Tel. : 011-23794971, 23017049





प्रीति सूदन

सचिव

**PREETI SUDAN**

Secretary



भारत सरकार  
स्वास्थ्य एवं परिवार कल्याण विभाग  
स्वास्थ्य एवं परिवार कल्याण मंत्रालय  
Government of India  
Department of Health and Family Welfare  
Ministry of Health and Family Welfare



### Message

Vector Borne Diseases pose a serious threat in tropical and subtropical countries including India, affecting individuals and families resulting in social distress and economic burden. Our country has made impressive gains towards the elimination of Malaria, Lymphatic Filariasis and Kala-azar. However, the burden of many other arboviral diseases like Dengue, Chikungunya and Japanese Encephalitis has increased in recent years with repeated outbreaks in many parts of the country. Emerging diseases like Zika virus infection, Crimean-Congo Hemorrhagic Fever, Kyasanur Forest Disease, Scrub Typhus are also adding to public health concern.

Vector control strategy has remained an integral part of National Vector Borne Disease Control Programme. Its impact has been evident during 60's in bringing down the cases and deaths due to Malaria in the country. However, the effectiveness of vector control could not be sustained in recent years due to several reasons. Therefore, a need was felt for a holistic approach aligned to the principle of Universal Health Coverage for effective prevention and control of vector borne diseases. Accordingly, National Vector Borne Disease Control Programme has developed the "Guidelines on Mosquito and other Vector Control Response" to leverage the existing vector control interventions with accelerated efforts.

I am sure that this document will help in significantly strengthening entomological pursuits and in acceleration of vector control activities to minimize the risk and burden of vector borne diseases and help achieve the NHP 2017 and the SDG targets.

  
(Preeti Sudan)



वन्दना गुरनानी, भा.प्र.से.

**Vandana Gurnani, I.A.S.**

अपर सचिव एवं मिशन निदेशक (रा.स्वा.मि.)

Additional Secretary & Mission Director (NHM)



भारत सरकार  
स्वास्थ्य एवं परिवार कल्याण मंत्रालय  
निर्माण भवन, नई दिल्ली - 110011

Government of India  
Ministry of Health & Family Welfare  
Nirman Bhavan, New Delhi - 110011



#### MESSAGE

Vector borne diseases pose a major threat to the health of people around the world including India. Since the inception of National Health Mission in 2005, efforts have been made to accelerate the activities for prevention and control of vector borne diseases in general, and for elimination of Malaria, Kala-azar and Lymphatic filariasis from India in particular. Vector control is a powerful preventive tool for arboviral diseases which do not have any specific drug for treatment. However, over the years vector control efforts in India have faced various challenges, and have not yielded the desired results due to multiple reasons. It is strongly felt that the entomological aspect needs to be geared up and aligned with the evidence based best global strategies in order to achieve Sustainable Development Goals.

In view of above, vector control strategies have been revisited and the 'Guidelines on Mosquito and other Vector Control Response' have been developed by the National Vector Borne Disease Control Programme. This document is to help the States in improving the vector control interventions for prevention and control of mosquito and other vector borne diseases with optimal utilization of available resources and tools to achieve the desired outcomes in an effective and efficient manner.

I believe this document will be beneficial for all those who are involved in policy making, planning, management and research on prevention and control of vector borne diseases.

(Vandana Gurnani)





**रेखा शुक्ला**  
**REKHA SHUKLA**  
संयुक्त सचिव  
JOINT SECRETARY



भारत सरकार  
स्वास्थ्य एवं परिवार कल्याण मंत्रालय  
निर्माण भवन, नई दिल्ली - 110011  
Government of India  
Ministry of Health & Family Welfare  
Nirman Bhavan, New Delhi - 110011



#### MESSAGE

Vector Borne Diseases pose a significant public health threat in the country. Vector control strategies have been implemented for managing the disease transmission since the inception of the National Vector Borne Disease Control Programme (NVBDCP), and continue to remain its mainstay. It has, however, been observed that the existing vector control interventions suffer from a number of limitations in terms of human resource, service delivery, long-term sustainability and other technical issues. Therefore, it's considered important to review the vector control concepts in line with the changing bio-ecology, vector bionomics, climate, epidemiology, global practices and recent advancements in vector control.

In light of above, the 'Guidelines on Mosquito and other Vector Control Response' have been framed by the NVBDCP in consultation with the subject experts. The Guidelines aim to counter the rapidly changing situation, prevent the entry of emerging threats and pave the way for achieving the elimination targets of VBDs under the National Health Policy. This document shall also render technical guidance to the implementing agencies, research organizations, stakeholders, inter-ministerial and inter-sectoral partners of NVBDCP.

I hope these Guidelines will be a useful resource that can be adapted by the states according to their respective vector borne disease situation. Consistent and continued implementation of entomological activities shall certainly go a long way in reducing the burden of Vector Borne Diseases (VBDs). I hope that the States/UTs shall strengthen their internal mechanisms to ensure adherence to the important parameters in the Guidelines for improving the effectiveness of the programme implementation at all levels.

I also take this opportunity to put on record my appreciation for the officers and staff of NVBDCP for the development of these guidelines.

(Rekha Shukla)

---

स्वच्छ भारत-स्वस्थ भारत

Telefax : 011-23061673, 23061541 E-mail : rekha.shukla@nic.in

डा० नीरज धींगरा  
निदेशक

**Dr. Neeraj Dhingra**  
Director

MBBS, D.Orth, M.D. (Community Medicine)

Tel. : +91-11-23918576

Fax : +91-11-23968329

E-mail : dhingradr@hotmail.com



भारत सरकार  
राष्ट्रीय वैक्टर जनित रोग नियंत्रण कार्यक्रम  
स्वास्थ्य सेवा महानिदेशालय  
स्वास्थ्य एवं परिवार कल्याण मन्त्रालय  
२२, शाम नाथ मार्ग, दिल्ली-११००५४

Government of India  
NATIONAL VECTOR BORNE DISEASE CONTROL PROGRAMME  
Directorate General of Health Services  
Ministry of Health & Family Welfare  
22, Sham Nath Marg, Delhi - 110054



#### FOREWORD

'Guidelines for Mosquito and other Vector Control Response' (MVCR) have been drafted to facilitate delivery of interventions by the states, municipalities, local bodies, Panchayats and other institutions and thereby give an impetus to the Integrated Vector Control Strategies for prevention and control of vector borne diseases in India. The strategies including outlined in the MVCR are to help a rational decision making and effective use of limited resources. These guidelines include strengthening of infrastructure, human resource, capacity, inter-ministerial and inter-sectoral coordination, monitoring system, logistic management, community involvement etc. The Guidelines promote linking the vector control with initiatives like Swachh Bharat Abhiyan, Smart Cities Mission, Ayushman Bharat, Aspirational District Programme, Kayakalp etc. MVCR has been designed to leverage the use of these platforms for initiating effective response for control of mosquitoes and other vectors of public health importance. Implementation science research agenda is an inbuilt component of MVCR for development of innovative approaches with newer tools and interventions in vector control.

Effective implementation of MVCR will entail engagement with public health leadership for getting strong political commitment, advocacy, partnership, resource mobilization, involvement of non-health sector, policy and normative support to elevate vector control as a public health service. Guidelines provided changes in regulatory processes and effective communication across and among various ministries/departments which are essential in the context of universal health coverage to achieve Sustainable Development Goals (SDGs) to ensure healthy lives and promote wellbeing for every fellow citizen on this world.

(Dr. Neeraj Dhingra)



Swachh Bharat : An opportunity for Dengue and Malaria Control  
Website : [www.nvbdcp.gov.in](http://www.nvbdcp.gov.in)







**Dr. Kalpana Baruah**  
Additional Director

Tel: 91-11-23910104  
E-mail: drkalpanabaruah@gmail.com

भारत सरकार  
राष्ट्रीय वैक्टर जनित रोग नियंत्रण कार्यक्रम  
स्वास्थ्य सेवा महानिदेशालय  
स्वास्थ्य एवं परिवार कल्याण मन्त्रालय  
२२, शाम नाथ मार्ग, दिल्ली-११००५४

Government of India  
NATIONAL VECTOR BORNE DISEASE CONTROL PROGRAMME  
Directorate General of Health Services  
Ministry of Health & Family Welfare  
22, Sham Nath Marg, Delhi - 110054



## PREFACE

Vector Borne Diseases (VBDs) affect millions of people all over the country and affect not only the individuals but community at large with heavy toll on human life and impoverish those who survived. India having tropical climate is under constant threats from vector borne diseases due to diversity of both pathogens and disease vectors. There has been constant threat of emerging and re-emerging VBDs with a great potential for geographical spread and outbreaks.

Significant advances have been made in the field of diagnosis, disease surveillance and treatment. However, entomological surveillance and vector control still remain the key components for prevention and control of VBDs. But the value of vector control and its reliance have not been clearly recognized and its effectiveness has been declined in recent years due to several reasons. Global Vector Control Response (2017-2030), World Health Organization also highlights for strengthening of entomological infrastructure and vector control.

A holistic approach aligning with principle of Universal Health Coverage was perceived as the need for development of the Guidelines on Mosquito and other Vector Control Response (MVCR) as a policy document to minimize morbidity and mortality associated with VBDs. Major administrative and technical determinants for efficient vector management have been reviewed in MVCR and stressed for strengthening to bridge the gaps. It will leverage the existing vector control interventions on attaining inter-sectoral convergence and strong community engagement in controlling vectors of public health importance. It envisages on identification of priority areas for research on evaluation of interventions and to develop newer tools to benefit the community in an efficient and economic manner. For successful implementation of vector control at various levels, roles and responsibilities have been clearly articulated in MVCR. It also emphasizes for a robust response mechanism and call for actions at National, State, District and Municipal level to achieve the desired goals and targets.

It is hoped that the MVCR will help in strengthening and improving the vector control programme in a comprehensive manner to minimize the economic and social burdens of VBDs.

  
(Dr Kalpana Baruah)



Swachh Bharat : An opportunity for Dengue and Malaria Control.  
Website : [www.nvbdc.gov.in](http://www.nvbdc.gov.in)



# ACKNOWLEDGEMENTS

The Guidelines on Mosquito and other Vector Control Response (MVCR) have been developed through a process of extensive consultations. The Global Vector Control Response (GVCR) 2017-2030 was shared by World Health Organization (WHO) with the member countries after adoption in the 70th session of World Health Assembly held in May 2017 at Geneva, Switzerland. The rationale and priorities of GVCR in Indian context were discussed in detail with experts from NVBDCP, NCDC, ICMR, WHO, Municipal Corporations, Medical Colleges, Universities, various professional bodies and stakeholder organizations. This document has been developed by Dr Kalpana Baruah, Additional Director, NVBDCP under the leadership of Dr Neeraj Dhingra, Director NVBDCP and Dr PK Sen, former Director along with a team of Consultants - Dr Amit Katewa, Dr Kaushal Kumar, Dr Gavendra Singh, Sk Md Jakir Hossain and Shri Sanjay Kumar Gupta.

The Directorate of NVBDCP is grateful to Dr PL Joshi, former Director NVBDCP for his critical technical inputs in drafting and providing valuable suggestions for accomplishment of this document. The crucial comments and suggestions received from Prof AP Dash, Vice Chancellor, Central University, Tamil Nadu throughout the draft are greatly acknowledged. NVBDCP is grateful to Dr Raman Velayudhan, Coordinator, Vector Ecology and Management, WHO HQs, Geneva; Dr PK Srivastava, Ex Joint Director, NVBDCP; Dr P Jambulingam, former Director VCRC; Dr K Raghavendra, Scientist G, NIMR; Dr K. Krishnamurthy, Senior Consultant VCRC; Dr S. Subramanian, Scientist-F VCRC; Dr Ravi Kumar, Senior Regional Director, RoH&FW, Bengaluru; Dr Shaukat Kamal, Joint Director, RoH&FW, Lucknow; Dr T Dilip Kumar, Ex State Entomologist, Kerala; Dr Ramesh Chandra, Ex State Entomologist, Uttar Pradesh and Dr NR Tuli, Deputy Municipal Health Officer, South Delhi Municipal Corporation for their indispensable technical contributions towards finalization of this document.

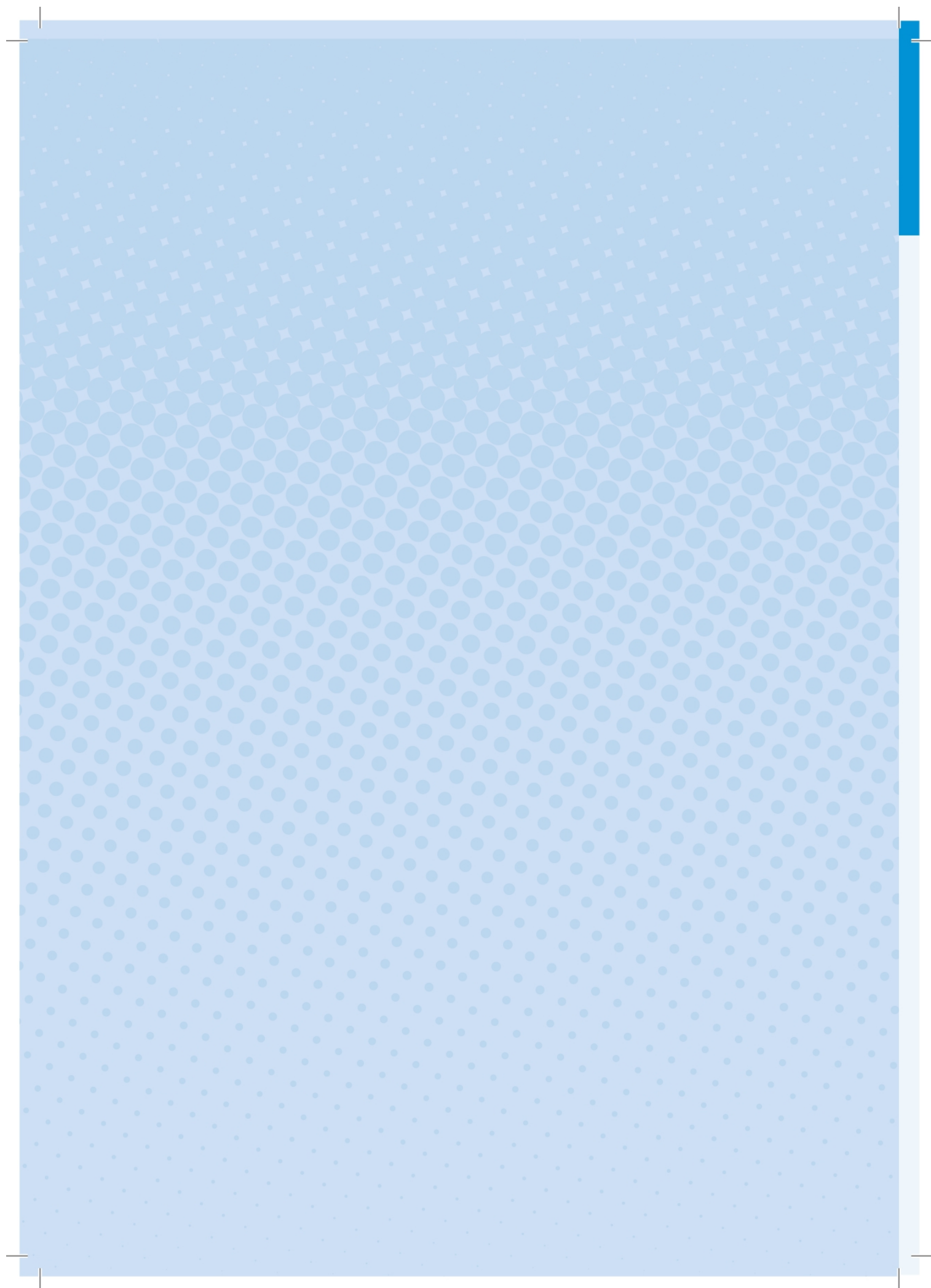
NVBDCP is grateful to Shri Manoj Jhalani, former Additional Secretary & Mission Director NHM, Smt. Vandana Gurnani Additional Secretary & Mission Director NHM, Shri Vikas Sheel, Joint Secretary and Smt. Rekha Shukla, Joint Secretary, MoH&FW for their overarching guidance in bringing out this document.

NVBDCP acknowledges the technical suggestions by Dr NS Dharmshaktu, Ex Principal Advisor (Public Health), Dte. GHS, MoH&FW.

The contribution of Shri CK Rao, Ex Deputy Director, NVBDCP & former NPO, WHO in reviewing the document critically before printing is gratefully acknowledged.

NVBDCP sincerely acknowledges the valuable support and inputs of Team Leader, Communicable Diseases and Dr Roop Kumari, NPO, WHO Country office for India. The Communication team of WCO is also acknowledged for editing and designing the document.

The support of Ms Nandini Arora, Shri Sachin Verma and Ms Puja Agarwal is also duly acknowledged.





# ABBREVIATIONS

AES	Acute Encephalitis Syndrome
ASHA	Accredited Social Health Activist
AWWs	Anganwadi Workers
AYUSH	Ayurveda, Yoga and Naturopathy, Unani, Siddha and Homoeopathy
BCC	Behavioural Change Communication
Bti	<i>Bacillus thuringiensis</i> var. <i>israelensis</i>
CBO	Community Based Organization
CBSE	Central Board of Secondary Education
CCHF	Crimean Congo Haemorrhagic Fever
CCCO	Central Cross Checking Organization
CDPO	Child Development Project Officer
CFR	Case Fatality Rate
CII	Confederation of Indian Industry
COMBI	Communication for Behavioural Impact
CPWD	Central Public Works Department
CSO	Civil Society Organization
DMO	District Malaria Officer
DPO	District Programme Officer
EC	Emulsifiable Concentrate
FBO	Faith Based Organization
FMR	Financial Management Report
GoI	Government of India
Govt	Government
GR	Granules
GVCR	Global Vector Control Response
HQs	Head Quarters
HR	Human Resources
H&FW	Health & Family Welfare
HUPA	Housing and Urban Poverty Alleviation
ICMR	Indian Council of Medical Research
ICSE	Indian School Certificate Examinations
IDSP	Integrated Disease Surveillance Programme
IEC	Information, Education and Communication
IPC	Inter Personal Communication
IRS	Indoor Residual Spraying
ITN	Insecticide Treated Nets
IVM	Integrated Vector Management
JE	Japanese Encephalitis
KA	Kala-azar
KFD	Kyasanur Forest Disease

LF	Lymphatic Filariasis
LLIN	Long Lasting Insecticidal Nets
MCGM	Municipal Corporation of Greater Mumbai
MDA	Mass Drug Administration
MGNREGA	Mahatma Gandhi National Rural Employment Guarantee Act
MPO	Modified Plan of Operation
MVCR	Mosquito and other Vector Control Response
NCC	National Cadet Corps
NCDC	National Centre for Disease Control
NFCP	National Filaria Control Programme
NGO	Non Governmental Organization
NHP	National Health Policy
NMCP	National Malaria Control Programme
NMEP	National Malaria Eradication Programme
NSS	National Service Scheme
NVBDCP	National Vector Borne Disease Control Programme
PHC	Primary Health Centre
PIP	Project Implementation Plan
PKDL	Post Kala-azar Dermal Leishmaniasis
PRI	Panchayati Raj Institutions
PWD	Public Works Department
RD	Rural Development
RDT	Rapid Diagnostic Test
RoH&FW	Regional Office for Health & Family Welfare
RWA	Resident Welfare Association
SDG	Sustainable Development Goal
SEWA	Social Empowerment through Work and Action
SHG	Self Help Group
SIT	Sterile Insect Technique
SPO	State Programme Officer
SR	Source Reduction
SRW	Source Reduction Week
UD	Urban Development
UHC	Universal Health Coverage
UMS	Urban Malaria Scheme
UT	Union Territory
UVBD	Urban Vector Borne Disease
VBD	Vector Borne Disease
VBDCP	Vector Borne Disease Control Programme
VCAG	Vector Control Advisory Group
WHA	World Health Assembly
WHO	World Health Organization
WP	Wettable Powder

# CONTENTS

## Guidelines on Mosquito and other Vector Control Response

Abbreviations	xv
Executive Summary	xix
Chapters	
1. Background	1
2. Rationale	8
2.1 Determining factors for vector borne diseases	9
2.2 Need for overarching vector control response	13
3. Concept of mosquito and other vector control response	14
4. Response mechanism	17
4.1 Need assessment	17
4.2 Basic Foundation	18
4.3 Need based Research	19
4.4 Strengthening the core capacities at various levels	19
4.5 Public Health units	19
4.6 Project areas intervention	20
4.7 Data management	20
4.8 Inter-sectoral coordination	20
5. Pillars of MVCR	21
5.1 Pillar 1	21
5.2 Pillar 2	22
5.3 Pillar 3	23
5.4 Pillar 4	23
6. Enabling Factors for MVCR	24
6.1 Leadership	24
6.2 Advocacy, resource mobilization and partner coordination	24
6.3 Regulatory, policy and normative support	25
7. Opportunities and linkage with other Flagship Programmes	26
7.1 Swachh Bharat Abhiyan	26
7.2 Smart Cities Mission	27



7.3 Ayushman Bharat	27
7.4 Mission Antyodaya	28
7.5 Aspirational District Programme	28
<b>8. Operational Plan</b>	<b>29</b>
8.1 Task Force	29
8.2 Structural framework and resource mapping	31
8.3 Filling up of the vacant posts	31
8.4 Training and Skill development	31
8.5 Community Engagement and Social Mobilization	32
8.6 Partners and inter-sectoral collaboration	33
8.7 Operational Research	34
8.8 Strengthening legislative measures	35
8.9 Financial Support	35
8.10 Monitoring and Evaluation	35
<b>9. Call for Action: Roles and responsibilities for implementation of MVCR</b>	<b>38</b>
9.1 Technical activities	38
9.2 Administrative	44
9.3 Financial	45
<b>Bibliography</b>	<b>46</b>
<b>Annexures</b>	<b>47</b>
I. Magnitude of other Vector Borne Diseases prevalent in India	47
II. Life cycle of various Vectors	49
III. Vector control measures	52
IV. Newer Vector Control Tools	55
V. List of urban malaria towns	57
VI. Entomological zones in India	58
VII. Relationship between Sustainable Development Goals and VBDs	59
VIII. Inter-ministerial convergence	61
IX. Involvement of Little Champs (School children) for prevention and control of dengue	64
X. Community engagement for effective mosquito & other vector control response	67
XI. Mosquito Abatement Committee: historical perspective and the current significance	71

# Executive Summary

Public health implications of diseases transmitted by vectors and their impact on social and economic development are major global concerns including India. Though there has been reduction in the major vector borne diseases (VBDs), re-emerging VBDs and their geographical spread is a major public health concern in recent years. Malaria, kala-azar, lymphatic filariasis (LF), dengue, chikungunya and Japanese Encephalitis (JE) are important public health problems. The National Vector Borne Disease Control Programme (NVBDCP) is an umbrella programme under the Ministry of Health and Family Welfare, Government of India for prevention and control of these diseases. NVBDCP mandated for planning including financing, policy making, technical guidance, monitoring and evaluation; while states are responsible for implementation of the programme. Besides, other VBDs like Kyasanur Forest Disease, Crimean Congo Haemorrhagic Fever, Scrub typhus, etc. have been reported from certain regions with varying morbidity and mortality. Emergence of Zika virus and impending threat of yellow fever cannot be overlooked due to wider distribution of vector and presence of susceptible population.

The basic approach for VBD control involves disease management, integrated vector management and cross-cutting supportive interventions. To eliminate/reduce the risk of transmission and outbreak containment, vector control is the main component of any VBD control programme. Significant advances have been made in the field of diagnosis, disease surveillance, treatment and control of VBDs. Entomological surveillance and vector control still remain the key components. However, the value of vector control and its reliance have not been clearly recognized and its effectiveness has declined in recent years due to several reasons viz., lack of trained entomological human resources, inadequate knowledge of the technique adopted, inappropriate use of insecticides and poor management. Vector control concepts have been changing from time to time depending upon the changing bio-ecology, climate, transmission dynamics and advancements made in the vector control methodology/tools over the years.

Under NVBDCP (erstwhile NMEP), for entomological surveillance and vector control, Urban Malaria Scheme came into existence in 1971, covering 23 towns initially which was expanded to 131 towns in 17 states and 2 UTs. Subsequently, 72 Entomological Zones were established in the country during 1977, which were increased to 78. Likewise, entomologists were placed at state and NVBDCP HQs for efficient and effective vector control implementation, entomological surveillance, monitoring and evaluation. Besides, entomological activities, research is also carried out by Regional Offices for Health & FW, ICMR institutions, National Centre for Disease Control (NCDC) and major municipal corporations. All these organizations are facing constraints due to large number of vacancies of entomological manpower over the years.

Major administrative and technical determinants for efficient VBD management have been reviewed in this document and stressed for strengthening. Recently, Global Vector Control Response 2017-2030 of World Health Organization highlighted the need for strengthening of entomological infrastructure and vector control. Need was also felt for a holistic approach for effective prevention and control of VBDs aligning with the principle of Universal Health Coverage and National Health Policy (NHP) 2017.

## EXECUTIVE SUMMARY

---

Accordingly, NVBDCP formulated the guidelines on Mosquito and other Vector Control Response (MVCR) for broadening the scope of vector control. Adjunct to the ongoing strategies of NVBDCP, MVCR will leverage the existing vector control interventions with accelerated efforts on attaining intersectoral convergence and strong community engagement. MVCR resiliently envisages bridging the gap in human resources involved in VBDs.

The purpose and broad objective of MVCR is to provide an environment with reduced vector density to achieve the disease specific targets for elimination of malaria, filariasis, kala-azar and to prevent outbreaks of arboviral diseases (dengue, chikungunya and JE) and other VBDs. The vision of MVCR is to minimize morbidity and mortality associated with VBDs in the country for which the goal is set aligning with NHP 2017. Implementation, success and sustainability of MVCR will depend on commitment at the national and state level leadership, availability of technical human resource, budgetary provision, resource mobilization and interministerial/departmental coordination. To be effective, strong political commitment and long-term investment are needed for MVCR. It will provide necessary strategic guidance to states, municipalities, local bodies and Panchayats for urgent strengthening of vector control as a fundamental approach to prevent diseases and responding to outbreaks. MVCR has four key areas or pillars of action and the activities within these four pillars complement one another with some overlap.

To achieve the VBDs targets, MVCR emphasizes the following robust response mechanisms and call for actions:

Infrastructural capacity essential to support the activities need to be identified including technical and operational facilities for a functional health system. An in-depth evaluation of the existing policy framework, current status of vector control planning and implementation with respect to VBDs, disease burden, vector bionomics, methods/strategies, necessary human resource, infrastructural and institutional capacity within the programmes is essential. A clear plan is needed to support mobilization of resources to address the gaps and sustain with identification of additional resources. Core functioning of the MVCR is through the entomological infrastructure. Hence, it envisages strengthening of various public health programmes/institutes by filling of the vacant posts of entomological manpower in time bound manner for effective implementation and to optimize the vector control activities.

Systematic collection of relevant information, timely dissemination of data and its analysis are vital for VBD programmes. At present, due to suboptimal infrastructure and human resource, the entomological data generated by the programme is scanty and inadequate to assess the impact of any intervention or to find out any early warning signal. Also, timely sharing of entomological surveillance data and associated activities by non-programme organizations, research institutes and municipal bodies with programme for decision making has also been emphasized. Convergence of epidemiologic information with available environmental data with India Meteorological Department, research organizations, etc. and their use as interface for GIS mapping will be imperative. Research is an inbuilt component of MVCR for development of innovative approaches to vector control, to evaluate effectiveness of existing and newer interventions and to develop newer tools.

Multiple approaches that are implemented by different sectors will be crucial for control and elimination of VBDs for promoting healthy environments as VBDs are everyone's problem, not just the health sector.



## EXECUTIVE SUMMARY

---

Achievement of Sustainable Development Goals (SDG) to ensure good health and well-being will rely on effective vector control. MVCR will provide windows of opportunities by linking with other flagship programmes towards the government's commitment to raise the living standards of the citizens and ensuring inclusive growth for all. Without improving the health status of the person in the last mile, socio-economic development remains a great challenge. In this endeavour, the government has initiated/launched various developmental schemes and Missions- Swachh Bharat Abhiyan, Smart Cities Mission, Ayushman Bharat, Mission Antyodaya, Aspirational District Programme, Kayakalp Scheme, etc. MVCR will work with all these flagship programmes in a concerted way and will leverage the use of these platforms for the control of mosquitoes and other vectors of public health importance.

MVCR gives emphasis on availability of effective inter- and intrasectoral collaboration with strong political commitment from Central and state governments beyond health sector including earmarked funds to support activities with synergistic efforts. Wherever possible, inter and intrasectoral collaboration and actions need to be translated into rules and regulations that mandate action at national and subnational levels, such as through bye-laws. MVCR will coordinate with concerned ministries to ensure strengthening of legal actions against regular offenders for creating/encouraging mosquitogenic conditions. Construction related activities, floating population, improper solid waste disposal, etc. are the few major factors of VBDs transmission and outbreak in industrial setup and large projects. MVCR emphasizes to ensure vector control activities in such setup by establishing a public health unit in collaboration with local health authorities.

Enabling factors for effective implementation of MVCR include leadership for strong political commitment at national and subnational levels, including within local governments and municipalities to plan, fund and implement priority activities. In addition, advocacy, resource mobilization, partner coordination and involvement of non-health sector to secure adequate funding, policy and normative support to elevate vector control as a public health service for changes in regulatory processes and supporting mechanisms will be important. This will also require effective communication across and among various ministries/departments. Introduction and enforcement of local bye-laws would be required to enable effective vector control.

A rational operational plan has been outlined for execution of MVCR at national, state, district and municipal levels. The MVCR will have a Cell at NVBDCP at the national and state level with adequate entomological human resource. The National Cell will develop the strategic framework, guidelines, budget and planning for its implementation through the State Cell. The Cell will render technical guidance to the implementing agencies, stakeholders and interministerial and intersectoral partners. To assess the overall impact of the MVCR activities, a strong surveillance of the disease prevalence and outbreaks will be crucial. Implementation of MVCR activities at the field level will be carried out using the existing setup of NVBDCP with requisite additional support in terms of human resource and budget for VBDs. The MVCR will not overlap the mandatory activities of NVBDCP but will strengthen its ongoing activities.

Within a structural framework, adequate manpower will be needed to plan, implement, monitor and evaluate the proposed activities of MVCR. To roll out MVCR, recruitment of the manpower and arrangement for the logistics to be done in a time-bound manner. The vacant positions at the national, regional, state and municipal levels are to be filled up on priority. The Ministry of Health and Family Welfare (MoH&FW), GoI, will issue necessary instructions and guidance to the State Health Department and Urban Development Department in this regard.

## EXECUTIVE SUMMARY

---

The MVCR highlights improvement of core capacity of entomologists at the national, state, district and municipal levels for vector surveillance, intervention, monitoring, analysis and interpretation of data for optimal use for decision-making and programmatic responses. Regular trainings to update their knowledge on newer techniques/tools/parameters and build their capacity have also been emphasized. Performance of the trained entomologists will be reviewed and a need-based guidance will be provided periodically to strengthen the functioning as per the need of the programme.

Constitution of inter-ministerial task force is important to undertake comprehensive review of implementation and in-depth assessment of progress indicators under the Chairmanship of Secretary, HFW at national level, Additional Chief Secretary/Principal Secretary, Health, at state level and District Magistrate at district level with members from relevant ministries, departments and other stakeholders and concerned VBD officer as Member Secretary. Similarly a task force will also be constituted at the municipal level.

Vector control hinges on prompting/encouraging individuals for specific behavioural response and appropriate government departments to work regularly to minimize the vector breeding. Engaging local authorities and communities as part of a broad-based intersectoral collaboration will be the key to improve vector control delivery, through tailoring of interventions to specific scenarios based on local entomological and epidemiological data. MVCR emphasizes on effective community engagement in prevention and control of VBDs. Children can play a pivotal role in this endeavour and they can be involved as Brand Ambassadors (“Little Champs”). MVCR also advocates the involvement of civil society organizations to reach remote areas more efficiently.

Roles and responsibilities at the national, regional and state levels have been clearly articulated for implementation of MVCR. The National Cell will facilitate the states in carrying out the activities. The implementation and progress under MVCR will be reviewed from time to time to achieve the objectives, goals and disease specific targets, and to set out priority activities which are developed based on reviewing the situation and strategy.

The funding mechanism for MVCR will be vertical within the NVBDCP under Communicable Diseases Pool of National Health Mission (NHM). The demand from states will be driven in the annual State Programme Implementation Plans (PIPs). FMR code will be provided to the states for projecting their financial requirement for the activities under PIPs at appropriate places. Resource mobilization from donor agencies, development partners and corporate sectors will be explored by MoH&FW/Directorate of NVBDCP.

The MVCR is expected to serve as a policy document for the health officials at the national, regional, state, district and municipal levels to add value on policy reform of NVBDCP by strengthening the entomological infrastructure and vector control in the light of elimination target and to achieve the NHP goals aligning with global targets.

# Background

Public health implications of diseases transmitted by vectors cannot be overemphasized. According to World Health Organization (WHO), more than 80% of the global population, approximately 5.5 billion people are threatened by at least one major Vector Borne Disease (VBD) and more than half at risk for two or more. In recent years, there has been a significant increase in VBDs, as observed in the intensified transmission in endemic areas, re-emergence after a gap of several decades and spread to newer areas. The high incidence of VBDs is an indicator for deficient health and well-being of the community as well as leading to personal and national economic loss due to disease burden associated with morbidity and mortality. The direct costs of VBDs include a combination of personal and public expenditures on both prevention and treatment. The indirect costs include productivity or income loss due to illness or premature death.

Significant advances have been made in the field of diagnosis, disease surveillance, treatment and control of vector borne diseases. However, entomological surveillance and vector control still remain key components.

Prevalence of VBDs like malaria, kala-azar, lymphatic filariasis, dengue, chikungunya and Japanese Encephalitis is an important public health problem in our country. Other vector borne diseases viz., Kyasanur Forest Disease (KFD) and Crimean Congo Haemorrhagic Fever (CCHF) have been reported from certain regions with high mortality. Scrub typhus is being reported from different parts and other vector borne viral, bacterial, and parasitic diseases put billions of people at risk for infection and millions of human beings get infected annually. The threat of yellow fever is also impending over the country due to wider distribution of vector mosquito, *Ae. aegypti*, in abundance and the presence of susceptible population.

The National Vector Borne Disease Control Programme (NVBDCP), under the Ministry of Health and Family Welfare, Govt. of India is the nodal agency for prevention and control of vector borne diseases viz., malaria, lymphatic filariasis (LF), Kala-azar, dengue, chikungunya and Japanese Encephalitis (JE) in the country. Out of these, except Kala-azar, which is transmitted by sandfly, other five VBDs are transmitted by mosquitoes. NVBDCP is mandated for planning including financing, policy making, technical guidance, monitoring and evaluation, while, states are responsible for implementation of the programme.

There are considerable variations in epidemiology and transmission dynamics of these VBDs across the country. These are complex since their presence and transmission depend on interaction of numerous ecological, biological, social and economic factors. The transmission of VBDs is mainly dependent on frequency of man-vector contact which is influenced by various biotic and abiotic factors.



## Major vector borne diseases

### Malaria

Malaria is transmitted by *Anopheles* mosquitoes and it is a major public health concern in India due to high morbidity and mortality. Although malaria cases present with various manifestations like shaking chills, high fever, profuse sweating, headache, etc., vector control is important even in areas where asymptomatic cases are reported in higher numbers to reduce the risk of transmission. All the states and Union Territories (UTs) are affected by malaria. There were 75 million cases and one million deaths attributed to malaria during 50s, which was brought down to one lakh cases in 1965 after the inception of the National Malaria Eradication Programme in 1958. However, it could not be sustained in 70s. Repeated outbreaks were reported from hardcore malaria endemic states mostly inhabited by marginalized and vulnerable tribal community. However, in the last 10 years, significant decline in cases and deaths due to malaria has been observed in many states. Considering the achievement and global call to eliminate malaria, India has also launched the framework for malaria elimination in 2016 with the goal to eliminate malaria from the country in a phased manner by 2030. The complex epidemiology of malaria is due to involvement of multiple vectors, primarily *Anopheles culicifacies*, *An. fluviatilis*, *An. minimus*, *An. philippinensis*, *An. dirus*, *An. stephensi*, *An. annularis*, *An. varuna* and *An. sundaicus*, posing a great challenge to reduce the risk of transmission. Insecticide resistance, acceptance of vector control tools by community and drug resistance further make the problem complex.

### Dengue

Dengue is the fastest spreading outbreak prone *Aedes* borne viral disease with evolving epidemiology and rapid geographical expansion to newer eco-epidemiological areas. Dengue usually present with sudden high fever, severe headache, pain behind the eyes, severe joint and muscle pain and rashes, but majority of the cases are self-limiting. Complications like haemorrhagic manifestations, shock, etc. may rarely occur and are serious. Dengue is currently endemic in all states/UTs. Repeated outbreaks were reported from many states during the last three decades. In 2010, WHO stratified the current situation of dengue in India under category-A (earlier it was under category-B), which indicates it as a major public health problem. It is also a leading cause of hospitalization and death among children showing cyclical epidemics in urban centres spreading to rural areas with circulation of multiple virus serotypes. Incidence of dengue is increasing in recent years. In 2016, total 0.13 million confirmed cases were reported which has increased to 0.19 million in 2017. Case Fatality Rate (deaths per 100 cases) has been brought down from 3.3% in 1996 to less than 1% and sustained at 0.2% since 2015, due to improved case management. The disease is spreading to rural areas due to ecological and life style changes with increased mobility and transport. There is a paradigm shift in transmission dynamics from seasonal to perennial in the southern and western parts of the country. *Aedes aegypti* is the principal vector across the country. *Ae. albopictus* has also been incriminated as a vector in some states. In the absence of specific drug and vaccine, control of dengue solely depends on vector control. The success of vector control measures is directly related to vector bionomics with effective community participation and inter-sectoral coordination.

## Kala-azar

Kala-azar, a disease spread by *Phlebotomous argentipus* (sandfly) is endemic in 54 districts of Bihar, Jharkhand, West Bengal and Uttar Pradesh. Its symptoms include recurrent fever, loss of appetite, weight loss with progressive emaciation weakness, splenomegaly, dry and scaly skin. In 2017, total of 5758 cases of kala-azar and 1982 cases of Post Kala-azar Dermal Leishmaniasis (PKDL) were reported. No Kala-azar associated death has been reported since 2016. The disease is prevalent among marginalized population of low socio-economic strata, mostly in rural areas. Indoor residual spraying is the key vector control strategy for Kala-azar elimination. The Government of India has targeted kala-azar for elimination from the country and entered into an agreement with Bangladesh, Bhutan, Nepal and Thailand in 2014 on this commitment. Though significant reduction has been achieved in Kala-azar cases, achieving zero transmission status and sustaining the same would be a challenge.

## Japanese encephalitis

Japanese Encephalitis (JE), a mosquito borne viral disease transmitted by *Culex vishnui* group (*Cx. tritaeniorhynchus*, *Cx. vishnui* and *Cx. pseudovishnui*) is a major public health problem in India. The common symptoms are fever, headache, nausea, altered sensorium, convulsion, etc. The disease affects the central nervous system and can cause severe complications, seizures and even death. The Case Fatality Rate (CFR) of JE is very high and those who survive may suffer from various degrees of neurological sequelae and about 30-40% suffer from physical and mental impairment. Children suffer the highest attack rate because of lack of cumulative immunity due to repeated natural infections. JE is endemic in 22 states, out of which Assam, Bihar, Tamil Nadu, Uttar Pradesh and West Bengal are highly endemic. During 2016, total 1676 cases and 283 deaths were reported. In 2017, though the number of cases increased to 2181, the death declined to 254. Immunization is the main strategy of GoI for prevention of JE coupled with vector control. However, cases are occurring in newer areas. Owing to the complex epidemiology involving multiple vector mosquitoes, amplifier host (pig), reservoir (Ardeid birds) and change in agriculture practices (the vector breeds in rice fields), JE control becomes more challenging. GoI initiated a special programme on JE during 2012 to minimize the risk of JE transmission through interministerial coordination.

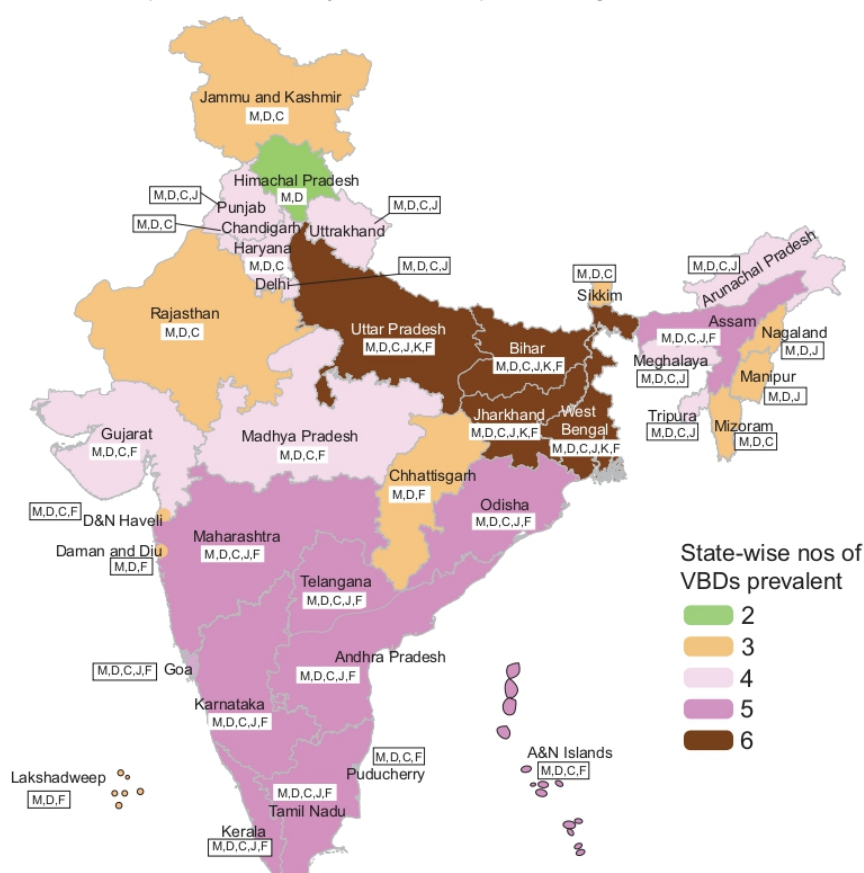
## Chikungunya

Chikungunya fever is a viral disease transmitted by *Aedes* mosquitoes (*Ae. aegypti* & *Ae. albopictus*). It resembles dengue fever and is characterized by excruciating and persistent joint pain (arthralgia) for a long time. It has re-emerged after quiescence of three decades in an unprecedented magnitude in many parts of the country in early 2006, with reporting of 1.39 million clinically suspected cases. Thereafter, cases were reported every year but gradually declined till 2014, when it again started rising from 2015 onwards. In 2016, total 64057 suspected cases were reported, which increased to 67769 in 2017. However, no death directly attributable to chikungunya has been reported by any state. Currently, chikungunya is endemic in 32 states/UTs in the country. Like dengue, in absence of specific drug and vaccine, control solely depends on vector control and social mobilization.

## Lymphatic Filariasis

Lymphatic filariasis (LF), commonly known as elephantiasis, is a profoundly disfiguring disease transmitted by mosquitoes. Most of the cases do not present any symptom, however, some people may develop a syndrome called elephantiasis, which is marked by severe swelling in the legs. It often affects the breasts and genitals as well. In India, it is caused by two species of nematodes: *Wuchereria bancrofti* is transmitted by *Culex quinquefasciatus* and *Brugia malayi* by *Mansonia annulifera*, *Mn. uniformis* and *Mn. indiana*. *Ae. niveus* group is known to transmit *W. bancrofti* in Andaman and Nicobar Islands. In India, 21 states/UTs are endemic to LF. The infection is acquired from infected vector mosquito and manifestation appears in later part of life, causing temporary or permanent disability. Though it is not a fatal disease, it has major social and economic impact and impairing economic activity due to non-reversible morbidity. LF was identified as one of the diseases for elimination globally. Following the National Health Policy (2002) goal for elimination of LF, the programme activities were reframed accordingly. Significant progress has been made in this direction and GoI is targeting LF elimination from India aligning with global target. The vector *Cx. quinquefasciatus* breeds in polluted water and the density of the mosquito is enormously high in endemic and non-endemic areas (as nuisance mosquito). After zero transmission level, xenomonitoring in the vector mosquitoes will be crucial to sustain the achievement.

The state-wise prevalence of major VBDs is depicted in Fig. 1 below:



M= Malaria, D= Dengue, C= Chikungunya, J= Japanese Encephalitis, K= Kala-azar, F= Filariasis

Fig. 1 Prevalence of major vector borne diseases in the country



Burden of the major VBDs in India during last four years is as under:

Diseases	2016		2017		2018		2019	
	Cases	Deaths	Cases	Deaths	Cases	Deaths	Cases	Deaths
Malaria	10,87,285	331	8,44,558	194	4,29,928	96	3,38,494	77
Dengue	1,29,166	245	1,88,401	325	1,01,192	172	1,57,315	166
Chikungunya	64,057	0	67,769	0	57,813	0	81,914	0
Kala-azar	6,249	0	5,758	0	4,386	0	3,143	0
JE	1,676	283	2,181	254	1,678	182	2,545	266

In addition to above, the emerging/re-emerging VBDs of local public health importance which have been reported by different states are as below:

### Scrub Typhus

It is transmitted by some species of Trombiculid mites (*Leptotrombidium deliense*), which are found in areas of heavy scrub vegetation. In early 80's, cases were reported from Dehradun (Uttarakhand), and sporadic cases were reported from the hilly forest tracts of Himachal Pradesh and Jammu & Kashmir. Presently cases and deaths are reported from almost 20 states in the country. The disease can be cured and treated with a course of antibiotics like doxycycline, azithromycin, etc, if detected in early stage of the disease.

### Kyasanur Forest Disease (KFD)

It is transmitted mainly by *Haemaphysalis* sp. of Ixodid ticks. In 1954, cases were reported for the first time from Shimoga district of Karnataka. Every year, cases and deaths are reported from Shimoga, North Kannada, Dakshina Kannada and Chikmagalur districts. Presently, cases are also being reported from Kerala, Tamil Nadu and Goa.

### ZIKA Virus

The disease is transmitted by *Aedes* mosquitoes. During 2017, a few cases of Zika virus were reported from Gujarat and Tamil Nadu. In 2018, outbreak of Zika was reported with 153 cases from Rajasthan (Jaipur District), 130 cases from Madhya Pradesh (Bhopal, Hoshangabad, Narsinghpur, Raisen, Sagar, Sehore, Vidisha districts) and one case from Gujarat (Ahmedabad district). No outbreak reported during 2019.

### Crimean Congo Hemorrhagic Fever (CCHF)

It is transmitted by *Hyalomma* sp. of Ixodid ticks. In 2011, the first outbreak was reported from Gujarat, thereafter, cases were also reported from Rajasthan.

### West Nile Virus

Human cases of West Nile virus transmitted by various species of *Culex* and *Aedes* mosquitoes have been reported from Karnataka, Andhra Pradesh, Maharashtra, Assam and the north eastern states since 1970s. Virus has also been isolated from mosquitoes.

## Chandipura Virus

It is a viral disease with fever and symptoms similar to those of flu, and acute encephalitis (inflammation of the brain). Chandipura virus was first isolated in 1965 from a village in Maharashtra state, India. Since then, the virus has been reported in adjoining states in central India. The vector is female sandfly, *Phlebotomus papatasi*. The virus has been detected in sandflies in Senegal and Nigeria as well as in India. In 2003, Chandipura virus was responsible for an outbreak in southern India in which 329 children developed acute encephalitis and 183 died. The disease progressed rapidly from an influenza like illness to coma and death.

Risk of some of the VBDs transmitted by flea, mite, sandfly and tick, the vector species involved in transmission and area of their influence in India is indicated at Annexure-I. Life cycle of the major vectors and their breeding preferences are indicated at Annexure-II.

## Current strategies for control of VBDs

The basic approach for VBDs control involves a strategy directed against the parasite and vector and to enlist involvement of community in practicing various preventive measures. Based on this concept under NVBDCP, the three pronged strategies for prevention and control of VBDs are:

- i. Disease management including early case detection and complete treatment, strengthening of referral services, epidemic preparedness and rapid response
- ii. Integrated vector management (for transmission risk reduction) including indoor residual spraying in selected high risk areas, use of insecticide treated bed nets, use of larvivorous fish, antilarval measures in urban areas, source reduction and minor environmental engineering
- iii. Supportive interventions including Behavioural Change Communication (BCC), Public Private Partnership & intersectoral convergence, human resource development through capacity building, operational research including studies on drug resistance and insecticide susceptibility, monitoring and evaluation through periodic reviews/field visits

## Vector control

Vector control is a main component of any vector borne disease control programme. The methods or techniques are applied to reduce or keep the vector population at a bare minimum level from where transmission of VBD is minimum. In general, vector control is considered to: i) prevent occurrence of outbreaks/upsurge, ii) prevent mortality and morbidity, iii) cut down disease transmission and iv) sustain the elimination or disease-free status.

However, the value of vector control and its reliance have not been clearly recognized and its effectiveness has declined in recent years for several reasons. This includes lack of trained entomological human resource, an epidemiological basis for intervention, inappropriate use of insecticides, inadequate knowledge of the technique adopted and poor management.

Vector control concepts have been changing from time to time depending upon the changing bio-ecology, climate, overall knowledge about the epidemiology of vector-borne diseases as well as the knowledge and advancements made in vector control methodology over the years. Keeping in view of all these, vector control strategies have to be reviewed and used judiciously and selectively. Vector control methods are to be applied in a community depending on the local situation and the preference of the population targeted. Methods suitable for one place may not necessarily be applicable in other place/s even if the characteristics of the disease and the vector remain the same. The methods selected should generally be:

- ⊙ Effective
- ⊙ Affordable

- ⦿ Equipment and materials are obtained locally and easily
- ⦿ Safe to user and the environment
- ⦿ Acceptable and compatible with local customs, attitudes and beliefs

Before selecting appropriate vector control method, decisions are required for identification of the situations in terms of when, where and what methods to be used considering the magnitude of the local VBD problem. Priority areas and groups are to be selected depending on the risk of transmission. The choice of control measures to be incorporated into the integrated package will depend on local conditions i.e., epidemiology, ecology of the target area, behaviour of the vector and its bionomics, housing conditions, human behaviour, proximity to breeding sites, agricultural practices and community organization.

The vector control measures may be categorized into active and passive measures. Active measures are those which affect the vector directly either by killing them in larval or in adult stage, or by eliminating their breeding sites. In passive measures, prophylactic measures are undertaken to protect from the bite of arthropod vector species viz. use of mosquito nets, repellents, protective clothing, screening of doors, windows, ventilators, etc. by fine mesh. The available vector control measures and newer tools under development are at Annexure – III & IV.

## Entomological Surveillance

The three important components of disease transmission are causative organism (parasite or pathogen), human beings as host and the transmitting agent (the vector). Not all mosquitoes transmit the disease. Hence the knowledge about capacity to transmit disease and their predominance in terms of time and space are very crucial to facilitate the decision about their control strategies. Entomological surveillance covers all these aspects and for such entomological surveillance, 72 Entomological Zones were established in the country during 1977. Subsequently, a few more zones were identified and at present, 78 zones are existing. Presently, out of the 78 zones, only 50% are having Entomologists and Insect Collectors in position. In addition, 16 Regional Offices for Health & FW, GoI were also equipped with Entomologists (Assistant Directors) for carrying out entomological activities in addition to other public health activities. In addition to the NVBDCP, entomological research activities are carried out by ICMR institutions and NCDC.

Gradually, due to non-adherence of due importance to the entomological work, the progress on entomological surveillance has suffered, though some states like Tamil Nadu, Kerala, Karnataka, Gujarat and Maharashtra have made efforts for strengthening state, districts and zonal entomological teams. To generate the latest information about various entomological parameters in the country for revising prevention and control activities against vectors, the entomological zones need to be strengthened with additional human resource and infrastructure with facilities like mobility support for field visits, etc.

There was a need of a policy document for the health officials at national, regional, state, district and municipal levels to add value on policy reform of NVBDCP by strengthening the entomological infrastructure and vector control in the light of elimination target for various VBDs aligning with global targets.



## Rationale

Vector control is an integral part of National Vector Borne Disease Control Programme (NVBDCP) since its inception in 1953 as National Malaria Control Programme (NMCP). The Directorate was initially established to deal with malaria alone but gradually other diseases were brought under the purview of NVBDCP. Currently, NVBDCP is dealing with prevention and control of six VBDs viz. malaria, dengue, chikungunya, JE, LF and kala-azar.

Under National Malaria Eradication Programme (NMEP), the Urban Malaria Scheme (UMS) came into existence in 1971 covering 23 towns initially which was expanded to 131 towns in 17 states and 2 UTs. The reason for UMS was that the urban conglomerations served as focal points for dissemination of malaria to peripheral rural areas which proved to be a great setback to the progress of NMEP. The approved staffing pattern for entomological activities includes Biologists, Inspectors, Insect Collectors, Field Assistants, Superior Field Workers and Field Workers. A list of towns under UMS is given at Annexure- V. During the 12th Five Year Plan, the UMS has been converted to Urban VBD Scheme to deal with all six VBDs under NVBDCP. However, the activities under UMS had deteriorated due to vacant positions of Biologists, Insect Collectors and other Field staff. Non-availability of mobility support also had adverse effect on the functioning.

The Modified Plan of Operation (MPO) came into existence in 1977. For improving the activities, a zonal tier was constituted under the NMEP during MPO. There were total 72 zones identified in 20 states. The zonal tier was assigned parasitological as well as entomological activities. The approved staffing pattern for entomological activities included Assistant Entomologist (1) and Insect Collectors (2) with mobility support. A list of the zones is given at Annexure- VI. The functioning of the zonal tier was established according to the divisional revenue boundary gradually subdivided into 2-3 divisions but the health zones remained the same. At present, except few states (Tamil Nadu, Karnataka, Gujarat and Maharashtra), the functioning of the zones had deteriorated due to vacant positions of Entomologists and Insect Collectors, and the non-availability of mobility support.

The National Filariasis Control Programme (NFCP) was launched in 1955 to delimit the problem and implement the treatment of microfilaria carriers and decrease cases along with antilarval measures in urban areas in 20 filaria endemic states/UTs. NFCP activities were implemented through 206 control units, 199 Filariasis Clinics and 27 Filariasis Survey Units located in urban areas of endemic states. The programme has undergone various paradigm shifts and since 1994, the services were extended to rural areas. Under NFCP in urban areas, the control strategies include antilarval measures at weekly intervals with approved larvicides, environmental engineering through source reduction and water management, antiparasitic measures through detection and treatment of microfilaria carriers and cases and IEC through community awareness. NFCP units were equipped with one Biologist/Entomologist/Vector Control Officer, Filariasis Inspector, Insect Collector, Field Assistant, Laboratory Technician, Field Workers/Anti-Larva Workers/Anti-Larva Operators. However, with the time, the functioning of these units was gradually deteriorated. Further, in view of ELF programme in all filaria

endemic districts, NFCP units were integrated by merging the treatment activities with district hospitals and antilarval operations with Urban Malaria Scheme. The available manpower was re-allocated by states. The state of Kerala had converted all the NFCP units to District Vector Control Units. However, in other states, the current position of Entomologist/Vector Control Officer and their activities are hardly monitored.

In addition to above, Entomologists were recruited at the state HQs as well as at the national HQs of NVBDCP for efficient and effective vector control implementation, entomological surveillance, monitoring and evaluation to get the desired results on prevention and control of VBDs. Further, the municipal corporations in metro cities also engaged Entomologists. The Entomologists recruited under NCDC and ICMR institutes were also involved in carrying out entomological surveillance and relevant activities.

However, over the years, the entomological infrastructure from national level to zonal and district levels under NVBDCP and other organizations could not be maintained and gradually declined due to non-filling of the posts, and the post falling vacant from time to time. Further, the programme was expanded from malaria to five other VBDs without any additional human resource.

## 2.1 Determining factors for vector borne diseases

The major determinants for VBDs which necessitated strengthening the vector control for efficient programme management are as below:

- ① Infrastructure: With the diminishing manpower, entomological surveillance became poor and practically non-existent, thus the data flow became very irregular. Available data/reports were also not analyzed in a timely manner which was one of the setbacks for entomological monitoring and effective vector control under the programme.
- ② Capacity: Non-conduction of regular trainings for Entomologists on national strategies, lack of newer tools for entomological monitoring and vector control also affected the knowledge and skills of existing entomological workforce. This led to lack of interest and consistency in work for evidence based decision-making. In addition, attrition of trained contractual manpower is also a major issue at various levels. The appointment of Entomologist without adequate educational qualifications by promotion from lower posts has also affected the quality of work. It is a felt need to have sufficient number of professional Entomologists in the programme to effectively undertake various entomological and vector control activities.
- ③ Carrier path: Due to the non-filling of the sanctioned entomological and vector control specialist posts for decades, the number of younger aspirant Entomologists is gradually declining, which is a challenge for functioning of the programme. Clear career structures, along with opportunities for career progression are needed to attract and retain capable staff at national and subnational levels. Further, staff retention is a major issue, as the contractual subject experts often move to other sectors or private industry for better career opportunity.
- ④ Information sharing: The entomological data/information generated by other institutions and municipalities were not shared in a timely manner with the programme, thus, findings were hardly found to be beneficial for the programme in planning or containment of the VBDs.
- ⑤ Socio-economic development: Over the years, the country is witnessing rapid and unplanned urbanization, construction activities, growth in industrial sector, developmental projects, economic reforms in rural areas, outreaching piped water supply, agricultural reform, irrigation practice, change in land use, etc. These have resulted in life style and societal changes leading to vector propagation into newer niche resulting in uncontrollable and unpredictable breeding habitats which are the challenges for the public health in terms of vector control. In addition, the automobile industry has also developed tremendously in recent years. The boom in transportation system is associated with the spread of

vectors and pathogens into newer geographical areas which were earlier free of VBDs. Also, used tyres are posing further challenge to the vector control programme.

- ⊙ Migration: Increased population movement due to improved transportation facilities for education, business, tourism, pilgrimage or displacement due to natural calamities, leads to excellent conditions for multiplication and propagation of vectors which make the control activities inadequate. Movement of migrant population into areas where construction or other developmental projects are ongoing is fraught with two types of risks. Firstly, the situation may bring parasite carriers from high malaria/VBD endemic areas to areas with low/no transmission but with potentially efficient vectors. Secondly, non-immune and susceptible workers from non-endemic areas may come to high-risk endemic areas. Both these situations could lead to malaria outbreaks if adequate surveillance and vector control measures are not implemented. If the project is located in a high endemic area, special attention should be paid to workforce coming from non-endemic areas with a high level of surveillance and adequate personal protection supplemented by vector control measures.
- ⊙ Insecticide resistance: NVBDCP, similar to other programmes in the world is still reliant largely on chemical insecticides for control of malaria and kala-azar. Under the programme, DDT, Malathion and synthetic pyrethroids are used for indoor residual spraying. Insecticide resistance to at least one of these insecticides, threatening control and elimination efforts of VBDs are of greatest concern. In India, *Anopheles culicifacies* is the major malaria vector out of six primary malaria vectors and it alone contributes about two third of the total malaria cases reported annually. A recent study in 2017 on the status of insecticide resistance among the major Indian malaria vectors in the last 25 years has revealed that *An. culicifacies* is resistant to at least one insecticide in 101 districts of 16 states. Double insecticide resistance to DDT and Malathion was reported from 22 districts, and to Malathion and Deltamethrin from five districts. Triple insecticide resistance, i.e., to DDT, Malathion and Deltamethrin was reported from 31 districts. Insecticide susceptibility data for *An. stephensi*, a predominantly urban malaria vector, is available from 18 districts in eight states. The species was resistant to DDT in seven districts and to Malathion in three districts. The species exhibited double resistance to DDT and Malathion in seven districts and to Malathion and Deltamethrin in one district. *An. fluviatilis*, a vector prevalent in hilly forested and foothill regions was reported resistant to DDT in 17 districts and to Malathion in one district. Similarly, there is varying status of resistance exhibited by other malaria vectors.

For effective management of vectors, current information on their susceptibility status to different insecticides is essential. Analyzing the extent of resistance and designing pre-emptive management strategy is needed, rather than waiting for report of resistance. Intensive surveillance and rapid response strategies are required to prevent the development of resistance. The major threat for the vector control programmes is multiple insecticide resistance which needs immediate attention for resistance management in order to sustain the gains achieved so far.

- ⊙ Solid waste management: In recent years, use of nonbiodegradable consumerism has been increased manifold resulting in huge solid waste which is perceived to be one of the reasons for increased incidence of dengue. Improper solid waste management leads to increase in breeding sites for mosquito vector species (particularly *Aedes*). The quantities of solid wastes generated in urban areas on daily basis are quite enormous. Lapses associated with the collection, treatment and disposal of solid wastes especially in urban areas are the key concern. In most urban setups, landscapes are littered with plastics, bottles, disposable cups, discarded tyres and even domestic and industrial junk. These constitute a habitat for vector and other nuisance organisms capable of transmitting or causing diseases including VBDs. With the development of the industrial sector and associated activities, waste and scrap generated in large quantity are a matter of concern towards curbing vector borne diseases.
- ⊙ Inequality: Equity in health and access to health care are central themes of health system stewardship. Addressing inequity requires a comprehensive approach and action on wider social determinants of health. Health inequities are increasingly becoming a major performance issue for ministries of health



and governments and feature more prominently in the policy and political discourse. India is committed to an equitable and healthy society with a plan for developing a state-based action-oriented surveillance system with emphasis on people's participation for generating and monitoring essential data for action. This plan is a promising beginning and MVCR can use this platform with respect to VBDs. The diversity in standards of health delivery in urban slums is one of the biggest challenge to health care delivery. With poverty associated hygiene and complex social dynamics, the urban slums pose major hurdles in achieving the elimination goals of malaria, lymphatic filariasis and prevention of dengue. The data from ever-growing population is either inconsistent or non-existent to make any evidence-based decision. Though an Urban Vector Borne Disease Scheme (erstwhile UMS) also exists under NVBDCP, but due to weak infrastructure and large vacancies, these setups are either performing poorly or non-functional.

Although health outcomes have improved with time, they continue to be strongly determined by factors such as gender, caste, wealth, education and geography. Still, individuals with the greatest need for health care have the greatest difficulty in accessing health services and are least likely to have their health needs met, for example, kala-azar endemic marginalized and disadvantaged populations in Bihar and Jharkhand; malaria endemic hardcore tribal areas in Andhra Pradesh, Arunachal Pradesh, Chhattisgarh and Odisha. The prevalence of Japanese Encephalitis is more among underprivileged community in certain districts of Uttar Pradesh and is another example associated with low socio-economic status and inequality. The distance to facilities is another key determinant for access to health facilities.

- ⊙ Lack of community ownership: IEC/BCC has been an integral component of NVBDCP since its inception; however, it could hardly be sustained over the years resulting in persistent transmission and repeated outbreaks of VBDs. This is also one of the major hurdles in achieving the elimination target for kala-azar and lymphatic filariasis in the country. Interventions like indoor residual spraying, practice of using LLIN, safe water storage practice for prevention of mosquito breeding, adoption of personal protection measures to avoid mosquito bites are not fully successful due to lack of community ownership. Though many attempts were made for active involvement of the community in reducing the risks of VBDs and promote health seeking behaviour, it still remains a critical area for elimination, prevention and control of VBDs.

It has usually proved difficult to motivate communities into action, but there have been some successes in the north-eastern states towards use of LLIN in bringing down the incidence of malaria, but other interventions are hardly seen to be sustained. Apart from greater efforts to educate communities to disease risks and prevention methods, there is a need for internalization of their beliefs and customs.

- ⊙ Gap in research: Very limited basic and applied research on VBD activities, insecticide resistance and changes in vector behaviour threatens the efficacy of current intervention measures. It is well known that the success of vector control strategies depends upon the understanding of changing vector biology, bio-ecology with the change in climate, overall knowledge of disease epidemiology as well as the transmission dynamics. Data on entomological, epidemiological and intervention aspects by research institutes/universities are often not shared with programme managers, or linkages are often weak for data sharing, or insufficient for decision-making.

The mapping of vector species is based on the information generated a long time ago and still being followed. The updating of species specific information and their bionomics, susceptibility status, etc. in respect of vector species is required for planning and implementation of the appropriate control methods.

- ⊙ Climate change: Risk of VBDs is intrinsically sensitive to changes in weather and climate. Arthropod vectors are influenced by multiple impacts of weather and climate, including direct effects of low and

high temperatures on rate of vector mortality and vector development from one life stage to the next. Effects of temperature and humidity on activity and host finding of vectors, and effects of rainfall on availability of breeding habitat for insect vectors have been amply studied. In recent years, studies are being carried out on relationship between climate change and VBDs, including vectors proliferation rate and temperature, transmission season, changes in ecological balances, climate-related migration of vector/reservoir hosts/human populations.

India is also experiencing climate warming, decline in monsoon rainfall since 1950s has already been observed. The frequency of heavy rainfall in some areas has also increased. Accelerating economic activity and fossil fuel combustion over the last century have precipitated an environmental impact of unprecedented proportions. Despite the abundance of environmental and epidemiologic data, they are often not linked, thereby preventing public health agencies, environmental agencies and scientists from gaining a more comprehensive understanding of the multicausal pathways that drive environmental and epidemiological change. The relationship between climate change and VBDs needs assessment and analysis for prediction of upsurge of cases for policy making and early containment of VBDs. Merging, integrating and analysing this data will advance understanding of the relationship between climate change and VBDs in the country for public health actions. The impact on public health from climate change may be far reaching and include potential shifts in transmission ranges of VBDs.

- ⊙ Legislative measures/building bye-laws: For effective mosquito control, enactment of existing Public Health Act against the violations of mosquitogenic conditions is essential. Legislative support is vital for the success of dengue control programme. Legislation should cover all aspects of environmental sanitation to effectively contribute to the prevention of all transmissible diseases. The Epidemic Disease Act 1897, under Part B, has provisions for taking legislative actions against the defaulters. This Act has been amended subsequently by the states as per their requirement.

Legislation needed to contemplate intersectoral co-ordination among the ministries involved in national development to prevent isolated implementation of individual programmes and harmful environmental changes that could create potentially hazardous public health conditions. Mandatory health impact assessment of various development projects and building construction activities is required. NVBDCP envisages additions to the Building Construction Regulation Act whereby building bye-laws should be framed for appropriate construction of mosquito proof overhead/underground tanks, mosquito proof buildings, designs of sunshades, porticos, etc. to prevent stagnation of water vis-à-vis breeding of mosquitoes.

Various municipalities in the country viz., Mumbai Municipal Corporation, New Mumbai Municipal Corporation, Municipal Corporations of Delhi, Chandigarh, Goa and a few other municipalities have adopted legislation for the prevention of "nuisance mosquitoes". However, they lack proper implementation at the ground level.

Low rainfall situations and drying ground water levels are the main challenges in urban as well as rural areas, forcing people to store water for household use. Many states are making efforts for rainwater harvesting in urban areas considering the increase in population and burden on water supply. Rainwater harvesting system needs to be designed in such a way that it does not allow breeding of *Aedes* mosquitoes. Currently there is no regulatory mechanism in this regard.

The VBDs are listed as notifiable diseases requiring mandatory notification by many states. Remaining states/UTs have been requested to take action to make the VBDs notifiable. Besides, at the national level, all countries are signatories to the International Health Regulations (2005) which have a specific provision for the control of *Ae. aegypti* and other disease vectors around international seaports/airports and ground crossings.

### 2.2 Need for overarching vector control response

A holistic approach, in tandem with Global Vector Control Response (GVCR), aligning with the principle of Universal Health Coverage (UHC) of NHP (2017) is the need of the hour for effective prevention and control of mosquito and other vector borne diseases in the country.

World Health Organization (WHO) has formulated a strategy on GVCR (2017-2030), which has been deliberated in the World Health Assembly (WHA) in its 70<sup>th</sup> session held on 22–31 May 2017 in Geneva (Switzerland), as Agenda No. 14. The strategic framework of GVCR (2017-2030) has been shared by WHO with the Member Countries.

Accordingly, the Directorate of NVBDCP at the behest of the Ministry of Health and Family Welfare, GoI, has formulated guidelines for Mosquito and other Vector Control Response (MVCR) with the objective to minimize the breeding and abundance of vectors of public health importance by broadening the scope of vector control. MVCR will be an adjunct to the ongoing strategies of NVBDCP for control of VBDs. MVCR will leverage the existing vector control interventions with accelerated efforts on attaining intersectoral convergence and strong community engagement in prevention and control of mosquitoes and other vectors of public health importance. MVCR resiliently envisages to bridge the gap in human resources involved for prevention and control of VBDs.

Like GVCR, MVCR envisages strengthening of vector control to enable the achievement of disease-specific targets thereby contributing towards achievement of Sustainable Development Goals (SDG). The link between VBD and SDG is at Annexure-VII. This will also facilitate achieving the goals of National Health Policy 2017 for VBDs.



# Concept of Mosquito and other Vector Control Response

The Mosquito and other Vector Control Response (MVCR) is based on the following two core elements: (i) enhanced human, infrastructural and health systems capacity for continuous monitoring, vector control and vector surveillance within all locally relevant sectors and (ii) increased diseases diagnostic facilities, basic and applied research to underpin optimized vector control, and innovation for development of new tools and approaches.

The broad objective is to provide an environment with reduced vector density and burden of vector borne diseases so as to:



- ⦿ achieve malaria elimination by 2030 and sustain thereafter



- ⦿ achieve elimination of kala-azar and sustain level of elimination



- ⦿ achieve lymphatic filariasis elimination and sustainability



- ⦿ prevent outbreaks of arboviral diseases viz., dengue, chikungunya, JE and other vector borne diseases

The vision of MVCR is to minimize the population of mosquito and other disease vectors to reduce transmission, morbidity and mortality related to vector borne diseases. The Ayushman Bharat Scheme of the Government of India would further bolster the efforts in bringing down the burden of VBDs through its country-wide network of wellness centres and health protection.

As part of this vision, MVCR sets the goal for strategic approach to achieve elimination of specific VBDs and control the arboviral diseases by 2030 as follows:

Goals	Milestones		Targets
	2020	2027	2030
Enable malaria elimination and sustain the status quo	Zero indigenous transmission in category 1 states	Zero indigenous transmission in the country	Sustain the achievement
Enable elimination of kala-azar and sustain	<1 case per 10000 at block level	Sustain the achievement	Sustain the achievement
Enable elimination of lymphatic filariasis and sustain	Microfilaria (Mf) rate <1% per district	Sustain the achievement	Sustain the achievement
Prevention of outbreaks of arboviral diseases	Early detection and curtailment of outbreaks to prevent spread		Effective control of arboviral and other vector borne diseases
Establishing routine surveillance of vectors in sentinel areas	Clear mapping of vectors and tracking of vector movement		Effective surveillance programme supporting control

The scope of the MVCR will be to enable the achievements of disease-specific national and state goals and contribute towards achievement of the Sustainable Development Goals (SDG) in Indian context. Implementation, success and sustainability of MVCR will depend on (1) commitment at national, and state level leadership; (2) availability of technical human resource (Entomologist), (3) budgetary provision and resource mobilization and (4) interministerial/departmental coordination.

To be effective, strong political commitment and long-term investment are needed for MVCR. This seeks neither to replace nor override existing disease-specific strategies for VBDs. Rather, it aims to add to the existing efforts and ongoing strategies in helping to mount coherent and coordinated efforts to address the increasing burden and threat of VBDs. It will also add to the acceleration in achieving the elimination targets set for specific VBDs.

MVCR will be linked to and closely work in tandem with activities related to SDG, Swachh Bharat Abhiyan, Ayushman Bharat and Universal Health Coverage to accelerate achieving the objectives of the programme. MVCR will also leverage the existing available entomological infrastructure available with ICMR, NCDC, IDSP, municipalities and universities in strengthening entomological surveillance and response by regular sharing of information and feedback.

MVCR will provide strategic guidance to states, municipalities, local bodies and Panchayats for urgent strengthening of vector control as a fundamental approach to prevent disease and responding to outbreaks. MVCR objectives and milestones should be aligned with the national objectives and targets for control and elimination of vector borne diseases. This would require re-alignment of vector borne disease control programme, supported by increased technical capacity, strengthened monitoring and surveillance systems, improved infrastructure by filling up the vacant posts and hiring additional technical manpower required at different levels of programme implementation. The structural organization of MVCR is depicted in Fig. 2.



**Fig. 2 Structural organization of Mosquito and other Vector Control Response**



# Response Mechanism

MVCR will provide guidance and technical support to states in reviewing and updating their VBD strategies in line with the priority activities for strengthening vector control as emphasized. It will further provide guidance for capacity development including training. It will ensure that capacities are strengthened at the national, regional and state levels to enable it to lead a coordinated effort to reduce the VBD burden by 2030, and to support the implementation of all recommendations in this response. To achieve the target, the response mechanism of MVCR is as under:

## 4.1 Need assessment

For success of MVCR, a situation analysis and need assessment would be carried out to provide appropriate guide in establishing or strengthening vector control in a way that coordinates multiple sectors and leverages data for local adaptability. Implementation will be guided by a comprehensive appraisal of current vector control infrastructures, capacity and partnerships, along with additional requirements to ensure optimal use of resources to tackle VBDs.

An in-depth evaluation of the existing policy framework, current status of vector control planning and implementation with respect to VBDs, disease burden, vector bionomics (e.g. ecology, insecticide resistance, etc.), and methods and strategies needs to be reviewed. In addition, human resources, infrastructure, institutional setup and functions of vector control would be assessed, including an evaluation of the structure of vector control; its information flow, and financial resources. It also outlines the extent of intersectoral collaboration and community engagement.

Assessing the needs and opportunities involved in realigning the vector control programme, MVCR focuses on the critical determinants of change. Needs refer to specific requirements for the change process (e.g. human resource and capacity building in terms of training and logistics), while “opportunities” refer to possibilities that already exist in the country that can affect the desired change. The various needs include:

- ⊙ Political commitment needs: The structure and functioning of health care system is largely a result of decisions made at the political level. Securing political commitment at the highest level, for example, from the Minister of Health at the national and state level will be paramount for MVCR.
- ⊙ Policy needs: Reforming and adjusting the policy framework that provides the enabling environment for effective vector control; desk review of the policies of other countries and WHO.
- ⊙ Institution building needs: Strengthening existing structures, institutions and the arrangements between them to facilitate vector control. Priorities are:
  - » Technical strengthening: Developing the technical facilities/infrastructure to support the vector control programme by strengthening the available infrastructure at national, regional, state (including districts, zonal levels, UVBD schemes, NFCP units) and corporations.

- » Human resources development needs: Identification of the gap in the sanctioned staff position and training of staff at all levels of the programme supported by a performance-based development programme, focusing on decision-making procedures to manage the vector control.
- » Intrasectoral and intersectoral collaboration needs: Facilitating better collaboration within and outside the health sector for more effective vector control.
- » Community engagement and mobilization needs: Ensuring proactive community involvement in the planning and implementation of vector control – a fundamental concept of the MVCR.
- » Financial resource needs: Clearly identifying financial needs and developing a comprehensive strategy to mobilize the required resources. This process will involve the identification of all possible internal (within the country: domestic funding from interministerial/departmental, corporate sector) and external funding sources from developmental partners.
- » Research needs: Research for new and novel vector control tools, and management of insecticide resistance.

## 4.2 Basic foundation

Effective and sustainable vector control is achievable only with sufficient human resources, an enabling infrastructure and a functional health system. A vector control needs-assessment will help to appraise current capacity, define the requisite capacity to conduct proposed activities, identify opportunities for improved vector control delivery efficiency and guide resource mobilization to implement the national strategic plan. A clear staffing requirement at national and subnational levels is imperative. Requirements will vary widely between states depending on VBD burden and population at risk. It will be driven by planned vector surveillance and control as well as monitoring and evaluation activities. Need may be redefined based on outcomes from assessments and on resources available. For example, the 72 Entomological Zones identified in 1978 in 20 states have been increased to 78. Based on the need, zones may also be identified by other states, or enhanced in states already having them. Infrastructural capacity essential to support the activities of the programme should be identified, including technical and operational facilities as well as facilities for research and training.

A comprehensive plan for developing the necessary human, infrastructural and institutional capacity within the programmes should be formulated and agreed upon. The plan should identify the additional resources and associated costs to achieve its objectives, with clear terms of reference for different staffing positions required. A clear budgeted plan will support mobilization of resources to address identified gaps. Sustainability of established posts should be a key consideration in order to ensure mid- to long-term retention of recruited staff.

Programmes would then assess the necessary positions and recruit the entomology staff at national and subnational levels. This should include operational staff required for ongoing implementation of vector control and needed for outbreak or epidemic response. To ensure availability of a cadre of sufficiently trained personnel, there is a need to strengthen and upgrade pre-service education and training curricula in line with programme needs. Inclusion of basic concepts and activities related to vectors and their control in primary level education will help to sensitize and engage community members and enable effective community-driven approaches. This will require involvement of education departments and concerned institutes to ensure integration into the curriculum.

Capacity building priorities for established staff would be defined through a comprehensive training needs assessment. National and regional institutional networks offer the opportunity to leverage resources for education and training across sectors, both within and outside of the states. Training should include theoretical

training on public health entomology as well as sufficient practical training in vector control implementation with a focus on quality control. Training should be complemented with periodic follow up; ideally, coaching or mentorship.

### 4.3 Need based research

Research is an inbuilt component of MVCR. Operational research has been and must continue to be a foundation upon which vector control programmes are planned and implemented. It is needed to understand the interaction between pathogens, vectors and hosts. It is also important to understand the changes in disease dynamics with climate change and global warming. The results of such research can inform the development of innovative approaches to vector control. Applied research is needed to evaluate the effectiveness of vector control, to optimize programmatic delivery of existing and new interventions, and to develop new monitoring tools.

While a basic research agenda for vector control may be determined by the research groups or institutions, the applied research agenda should be defined by the national vector-borne disease control programme in consultation with national and international experts in the relevant field. The agenda needs to outline a prioritized list of strategic focus areas required to inform vector control in the country and should serve to guide research and academic institutions to align their focus of work. A clearly defined national research agenda will help avoid overlap and gaps in the work conducted in the country and will assist in identifying additional external resources if any, to support priority work. Coordination of research activities within and between countries will maximize the benefits of research and avoid unnecessary replication. Research funding bodies should align their requirements as closely as possible with the national agenda of the country for VBDs.

### 4.4 Strengthening the core capacities at various levels

Currently, there are large vacancies of entomological manpower in various public health programmes i.e., NVBDCP, NCDC, Regional Offices for H&FW, Entomological Zones, UVBD Scheme, IDSP, etc. As the core functioning of MVCR is through the entomological infrastructure (manpower and logistics), it envisages strengthening of these institutes by filling of the vacant posts in a time bound manner for effective implementation of entomological activities and optimize vector control activities.

Besides, entomological infrastructure and human resource at ICMR institutions, local bodies, states/UTs, Universities, etc. are also adequately developed.

### 4.5 Public Health Units

In recent years, outbreak of VBDs have been reported frequently from industries and large projects, with population agglomeration. Construction related activities, floating population, improper solid waste disposal, etc. are a few major factors of VBDs transmission and outbreak in such setups. MVCR, in collaboration with Confederation of Indian Industry (CII), will ensure vector control activities in major industries and long-term large projects by establishing a public health unit. Building sustainable control programmes that are resilient in the face of technical, operational and financial challenges will require the engagement and collaboration of local health authorities.

In the case of minor projects with small workforce, health coverage can be given by the staff of the PHC. However, major projects need a separate set-up with staff for implementation of malaria control activities including surveillance and screening of workers for malaria and for vector control measures. The staffing should include a medical officer, laboratory technician and malaria inspector.



## 4.6 Project areas intervention

Weekly inspections of the project area and its surroundings should be made for detecting mosquito breeding sites. Environmental measures for water management like drainage, filling and leveling of water bodies should be undertaken, wherever possible. Weekly antilarval measures with chemical larvicides or biocides should be done where applicable.

## 4.7 Data management

Control of VBDs is primarily based on the systematic collection of relevant information. Timely dissemination of data to programme managers and those responsible for controlling the disease and its analysis is essential. For a good surveillance system of VBDs, the following should be included:

- ⊙ Disease detection via passive (patient data from health facilities) or active surveillance (visiting the community and testing individuals)
- ⊙ Entomological surveillance through monitoring density of vector species, infectivity (vector incrimination), and insecticide resistance
- ⊙ Environmental surveillance including climate and geographical data

At present, with the available resources, entomological data is generated by the programme at district, state, regional and national levels. Most of the data is scanty and information is inadequate to assess the impact of any intervention or to find out any early warning signal. Even the available data is also not analysed timely and utilization under the programme is sub-optimal.

In addition, various government organizations, municipal corporations, research institutes and Universities are also involved in entomological surveillance and associated activities. However, the findings/observations are not shared timely with the programme, thus such type of data loses its operational value in decision-making.

MVCR in its core role will coordinate with various data sources to monitor the disease trends and transmission risk through entomological surveillance at various levels in the country. Data generated by non-programme sources will be obtained in a time bound manner and triangulate for its real time validity for utilization in policy-making. It will support efforts to monitor vector control intervention coverage, quality and efficacy and will maintain database on various aspects including insecticide resistance. It will regularly collaborate and inform the respective state governments and municipalities for effective programme implementation to reduce the burden of VBDs through effective entomological monitoring and strengthened vector control.

## 4.8 Intersectoral coordination

Vector borne diseases are everyone's problem, not just the health sector. Achievement of Sustainable Development Goals to ensure good health and well-being will rely on effective vector control, as initiatives for clean water and sanitation, sustainable cities and communities and climate action, among others will reduce breeding sources. Multiple approaches that are implemented by different sectors will be required for control and elimination of VBDs, such as those promoting healthy environments. Engaging local authorities and communities as part of a broad-based intersectoral collaboration will be key to improved vector control delivery, through tailoring of interventions to specific scenarios, as informed by local entomological and epidemiological data.

Convergence of epidemiologic information with available environmental data collected by different organizations like India Meteorological Department (IMD) or research organizations and use as interface for GIS mapping, etc. will help response mechanism.

# Pillars of mosquito and other vector control response

The success of Mosquito and other Vector Control Response depends on four key areas or pillars of action to attain effective, locally adapted and sustainable vector control. These four areas are:



1. enhancing vector surveillance, monitoring and evaluation of interventions



2. scaling up and integrate tools and approaches



3. strengthen inter- and intra-sectoral action and collaboration



4. engage and mobilize communities

Actions in these areas are to be aligned with Integrated Vector Management (IVM) and the current strategies of NVBDCP. Limited human capacity to advocate IVM is one of the constraints in implementing IVM which can be resolved with MVCR. The activities within these four pillars complement one another and there are some evident overlap.



## 5.1 Pillar: Enhancing vector surveillance, monitoring and evaluation of interventions

A well-defined operational structure is fundamental to support systematic vector surveillance and proactively identify and manage arising programmatic issues. Strengthening of vector surveillance requires significant inputs in terms of adequate human and infrastructural capacity at national and subnational levels for sustaining the efforts to deal with evolving epidemiology of VBDs. Regular monitoring of insecticide resistance and its management is one of the critical needs of MVCR. For this, partnership with research institutions, universities, etc. would be useful. This involvement should not be seen as a replacement for establishing and sustaining the requisite capacity within national programmes. Data sharing agreements with partners would be managed through institutional agreements that hold partners responsible for providing data to the national programme in a timely and proactive manner, and in a pre-determined format aligned with programmatic requirements.

The capacity of vectors to transmit pathogens and their susceptibility to vector control measures can vary by species, location and time, depending on local environmental factors. Vector control must therefore be implemented on the basis of up-to-date local data generated by appropriate methods. Vector surveillance involves regular and systematic collection, analysis and interpretation of entomological

data for health risk assessment and for planning, implementing, monitoring and evaluating vector control. Entomological surveillance is to be strategically and purposefully planned to provide information that will enable stratification of areas for further investigation or prioritized resources. It will detect increases in risk or transmission aligning with the disease specific data of the national programme and will identify specific threats to the effectiveness of vector control such as insecticide resistance, introduction of new vector, etc.

Monitoring refers to the continuous tracking of programme implementation and performance and involves checking progress against pre-determined objectives, targets and adapting activities essential to maintaining vector control effectiveness. Monitoring includes coverage and implementation quality for vector control interventions. Information, thus generated should be analysed for evidence based decision-making for policy, planning and to predict early response need before build-up of vector populations to avoid occurrence of outbreaks. Assessment of social and behavioural change communication strategies is also essential. Evaluation of programmatic progress and outcomes is needed to periodically document whether programme activities lead to the expected impact on human health.

Knowledge of the entomological aspects and VBDs situation in the neighbouring states, countries, region and global trend alerts against emerging/re-emerging threats of new pathogens (e.g. Zika virus, CCHF, chikungunya, etc.) or insecticide resistance provides the essential information for taking preventive measure in advance. National network can play pivotal role in sharing data and experience to improve the quality of available information. Regular communication and reporting of key summary data will help to promote collaboration and experience sharing. WHO can update such information to the national programme to track the situation in order to make policy decisions to gear up the states to handle such situations. Evidence-based decision-making at national level requires both entomological and epidemiological data.

Other data from outside the health sector including information on climatic conditions (temperature, humidity and rainfall) urban planning, housing, water and sanitation as well as insecticide usage in agriculture sector is also important for use in public health policy and planning. Geographical information system techniques and technologies should be leveraged to aid data interpretation. Monitoring of human demographic and socio-economic changes is also imperative, given the association of VBDs with societal factors such as unplanned urbanization and migration especially for *Aedes* borne diseases.



## **5.2 Pillar: Scaling up and integrate tools and approaches**

A key action to maximize the public health impact of vector control is the deployment and expansion of interventions appropriate to the epidemiological and entomological context. Proven and cost-effective vector control interventions include long-lasting insecticidal nets, indoor residual spraying, space sprays, larvicides and environmental management for specific target vectors. Personal protection through repellents and coverage with clothing offer supplemental approaches appropriate for specific settings and situations. One intervention can have multiple effects against several vectors and diseases. Examples are indoor residual spraying against malaria and kala-azar and larval control for malaria and dengue vectors. Approaches effective against *Aedes* sp. can have impact on dengue, chikungunya and Zika virus disease where their distribution overlap and can impact on malaria in urban settings where *Anopheles stephensi* inhabits similar habitats.

Core interventions may need to be supplemented with additional tools, technologies or approaches to address specific challenges. The appropriate and evidence-based combination of interventions is important; programmes should avoid an approach that overlays multiple interventions to compensate for deficiencies in implementation of any tool, as this may divert resources and attention from reaching the full impact of existing interventions and may lead to resource wastage. Prioritization should be on the basis of evidence on cost-effectiveness, with feedback from monitoring and evaluation outcomes, especially important for environmental management and source reduction.



Strategies that alter the domestic environment to reduce vector habitats, such as improved water supply to prevent household-level storage, or to prevent vector entry into human dwellings through house screening, should also be considered as part of larger-scale sustainable preventive measures.

Vector control strategies should be applied in the broader context of VBDs prevention and control along with other proven strategies. Combination of the best available interventions whether they directly target vectors, human immune systems or pathogens to be undertaken on the basis of evidence and in line with policy recommendations.



### **5.3 Pillar: Strengthen inter and intrasectoral coordination and collaboration**

Reduction of disease burden through vector control is a shared responsibility of all members of society. Coordination between health and non-health sectors (e.g. other ministries, departments, development partners and the private sector/corporate sector, civil society) as well as within the health sector is crucial to have effective vector control programme. This will give a better understanding of the problems, opportunities, potential stakeholders and synergies available. Inter and intrasectoral collaboration requires strong political commitment including earmarked funds to support coordination activities.

After analysis, key stakeholders should be convened into an interministerial task force whose mandate is the oversight, coordination and strengthening of vector control. The core decision-making members should consist of high-level officers from relevant ministries (Annexure - VIII). Similar to this, task force at subnational and local levels is required in order to ensure necessary intersectoral collaboration at all levels.



### **5.4 Pillar: Engage and mobilize communities**

Communities play a major role and are key to the success and sustainability of vector control. While coordination between many stakeholders is required, vector control is critically dependent on harnessing local knowledge and skills within communities. Engagement strategies that build upon social/anthropological and behavioural evaluations have a solid foundation to leverage local knowledge and skills i.e. cultural capital. Where appropriate participatory community-based approaches are in place, communities are supported to take responsibility for and implement vector control.

Participatory community-based approaches aim to ensure that healthy behaviours become part of the social practice and communities take ownership of vector control at both the intra- and peri-domiciliary levels. It involves a process of dialogue, learning, decision-making and action so that community members, including vulnerable and disempowered groups, are empowered to recognize strengths, self-assess, collectively identify, analyse and prioritize problems that affect them. This leads to the identification of practical ways including adaptation of traditional practices and to address problems to build mutual accountability. Communities and service providers should meet regularly for mutual advocacy and to assess progress to ensure sustainable development.

Better communication strategies are needed to tailor approaches to local and disease-specific needs. These should use multiple channels including mass, local and social media and involve various stakeholders. The community health workers, local and religious leaders and school teachers may be involved to outreach the community. Involvement of school children as 'Little Champs' may set a good example in dengue control (Annexure - IX).

Efforts to engage communities could act in concert with regulatory or legislative actions to support vector control. Training and capacity building are needed for community health workers and leaders that leverage existing training sources. New information and communications technologies such as social media and text messaging can be used to support implementation as well as monitoring and evaluation. Documentation of existing community engagement strategies and their impact should be undertaken to share relevant best practices within and between states/municipalities.

# Enabling factors for mosquito and other vector control response



**Implementation of the MVCR will require strengthening of three key elements as under:**

## 6.1 Leadership

Strong political commitment is needed to enable an integrated approach to vector control at national and subnational levels, including within local governments and municipalities to plan, fund and implement priority activities outlined in this response. Establishing clear roles and responsibilities of inter and intrasectoral partners at the beginning are keys to sustainability in order to maintain momentum for systems/reforms required for an integrated approach. Establishment and regular meeting of a national interministerial task force for vector control are essential to enable multisectoral engagement and will require dedicated funding from each stakeholder.

Coordination between the neighbouring states and bordering countries is also important because vectors and pathogens are easily transported among and across states and countries. For trans-border initiatives that more broadly impact vector populations and protect human health through timely action and development of preparedness plans, the International Health Regulations (2005) assist the international community by preventing and responding to acute public health risks that have the potential to cross borders, including vector borne diseases.

## 6.2 Advocacy, resource mobilization and partner coordination

Broad advocacy initiatives are required to ensure awareness and involvement of those beyond the health sector and to secure adequate funding. Representatives of each of the ministries of interministerial task force are responsible for ensuring that relevant vector control components are integrated into respective strategic plans. This will require effective communication across and among ministries,

all of which should be centred on the national vector control strategy. A strong advocacy case needs to be built including information on the health, economic, social and cultural impacts of vector-borne diseases, cost-effectiveness of vector control tools and benefits of intersectoral collaboration, including resource- and cost-savings.

Predictable and long-term financing will be required to support vector control programming. Financial support from domestic and external agencies would be encouraged to maintain and increase commitments to attain national vector-borne disease goals and programmes. Dedicated resources are urgently required to establish and implement the MVCR plan and sustain priority activities outlined in this response. Resource mobilization focused on filling resource gaps and innovative financing options should be leveraged wherever possible.

An important priority is to address the acute shortage of resources for *Aedes*-borne disease prevention through better management, technical support and sustained operational capacity. National programmes need to improve the overall coordination of vector control activities with efficient use of resources by harmonizing efforts, avoiding replication, identifying and filling gaps.

### 6.3 Regulatory, policy, ethics and normative support

Regulatory and legislative controls for public health will need to be updated or revised in line with the enhanced focus on vector control outlined in this response. New legislation may be needed to support changes in programmatic structures, regulatory processes and supporting mechanisms to elevate vector control as a public health service. Introduction and enforcement of local bye-laws may be required to enable effective vector control.

Numerous potential vector control and surveillance tools and approaches are under development and are currently being evaluated. As candidate tools, technologies and approaches become available, they will be reviewed for their public health value primarily on the basis of evidence of effectiveness as per national criteria.



# Opportunities and linkage with other flagship programmes

The government is committed to raising the living standards of its citizens and ensuring inclusive growth for all. In a diverse country like India, balanced growth is a prerequisite for overall development. Without improving the health status of the person in the last mile, socio-economic development remains a great challenge. The strong belief that underlies this strategy is that advantages and challenges are different for each area. Recently, the government has initiated/launched various developmental schemes and missions in this endeavour. MVCR will leverage the use of these platforms for the prevention and control of mosquitoes and other vectors of public health importance.



## 7.1 Swachh Bharat Abhiyan

Swachh Bharat Abhiyan was officially launched on 2 October 2014 with the aim to clean up the overall environment in the country, streets, roads and infrastructure of cities, smaller towns and rural areas. It contains: Swachh Bharat Abhiyan ("Gramin" or rural), which operates under the Ministry of Drinking Water and Sanitation; and Swachh Bharat Abhiyan (Urban), which operates under the Ministry of Housing and Urban Affairs. One of the main activities is solid waste management, which is a leading factor for mosquito breeding and VBDs.

Poor sanitary condition leads to the accumulation of water which results in increase of breeding of vector mosquitoes of diseases like malaria, filariasis, dengue, chikungunya, etc. By proper collection and timely disposal of solid waste, its processing and management will minimize or eliminate the breeding and resting sites for vector mosquitoes which may improve hygienic living conditions which will keep the vector density at low/minimum level and may not pose a public health problem.

MVCR emphasizes to work in synchronization with Swachh Bharat Abhiyan to provide sanitation and safe water focusing on swachh (clean) and swasth (healthy) Bharat for better public health conditions. The message that poor solid waste management is a health hazard, has to reach the community through the Swachh Bharat Abhiyan. The truth is that in many state governments, there is a consciousness today that something needs to be done in this direction.

MVCR will coordinate with both the ministries to link the vector control activities to prevent the vector breeding in their construction and project activities. During the community interactive sessions, awareness on VBDs by eliminating the source of breeding and safe disposal of domestic and industrial waste will be highlighted.



## 7.2 Smart Cities Mission

Urbanization in India is increasing at a rapid pace. It is estimated that by 2030, over 40% of Indians will live in cities, accounting for a population of 600 million people. Consequently, it is expected that India will need at least 100 new cities over the next 10 years. These cities will need to be developed in a structured manner and built for the future. They should have adequate control on their natural resources and will need high-grade urban planning.

In this endeavour, the Smart Cities Mission has been launched as an urban renewal and retrofitting programme by the Government of India to develop 100 cities across the country making them citizen friendly and sustainable. The Ministry of Urban Development is responsible for implementing the mission in collaboration with the state governments of the respective cities. The objective of Smart Cities Mission is to drive economic growth and improve the quality of life of people by enabling local area development and harnessing technology that leads to smart outcomes, with a clean and sustainable environment and application of smart solutions.

During the planning for structuring the Smart City, it is important to consider high quality technology to avoid stagnation/accumulation of water in the infrastructure, premises and transport system, and prevent VBDs by reducing mosquito breeding environment.

MVCR will emphasize the following issues to be considered at the time of planning to develop a mosquito free smart city:

- ⊙ Use proper technology for infrastructure planning and design so that rain water and water for domestic use is not accumulated /stagnated.
- ⊙ Adequate water supply to be ensured to avoid water storage, which is the lead factor for proliferation of vectors of dengue, chikungunya and malaria.
- ⊙ The sanitation system may be designed in such a way to avoid mosquito breeding. Drainage system should have proper gradient for smooth flow.
- ⊙ Proper disposal of solid waste and junk material needs to be ensured from the construction sites to avoid mosquitogenic conditions which should be sustained in long run.
- ⊙ Pools and gardens to be maintained and cleaned on a regular basis to avoid breeding sources.
- ⊙ Cleanliness activities need to be carried out on a regular basis at schools, colleges, public places and workplaces.
- ⊙ From the beginning, an institutional mechanism has to be developed for ensuring behavioural practices needed for prevention and control of VBDs among the inhabitants of smart cities with citizen partnerships.



## 7.3 Ayushman Bharat

Ayushman Bharat scheme is a National Health Protection Scheme which aims to provide a service to create a healthy and capable India. As an initiative under Ayushman Bharat, 1.5 lakh wellness centres will bring the health care system closer to people which will provide comprehensive health care, but focus will be on prevention and promotion of healthy life style and behaviour. These centres will also provide free essential drugs and diagnostic services. The second flagship programme under Ayushman Bharat is National Health Protection Scheme, which will cover over 10 crore poor and vulnerable families (approximately 50 crore beneficiaries) providing coverage up to 5 lakh rupees per family per year for secondary and tertiary care

hospitalization. This will be the world's largest government funded health care programme. Primary Health Centres and Community Health Centres which are linked to Ayushman Bharat are already under the umbrella of NVBDCP and are providing diagnosis and treatment free of cost for VBDs. Implementation of Ayushman Bharat Scheme will boost up activities related to prevention and promotion of VBDs as well as facilitate treatment of complicated cases in secondary and tertiary health care facilities.

MVCR will be synchronized and link resiliently with health and wellness centres of Ayushman Bharat Scheme network for strengthening of prevention and control of VBDs to achieve the targets of National Health Protection Scheme in a harmonized way. MVCR will further sensitize the states to ensure an enabling environment and necessary reform to bring about tangible changes. This will significantly improve and reach out to the healthcare delivery system in terms of bringing down the morbidity and mortality due to VBDs.



## 7.4 Mission Antyodaya

Mission Antyodaya is a convergence framework for measurable effective outcomes on parameters that transform lives and livelihoods. As per Socio Economic Caste Census (SECC) of 2011, total 8.88 crore households are found to be deprived. Poor households require targeted interventions in areas such as wage creation, skill generation, social security, education, health, nutrition and livelihood creation. Initiatives have been taken to improve health, sanitation, drinking water, environment, etc.

Vector borne diseases affect the marginalized and lower socio-economic section of the society in rural India. Special focus will be paid to the Gram Panchayats under Mission Antyodaya for reducing morbidity and mortality due to VBDs like malaria, kala-azar, JE, dengue and chikungunya to achieve the goal of accelerating the transformation of rural livelihoods. MVCR will emphasize ensuring implementation of various vector control interventions with quality coverage in effectively bringing down the targeted vector population to minimize the transmission risk. Tailor made IEC as per the socio-cultural practices of the localities will be carried out for effective behavioural change to increase the acceptance of vector control measures in their households and to reduce the source of vector breeding. One of the major concerns is to sustain the progress made for elimination of the VBDs, viz. malaria, LF and kala-azar prevalent in rural and endemic areas. MVCR will work in a concerted way with Mission Antyodaya to sustain the achievements for eliminating these diseases which is anticipated through involvement and ownership of Panchayats.



## 7.5 Aspirational District Programme

In a diverse country like India, balanced growth is a prerequisite for overall development. The Aspirational Districts Programme (ADP) is a radical departure from the country's previous development strategies in its scale, scope and ownership. Implicit in the design of the programme is the fact that India's economy cannot sustain growth without improving human development for all its citizens. It focuses on transforming 115 districts across 28 states that have witnessed the least progress along certain development parameters. These 115 districts account for more than 20% of the country's population and cover over 8,600 Gram panchayats. The Aspirational Districts are not only important from an economic point of view, but due to socio-epidemiological conditions and life style, it makes the community vulnerable to VBDs like malaria, kala-azar, JE and filariasis. Each district identified under the programme has different challenges and constraints. MVCR will prioritize vector control activities to improve the well-being and augment socio-economic growth of the community in these districts by bringing down morbidity and mortality due to VBDs.

In addition to the above, the Kayakalp Scheme also emphasizes on mosquito breeding free environment in health facilities by adopting various preventive measures that will prevent the spread of VBDs among patients, their attendants and staff.



# Operational Plan

The MVCR will function as a Cell under National Vector Borne Disease Control Programme at the Directorate and state level. The National Cell will develop the strategic framework, guidelines, budget and planning for its implementation through the State Cell. The MVCR will not cross over the mandatory activities of NVBDCP, rather it will strengthen its ongoing activities. Implementation of MVCR activities at the field level will be carried out using the existing setup of NVBDCP with requisite additional support in terms of human resource and budget for VBDs under programme. The implementation of the MVCR is dependent on the availability of sufficient human, infrastructural and financial resources. Essential to this is the appraisal of current capacity and the identification of opportunities for improved delivery and efficiency of vector control.

The Cell will ensure the policy and implementation of the MVCR to counter the rapidly changing situation of VBDs and pave the way for achieving the elimination targets of VBDs under the programme. Also, it will render technical guidance to the implementing agencies, stakeholders and interministerial and intersectoral partners. Furthermore, MVCR Cell will coordinate with research organizations and universities to take up need based operational research on newer tools, technologies and approaches for their efficacy, feasibility, safety to human and environment and cost effectiveness. The NVBDCP will provide guidance for capacity development including training and will monitor the implementation of the strategy and review the progress from time to time. The implementation of MVCR at various levels under the National Vector Borne Disease Control Programme is depicted in Fig. 3.

To assess the overall impact of the MVCR activities, a strong surveillance of the disease prevalence and outbreaks, captured through IDSP mechanism will be crucial.

## 8.1 Task force

Constitution of Inter-Ministerial Task Force is important to undertake comprehensive review of the MVCR implementation and progress indicators with an in-depth assessment. With mandate of coordination and strengthening of vector control, Inter-Ministerial Task Force under Chairmanship of Secretary, HFW at the national level with members from relevant ministries, departments and other stakeholders to be constituted with defined roles and responsibilities including frequency of meeting. Similar to the national task force, a state task force under Chairmanship of Principal Secretary, Health, at the state level to be established with members/representatives from the Department of Health, municipal bodies, RWAs, PWD, Water Supply, Sanitation, Urban Development, Rural Development, Panchayati Raj, Irrigation, Agriculture, Horticulture, Education Department, Railways, Industry, Road and Surface transport, Social Welfare, NGOs, NSS, ICDS, etc. At the district level, the task force is to be constituted under the Chairmanship of the District Magistrate with members/representatives from concerned departments and other stakeholders like the State Task Force. In the line of District Task Force, the major municipalities will form the Task Force under the Chairmanship of the respective Mayors. The concerned VBD officer at various levels will be Member Secretary of Task Force.

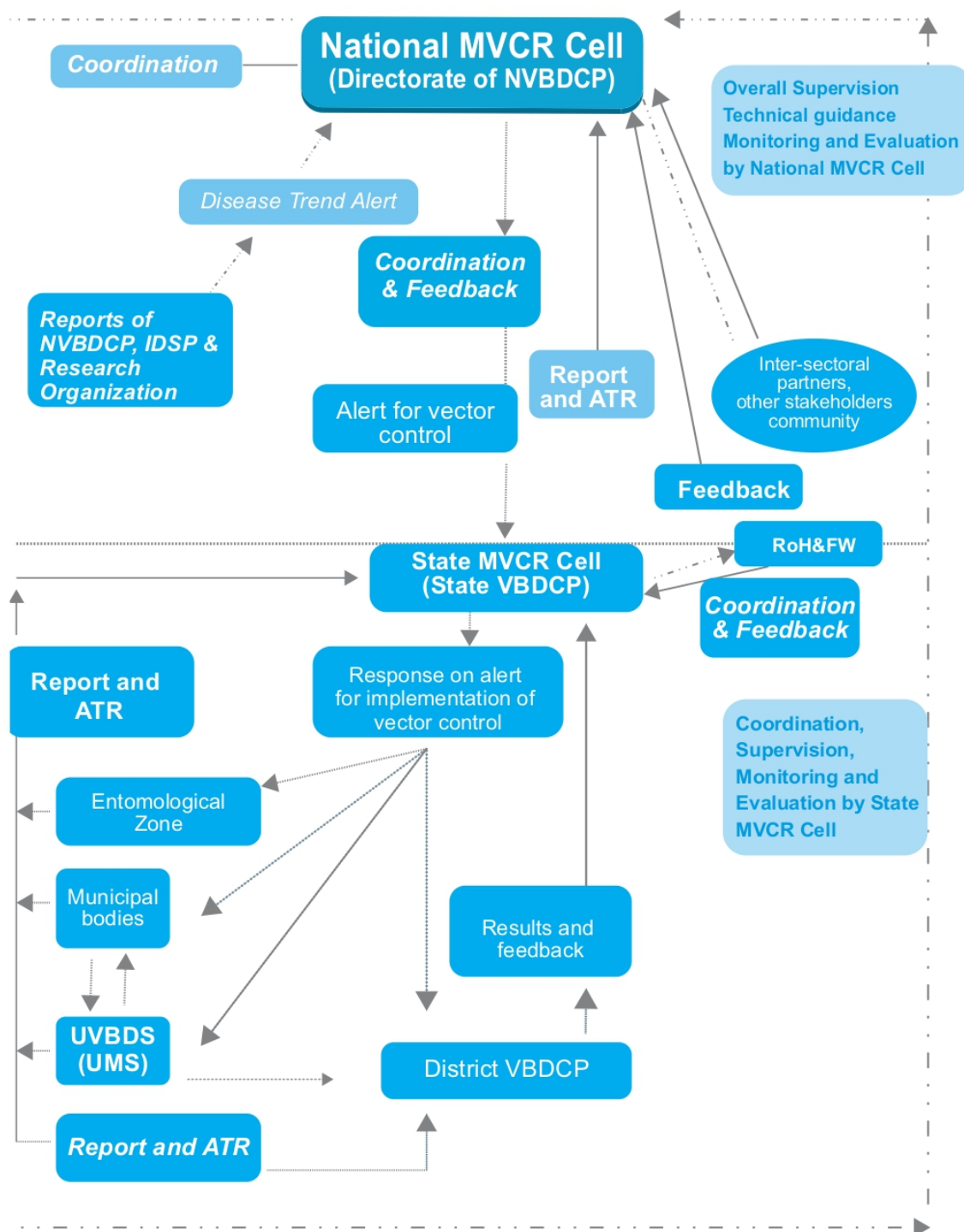


Fig. 3 Implementation of Mosquito and other Vector Control Response at various levels

## 8.2 Structural framework and resource mapping

Implementation of the MVCR will require expertise in various fields like surveillance, vector control, intervention monitoring and evaluation, insecticide resistance management, database geographic information systems, information and communication technologies and behavioural change communication.

At the national level, adequate manpower will be needed to plan, implement, monitor and evaluate the proposed activities of MVCR. Engagement of the human resource will be the first step of MVCR. The Cell at the national level will have four core components: i) technical (entomology & vector control), ii) training & skill development, iii) communication and iv) monitoring and evaluation. Recruitment of manpower and arrangement for the logistics to be done in a time bound manner to roll out the MVCR.

Given the extent of these needs, the MVCR would document the staffing level and skill balance on whether the programme is adequate to carry out its functions. Mapping of human resource, infrastructural and financial resources available across the different levels of the programme, as well as additional relevant resources available outside of the VBD programme (e.g. in municipal governments, non-health ministries, research institutions, academic institutions, implementing partners, etc.) would also be priority activities of MVCR.

Availability of trained and skilled human resource in the form of entomological infra-structure and Entomologists is vital for the success of MVCR. In this direction, mapping of all the available resources including human resource at the national, regional, state and municipal corporation levels in various government schemes/programmes for control and research of mosquitoes and diseases transmitted by them in the country need to be prioritized. In addition, Entomologists/subject experts dealing with mosquitoes and vectors available in Universities, research institutes and NGOs are also to be mapped out.

## 8.3 Filling up of the vacant posts and training

MVCR will support to improve the core capacity of Entomologists at the national, state, district and municipal levels for vector surveillance, intervention, monitoring, analysis and interpretation of data for optimal use for decision-making and programmatic responses. Considering the importance of Entomologists for keeping a vigil on the risk of VBDs, the posts of Entomologists at the national, regional and state level need to be filled up on priority to gear up prevention and control activities to achieve the national goals and progress indicators under MVCR.

The training of Entomologists is also very important as they play a crucial role in proper implementation of programme policies, entomological surveillance, vector control as per guidelines and monitoring and evaluation of programme. MVCR will ensure regular training of the Entomologists to update their knowledge and build their capacity.

## 8.4 Training and skill development

Once key gaps in capacity and capability have been identified, a comprehensive plan will be formulated to develop the necessary human, infrastructural and institutional capacity. Adequate training is imperative and the MVCR would document whether there are opportunities and procedures for staff training and supervision, institutions offering training or technical support, and registries of experts at the national and regional levels. Opportunities to utilize resources from outside the health sector will be explored. Need based guidance/updates and advancement in the field of entomological techniques and vector control programme regarding mosquitoes and other vectors would be provided to universities, research institutions and private organizations.



The MVCRC would also document the infrastructural capacity available to the programme both internally and externally including institutions/universities. This would include an assessment of equipment, transport, technical and operational facilities (e.g., functional insectaries and entomological laboratories to support assessments of vector species, insecticide susceptibility, intervention efficacy, etc.) and facilities for research and training.

**Skill development:** The country needs sustainable, high-quality human resources for health with a variety of skills and who are adequately distributed in all states, particularly in rural areas. The complexities are related to promoting healthcare equity, channeling non-governmental resources and promoting people's participation in health decision-making. Over a period of time there have been changes in vectors' ecology/their prevalence, susceptibility status, etc. leading to change in diseases transmission dynamics as a result of global warming, climate change, topography due to agricultural practices, deforestation/afforestation, cultural and social practices, population movement due to trade and travels, etc. Over a period of time and advancement in the knowledge of entomological skills, many new techniques/tools and parameters have been developed/invented which will help immensely in proper implementation of vector control methods. These would help to get the desired results in prevention and control of mosquito and other vectors prevalent in an area. In view of the above, the following actions would be taken to develop the skills of existing and newly appointed human resource under MVCRC:

- ⊙ **Refresher trainings:** Onsite short-term trainings would be conducted for available/in position of human resource (Entomologists) at the state, zonal, district and local body levels through structured modules. Guidance will be provided from time to time through electronic media (email, social media and video conference) to enhance their skills to carry out proper entomological surveillance, outbreak investigation of VBDs and undertake correct control measures.
- ⊙ **Induction trainings:** Long-term trainings covering all aspects related to vector biology and control of mosquito and other vectors for the newly appointed entomologists at state, zonal, district and local body levels would be conducted at NVBDCP and state headquarters. As the vector biology (mosquitoes, sandfly and other vectors) and medical entomology are not being covered in any of the University syllabi, proposed induction training courses are essential for new incumbent Entomologists to inculcate knowledge about vector control programmes being implemented at the central/state/district levels and all associated activities.

Performance of the trained Entomologists will be reviewed and need-based guidance will be provided periodically to strengthen the functioning as per the need of the programme.

## 8.5 Community engagement and social mobilization

Community engagement for vector control activity is an integral part of NVBDCP strategies for prevention and control of six VBDs viz., malaria, dengue, chikungunya, kala-azar, lymphatic filariasis and Japanese Encephalitis. To sensitize the community about prevention and control of VBDs, an intensive, comprehensive and integrated IEC/BCC and community participation approach is very important for the programme. Communication for behavioural change is used to encourage target populations to adopt appropriate behaviour. Interventions can be combined; depending on the local situation and the characteristics of the target group.

Awareness in the community regarding causes, symptoms, cure and control of VBDs are increasing. A lot is still to be achieved particularly regarding the importance of blood smear examination, prompt and complete treatment, source reduction, acceptance of cost-effective environment-friendly vector control initiatives such as source reduction, larvivorous fish, use of LLIN, adoption of appropriate measures for controlling breeding of mosquitoes and personal protection.

Towards this endeavour, strategies include involving the decision makers, implementers, people's representatives, community, village leaders, village health volunteers, representatives of mass organization including youth unions, women's unions, school teachers and religious leaders. Other strategies include social mobilization, advocacy and the use of mass media channels like radio, television, traditional performances and print media to create awareness about vector and its agents.

Institutions created under National Health Mission (NHM) at peripheral levels like Village Health and Sanitation Committees and Rogi Kalyan Samiti will be leveraged for community engagement for vector control.

**Social mobilization process and practice:** Social mobilization is a process to obtain and maintain the engagement of various groups and sectors of the community in public health disease control. Traditionally, it has been used to bring out community participation in VBD prevention and control activities like community clean-up campaigns, claim for government attention to environmental problem, improper sanitation and school-based action to mobilize parental involvement in maintaining the school premises.

This practice is selected because of the involvement across governmental entities, the level of participation of the community, the geographic area covered by the mobilization activities and creative use of multiple communication channels to encourage support and participation in the mobilization activities. Use of change agents like people's representatives, motivational leaders and involvement of school children is emphasized for the success of MVCR. Vector control hinges on prompting individuals for specific behavioural response that encourages individuals and appropriate government departments to work for source reduction regularly. Children need to be involved as Brand Ambassadors ("Little Champs") and can play a vital role for prevention and control of dengue. They can act as torchbearers to make the programme successful. Proposed strategy and role of the "Little Champs" to outreach the community with provision of acknowledging their role is detailed at Annexure-IX.

### Social Mobilization



The best practice is the use of intensive communication and mobilization strategies to mobilize the community to conduct VBDs control activities on specific days/months such as World Malaria Day (25 April), National Dengue Day (16 May), Anti Malaria Month (June) and Anti Dengue Month (July). These specific periods are registered in the history of the Indian public health system as observed days/months and carry out large-scale social mobilization activities across the country. Suggestive activities for social mobilization and hand holding of the community to bring about tangible behavioural changes and practice towards VBDs are at Annexure-X.

## 8.6 Partners and intersectoral collaboration

The prevention and control of vectors and VBDs require close collaboration and partnership between health and non-health sectors (i.e. public & private, civil society, etc.). Various sectors working in close collaboration with the health sector on policy development and implementation have been perceived to improve outcome towards bringing down the burden of VBDs. MVCR requires availability of effective inter and intrasectoral collaboration with strong political commitment from the central and state governments beyond the health sector including earmarked funds to support activities with synergistic efforts. The few ministries/departments which can play a crucial role in MVCR are listed along with suggestive list of actions to be taken are at Annexure-VIII. It is not an exhaustive list and any activity focusing on removing/avoiding development of mosquito-genic conditions could be undertaken. User friendly guidelines will be integrated to

make them simpler will be provided to the intersectoral partners. Each relevant ministry should ensure that their respective strategic plan allocates adequate resources to vector control and that strategies are adapted to specific contexts. Accountability to be fixed as required ensuring effective intersectoral collaboration at all levels. Where possible, inter and intrasectoral collaboration and actions need to be translated into rules and regulations that mandate action at the national and subnational levels, such as through bye-laws.

The committees under NHM viz., District Health Mission, Rogi Kalyan Samitis, and Village Health, Nutrition and Sanitation Committee will be encouraged to use flexi-pool to take up preventive activities in their respective areas as per the programme guidelines in addition to their routine activities.

It has long been clear that confronting society's health challenges cannot be done by the health sector alone, as health is mainly determined by factors outside the health sector. Importance of intersectoral collaboration in malaria control was recognized way back in 1901 during the British era in Bombay Municipal Corporation (now Mumbai). At present too, the best practice of intersectoral collaboration in VBD control exists in the Greater Mumbai Municipal Corporation (MCGM), the erstwhile Bombay Municipal Corporation which is known as Mosquito Abatement Committee constituted under the Chairmanship of the Municipal Commissioner. MCGM conducts the meeting of the Committee mostly in the month of March every year with the Chief Officers of those authorities whose work is related to mosquito breeding and mosquito proofing of water storage tanks. Details of the committee and the list of authorities/partners of this committee are at Annexure-XI.

Major municipal corporations will be encouraged through MVCR to adopt the practice for their areas of operation.

**Involvement of civil society/partners:** Increased public concern over the right to participate in policies and processes that affect people's lives and the growing demand for improved public accountability and responsiveness to citizen inputs at the local, national and global levels has made the work of Civil Society Organizations (CSO) more prominent. CSOs can contribute to VBD control activities by providing services in response to community needs and adapted to local conditions. They often act as an intermediary between communities and government; reach remote areas poorly served by government facilities and provide services that may be less expensive and more efficient. MVCR advocates for need based involvement of CSOs in the programme activities. Following the need assessment, procedure and guidelines would be developed to engage CSOs.

## 8.7 Operational research

It is an inbuilt component of MVCR and the scope is to coordinate with existing research institutions and academic institutions to align their focus of work, help avoid overlap and gaps in the work conducted. Further the MVCR would review and update research activities on a regular basis to maximize the benefits of basic and applied research on entomology and vector control to strengthen programme strategies and to avoid replication. The MVCR will enlist national, regional and international research/training institutions with which the vector control programme collaborates and identify options for creating a network of institutions.

Innovations such as novel tools, technologies and approaches require a clear evidence-base that demonstrates their potential value to public health leading to policy recommendation. Ideally, applied research should be led and conducted by the NVBDCP. However, because human and financial capacity in national



programmes will often be focused on implementation, research may be performed through collaboration with NCDC, ICMR institutes and Universities. Research findings of any relevant work conducted in the country is to be presented to the national programme as soon as available.

### 8.8 Strengthening legislative measures

The NVBDCP guidelines on Integrated Vector Management for control of VBDs have recommended legislative measures as an integral component. Protection against VBDs needs a judicious combination of approaches to adapt and implement model bye-laws to reduce/eliminate mosquito breeding sources in domestic and peri-domestic areas. MVCR will coordinate with concerned ministries to ensure strengthening of legal actions against regular offenders for creating/encouraging mosquitogenic conditions. Development/construction projects and industries need to be mandatorily examined for health impact assessment with respect to design and technology so as to prevent the possibility of breeding in the first place and safe waste disposal. Besides, implementation of MVCR with strengthened public health will help to ensure an equitable health care and quality life in Smart Cities as designed to be. Whenever any major development project, particularly irrigation project, is planned, the SPO/DMO should be involved in conducting a health impact assessment survey including an assessment of the project's mosquitogenic potential so that control measures are built into the plan, including budgetary provisions.

### 8.9 Financial support

The funding mechanism for MVCR will be by way of a vertical programme within the NVBDCP under Communicable Diseases Pool of National Health Mission (NHM). The demand from states will be driven in annual state Programme Implementation Plans (PIPs). The central and state shares will be as per NHM norms. Resource mobilization from donor agencies, development partners and corporate sectors will be explored for strengthening the implementation of the activities under MVCR.

At the national level, dedicated funds for establishment of MVCR Cell at NVBDCP headquarters including the infrastructure and human resource has to be worked out and included in the NVBDCP resource envelop in the subsequent years.

States will be asked to project their requirement of MVCR under different budget heads in the annual PIP as per the guidelines to be provided. The guidelines and FMR code for various budget heads for the states will be prepared at NVBDCP HQs and the same will be communicated through NHM.

In addition to domestic budget support under NHM, resource mobilization from outside the health sector will be explored, including corporate sector and donor agencies for implementation of MVCR.

### 8.10 Monitoring and evaluation

This is an important component of programme implementation serving as a feedback to improve the performance and impact. The progress made on the identified indicators under MVCR needs to be reviewed by assessment of the indicators as per the timeline. Regular review and monitoring are essential for the effective implementation of MVCR and taking corrective measures well in time.



To achieve the targets, priority activities are set out with implementation targets which are developed based on reviewing the current situation and strategy available for vector control in the country. These are not all encompassing and it is anticipated that additional activities will be required depending on the context. The priority activities are indicative and may be modified (if needed) during or after launching of the response depending on the programme strategy and guidelines.

Performance and progress indicators are as below:

### National Level

Activity	Indicator	Timeline				
		As decided by the NVBDCP				
Approval of the Mosquito & other Vector Control Response	Approval of competent authority	Approved				
Approval of budget for MVCR	Approval of MoH&FW					
Funds provisioned by NHM	Release of funds	Dedicated FMR code issued				
Establishment of MVCR Cell with human resource and other logistics in place	Filling of the posts and procurement of essential logistics					
Stakeholders appraisal and roll out activities	Meeting with the states					
Formation of Interministerial Task Force	Notification of the Task Force					
Resource mapping for health and non-health sector	Inventory of entomological resources available with health sector and research institutions, Universities, etc.					
Mapping of posts vacant at national and state/zonal levels	Enlisting of vacant positions of Entomologists at all levels					
Filling of the posts	All vacant posts of Entomologists are filled up at the national level (NVBDCP, NCDC & RoH&FW)					
Identifying/mapping of institutional capacity for undertaking skill development training in vector biology and control	Inventory of institutions and subject experts are in place and updated					
Capacity building	Orientation training of existing entomological manpower					
	Induction training of newly recruited/engaged entomological manpower					
Strengthening of entomological surveillance	Establishment of national entomological database or updation					
Insecticide resistance monitoring in place to guide vector control programme for policy decision	Susceptibility status of disease vectors to conventional insecticides used under NVBDCP and database updated regularly					
Review by Task Force	Convening of meeting of Task Force every year					
Development of plan for effective community engagement and social mobilization in vector control	Activity plan and process in place and shared with the states for time bound activities					

**State level**

Activity	Indicator	Timeline				
		As decided by the State/UT				
Adoption of the Mosquito & other Vector Control Response	Aligning Mosquito & other Vector Control Response with state VBDCP					
Estimation of budget for MVCR	Proposal submitted in the PIP to NVBDCP/MoH&FW					
Funds provisioned under NHM	Release of special installment					
Stakeholders appraisal and roll out activities	Meeting with the districts					
Formation of Inter-Departmental Task Force	Notification of the Task Force					
Filling of the posts	All vacant posts of Entomologists and Insect Collectors at state, zone & district and Urban VBD Scheme are filled up					
Entomological infrastructure strengthened	All units are functional with adequate logistics and mobility support					
All entomological zones are made functional	Vacant posts of entomologists and Insect collectors are filled up at state/zonal level					
All Urban VBD Scheme control Schemes are made functional	Vacant posts of Biologists, Insect collectors and Field Workers are filled up					
Capacity building	Orientation training of existing entomological manpower					
	Induction training of newly recruited/engaged entomological manpower					
Strengthening of entomological surveillance	Reporting entomological data timely manner to the national MVCR Cell/NVBDCP					
Insecticide resistance monitoring in timely manner	Susceptibility status of disease vectors to conventional insecticides used under NVBDCP and reported timely to the national MVCR Cell/NVBDCP					
Review by Task Force	Convening of meeting of state Task Force every year					
Effective community engagement and social mobilization plan for VBDs in place	Activity plan and process in place and shared with the districts & municipalities for time bound activities					



# Call for Action: Roles and responsibilities at different levels for implementation of MVCR

## 9.1 Technical Activities

### Directorate of NVBDCP

Directorate of NVBDCP at the central level and state NVBDCP at the state level will be the nodal agencies for the overall successful implementation of Mosquito & other Vector Control Response in the country. The agencies will be responsible for making provision of adequate funds for MVCR for its national and state level Cells for implementation of the vector control response mechanism. The national MVCR Cell will submit its report to the Director, NVBDCP. The implementation and progress will be reviewed from time to time to achieve the desired objectives and to suggest any change in the strategy, if required.

As already mentioned in Chapter 2, MVCR will be an adjunct to the ongoing strategies of NVBDCP for control of VBDs by broadening the scope of vector control with accelerated effort. Thus, the Entomology & Vector Control division of the Directorate of NVBDCP will continue its existing functions. The division will be responsible for planning insecticide procurement (Central supply), mandate committee requirement, insecticide quality issues, monitoring the supply status, etc. Introduction of new insecticide/s, vector control tools, etc. by following the existing norms of the programme like obtaining approval from Expert Committee and Technical Advisory Committee. Any policy decision on entomology and vector control component of the programme and coordination with the regulatory body will be under the purview of the Division.

#### 9.1.1 National MVCR Cell

The National MVCR Cell will have adequate manpower viz., one Sr. Consultant, four Consultants, one Technical Assistant and eight support staff for smooth functioning and implementation of the activities. The Cell will function under the umbrella of NVBDCP as an independent cell. It will carry out the following activities:



## Resource Mapping

- ⊙ Need assessment for entomological manpower available against the sanctioned posts at the national, state, regional, zonal, district, municipal levels and in Urban VBD Scheme
- ⊙ Capacity assessment – the Urban Malaria Scheme (now Urban VBD Scheme) and entomological zones were established in 1971 and 1978 respectively, based on the population of cities/towns at that time. Over the years, the population and geographical areas of cities/towns have increased. There has also been increase in the number of states and districts, however, infrastructure under the scheme remained unchanged. There is a need to re-assess the requirements of the scheme as per the current urban demographic situation in the country
- ⊙ Identifying/mapping of institutional capacity for undertaking skill development training in vector biology and control
- ⊙ Entomological infrastructure available at different research institutes and Universities will be mapped out to assess their capacity for linking with the programme activities in terms of surveillance, vector control, research, etc.



## Transmission Risk Reduction

- ⊙ Monitoring the impact of vector control through the programme reports submitted by states, IDSP reports and outbreak alerts and surveillance data received from research organizations (ICMR institutes, Universities, etc.)
- ⊙ Providing feedback to the respective states for appropriate vector control response. In case of any upsurge/outbreak situation, immediate information will be communicated to the state for deputation of the Rapid Response Team (RRT) to liquidate the focus of transmission



## Entomological Monitoring

- ⊙ Alert the concerned authority if any increasing trend is observed in vector prevalence with respect to time and space, larval indices and adult density of disease vectors and seasonal trend of vectors
- ⊙ Establishment of national entomological database and its regular updation
- ⊙ Surveillance at airports/seaports and ground crossings to maintain *Aedes* free status as per International Health Regulations (2005), WHO
- ⊙ Monitoring the susceptibility status of various vectors against insecticides used in the particular locations to guide the programme
- ⊙ Compilation of studies conducted by various research organizations including Universities on insecticide resistance in mosquitoes and other vectors



## Capacity Building through Training

- ⦿ Coordination with states for capacity building of existing manpower by conducting orientation and induction training for newly recruited/engaged Entomologists, Insect Collectors and Field Assistants
- ⦿ Orientation of the CPWD/PWD engineers and builders involved in Smart Cities or other such government schemes on mosquito breeding free construction activities



## Logistic Monitoring

- ⦿ Timely alert to the states/municipal corporations for ensuring sufficient stock of insecticides before transmission to avoid any stock out, including vector control equipment



## Coordination

- ⦿ The MVCR cell will coordinate with State MVCR cells in overall implementation of response activities in their respective states and in urban local bodies
- ⦿ Regular interaction with Entomologists at regional/state/zonal/urban VBD scheme/municipalities and other sectors for information sharing and feedback
- ⦿ The MVCR Cell will coordinate and organize meetings with various ministries/departments, intersectoral partners for their active participation with resource sharing for prevention and control of various VBDs
- ⦿ Guidelines and necessary technical information will be shared with the flagship programmes/schemes to maintain VBD free environment and to reduce morbidity and mortality due to various VBDs
- ⦿ Efforts will be made to involve the corporate sector in various public health activities related to VBDs under Corporate Social Responsibility (CSR)
- ⦿ Liaisoning with various international agencies/donors for their partnership in entomological aspects to achieve the programme targets for elimination/control of various VBDs



## Legislative Measures

- ⦿ MVCR Cell will coordinate with states for enactment and implementation of bye-laws to prevent mosquitogenic conditions with penal provision



## Task Force

- ⦿ Constitution and notification of the inter-Ministerial Task Force with defined terms of reference
- ⦿ Organizing meetings and follow-up for actions on the decisions taken in previous meeting/s





## Research & Development

- ⦿ Coordination with various research organizations for update on newer vector control tools, and innovations on entomology and vector control
- ⦿ Timely sharing of the data/observations on various studies pertaining to entomology and vector control to assess the programme implication



## Community Mobilization

- ⦿ Focused activities will be carried out to strengthen community participation and ownership in prevention of vector breeding
- ⦿ Motivate the community for optimal utilization of various services provided under the programme
- ⦿ Media tools will be developed and shared with all stakeholders for community sensitization and advocacy
- ⦿ Planning for timely implementation of media activities at various levels will be coordinated
- ⦿ Encouraging involvement of school children as 'Little Champs' for behavioural change of community towards prevention and control of dengue



## Analysis of Data and Feedback

- ⦿ Timely analysis of reports/data submitted by the states and other stakeholders and provide feedback to the concerned for taking corrective/preventive vector control measures
- ⦿ Identification of the hotspots for various vectors through GIS mapping and share the information with all concerned for appropriate measures
- ⦿ Update the Directorate of NVBDCP and states with factual positions in terms of entomological observations for taking necessary measures



## Monitoring and Evaluation

- ⦿ The National MVCR Cell will monitor the activities as emphasized in the guidelines for timely actions at various levels
- ⦿ The Cell will monitor the recruitment status of entomological manpower at various levels as indicated in the guidelines
- ⦿ Ensuring regular submission of entomological reports from regional centres/states/state MVCR cells/urban local bodies and timely action for inconsistency reporting, if any
- ⦿ Evaluation of entomological activities and their effect in terms of VBD cases at various levels and update all concerned
- ⦿ The National MVCR Cell will coordinate with the State MVCR Cells for monitoring the coverage and quality for vector control interventions under the programme

### 9.1.2 Regional Office of Health & Family Welfare (RoH&FW)

The Entomologist posted at RoH&FW will continue the regular activities as per the assigned duties. In addition, the Entomologist will coordinate with the MVCR Cell/s in the states under their jurisdiction for overall activities as per the response/alert of the National MVCR Cell to provide technical guidance/support to the state/s, zones and municipal corporations

Timely submission of the report on the activities to the National Cell including the feedback provided to the state/s will be critical for successful implementation of MVCR

### 9.1.3 State MVCR Cell

The Cell will function at the State NVBDCP HQs under the respective State Programme Officer (SPO). Like the National Cell, the State Cells will have one Entomologist/State Consultant Entomology and two Insect Collectors who will coordinate with the existing entomological setup (zone, Urban VBD Scheme and municipal corporations). The Cell will carry out the following activities:



#### Gap Analysis

- ⦿ Carry out the gap analysis of entomological activities at state, zone and the municipal corporation and submit the report to the SPO under intimation to ROH&FW and Directorate of NVBDCP for taking corrective measures



#### Entomological Monitoring

- ⦿ Vector prevalence with respect to time and space (in various districts)
- ⦿ Larval indices and adult density of disease vectors
- ⦿ Seasonal trend of vectors, if any increasing trend is observed, the Cell will bring to the notice of respective SPO and alert the concerned district and/or municipality for taking public health measures
- ⦿ Timely analysis of reports/data submitted by the districts/municipalities and other stakeholders and provide feedback to the concerned for taking corrective/preventive vector control measures
- ⦿ Monitor the impact of vector control through disease reports
- ⦿ Update the SPO and National MVCR Cell with factual positions in terms of entomological observations from time to time for updating the national entomological database



### Mapping of insecticide resistance and management strategies

- ⦿ Carry out susceptibility test to assess the status of various vectors against insecticides under use in the state
- ⦿ Analyze the report on insecticide resistance status of various vectors, management strategies and submit to the Directorate of NVBDCP through SPO for any policy decision, if needed



### Capacity Building through Training

- ⦿ Conduct training/s for the peripheral health workers through the districts on various vector control measures and documentation/reporting
- ⦿ Orientation of the stakeholders and interdepartmental partners for their involvement in the preventive and control measures of VBDs



### Logistic Monitoring

- ⦿ Monitor the availability of the stock of insecticides in the districts/municipalities to ensure timely procurement before transmission to avoid any stock out
- ⦿ Assess the functional status of vector control equipment in the districts/municipalities before transmission season



### Coordination

- ⦿ The State MVCR Cell will coordinate with the existing entomological setup in the state for overall implementation of response in the state. Regular interaction with Entomologists at regional/zonal/urban VBD scheme/municipalities and other sectors for strengthening the entomological monitoring and vector control
- ⦿ The Cell will facilitate establishment of Public Health Unit in industrial setup and provide technical support for their capacity building
- ⦿ The State MVCR Cell will coordinate and organize meetings with various departments for their active participation with resource sharing for prevention and control of various VBDs and follow-up actions



### Legislative measures

- ⦿ State MVCR Cell will coordinate with urban local bodies for implementation of existing bye-laws to prevent mosquitogenic conditions. Wherever such provision is not existing, the Cell will facilitate to frame and enact the bye-laws
- ⦿ Coordinate with the Department of Rural Development and Panchayati Raj Institute for taking appropriate legislative measure/s (wherever applicable) to avoid mosquitogenic conditions to reduce the risk of transmission of VBDs





### Task Force

- ⊙ Constitution and notification of the interdepartmental Task Force with defined terms of reference aligning with National Task Force. Organizing meetings and follow-up for actions on the decisions taken in previous meeting/s and submit the report to the National Cell



### Community Mobilization

- ⊙ Focused activities will be carried out to strengthen community participation and ownership in prevention of vector breeding
- ⊙ Motivate the community for optimal utilization of various services provided under the programme
- ⊙ Media tools will be translated into local languages and shared with all stakeholders for community sensitization and advocacy
- ⊙ Planning for timely implementation of media activities at various levels will be coordinated
- ⊙ Ensuring behavioural change of community towards prevention and control of dengue by encouraging involvement of school children as 'Little Champs'



### Monitoring and Evaluation

- ⊙ The State MVCR Cell will monitor the activities as emphasized in the guidelines for timely actions at various levels
- ⊙ Ensuring regular submission of entomological reports from zone/urban local bodies and feedback for timely action
- ⊙ Evaluation of entomological activities and their effect in terms of VBD cases at various levels and update all concerned through SPO under intimation to RoH&FW and the National Cell
- ⊙ The State MVCR Cell will coordinate with districts for monitoring the coverage and quality for vector control interventions under the programme

## 9.2 Administrative

- ⊙ At the National level, Directorate of NVBDCP will initiate the process of filling up the vacant posts of various categories of Entomologists at NVBDCP and RoH&FW
- ⊙ Similarly, NCDC will fill up the vacant post of Entomologists at the National level and existing/new branches

- ⊙ State governments will
  - » strengthen the entomological setup at State NVBDCP with adequate human resource and facilitate its smooth functioning by providing necessary logistics and mobility support
  - » process and fill up the vacant positions of Zonal Entomologists, Insect Collectors at the zonal level of the respective states. The state governments will be responsible for making all the zones functional with logistics and mobility support
  - » review the Urban VBD Scheme, erstwhile Urban Malaria Scheme and take action to make them functional as per the requirement of the MVCR
  - » process for creation of new entomological zones and/or Urban VBD Scheme if needed in the respective States
  - » creation of entomological infrastructure at the district level with adequate human resource and logistics (including mobility support)
  - » coordinate with major municipalities for resource mapping, filling up of the vacant positions and creation of new posts, wherever needed
- ⊙ MoH&FW, GoI, will issue necessary instructions and guidance to the State Health Department and Urban Development Department to fill the vacancies as stated above as and when needed

### 9.3 Financial

- ⊙ The funding mechanism for MVCR is vertical within the NVBDCP under Communicable Diseases Pool of National Health Mission (NHM)
- ⊙ The demand from states will be driven in annual state PIPs. The central and state shares will be as per NHM norms
- ⊙ New FMR code for MVCR provided by NHM Division, GoI, will include the projected financial requirement of the states for the activities under Programme Implementation Plans (PIPs) at appropriate places
- ⊙ Resource mobilization from donor agencies, development partners and corporate sectors will be explored by MoH&FW/Directorate of NVBDCP
- ⊙ At the national level, dedicated funds for establishment of the MVCR Division at NVBDCP HQs including the infrastructure and human resource for MVCR cells at the national and state level to be provisioned
- ⊙ Separate funding and its mechanism of flow at the national and state levels with timely release of funds will be crucial for successful implementation of MVCR activities

# Bibliography

1. Accelerated plan for Kala-azar elimination, NVBDCP 2017.
2. Aspirational Districts Programme. [www.niti.gov.in](http://www.niti.gov.in)
3. Ayushman Bharat. <http://ayushmanbharat.net>
4. Communication For Behavioural Impact (COMBI) : A toolkit for behavioural and social communication in outbreak response, WHO 2012.
5. Compendium on Entomological Surveillance & Vector Control in India, NVBDCP 2016.
6. First WHO report on neglected tropical diseases, "Working to overcome the global impact of neglected tropical diseases", WHO 2010.
7. Fourth WHO report on neglected tropical diseases, "Integrating neglected tropical diseases in global health and development", WHO 2017.
8. Framework for a national plan for monitoring and management of insecticide resistance in malaria vectors, WHO 2017.
9. Global Plan for Insecticide Resistance Management in Malaria Vectors, WHO 2012.
10. Global Vector Control Response 2017–2030, WHO 2017.
11. Handbook for Integrated Vector Management, WHO 2012.
12. Informal Expert Consultation on Yellow Fever Threat to India and other SEA Region Countries. Report of the Consultation, Goa, India. WHO SEARO 23-25 March 2011.
13. International Health Regulations, Second edition, WHO 2005.
14. Mid Term Plan for Prevention and Control of Dengue and Chikungunya, NVBDCP 2011.
15. Mission Antyodaya, Ministry of Rural Development, Government of India. <https://missionantyodaya.nic.in>
16. National Guidelines for Transmission Assessment Survey for Elimination of Lymphatic Filariasis India-2013-14, NVBDCP.
17. National Programme for Prevention and Control of Japanese Encephalitis/Acute Encephalitis Syndrome, NVBDCP 2014.
18. National Strategic Plan for Malaria Elimination in India 2017-22, NVBDCP 2017.
19. Operational Manual for Integrated Vector Management in India, NVBDCP 2016.
20. Pruss-Ustun A, Wolf J, Corvalan C, Bos R, Neira M. Preventing disease through health environments: a global assessment of the burden of disease from environmental risks. WHO, Geneva 2016.
21. Smart Cities Mission, Ministry of Housing and Urban Affairs, Government of India. [www.smartcities.gov.in](http://www.smartcities.gov.in)
22. Strategy and Plan of action for Effective Community Participation for Prevention and Control of Dengue, NVBDCP 2017.
23. Swachh Bharat Mission, Government of India. [www.swachhbharat.mygov.in](http://www.swachhbharat.mygov.in)
24. Vector control operations framework for Zika virus, WHO 2016.
25. Vector surveillance and control at ports, airports, and ground crossings. International Health Regulations, WHO 2016.



# Annexure - I

## Magnitude of other Vector Borne Diseases Prevalent in India

Disease	Vector	Magnitude and area of influence*
<b>Sandfly Borne</b>		
Cutaneous leishmaniasis	<i>Phlebotomus papatasi</i> , <i>P. sergentii</i>	Cutaneous leishmaniasis - cases reported in 1980 from Bikaner in Rajasthan since 2001 and till 2011 a total of 1379 cases were reported. Thereafter, from 2005, cases are reported from Himachal Pradesh. Other states from where cases were reported are Uttarakhand, Jammu & Kashmir, Punjab, Gujarat, Tamil Nadu and Kerala.
Sandfly fever (Papatasi Fever)	<i>P. papatasi</i>	160 cases of Sandfly fever reported from Nashera (western Himalayas) India, in 1915.  Isolation of Sandfly fever virus was done from sandflies and humans during the 1970s in Aurangabad district, Maharashtra.  Sandfly fever virus reported from Ganjam district in Odisha in 2018  Sandfly fever (Papatasi fever) – Sporadic cases are reported frequently in the recent past from Gujarat and Maharashtra.
Chandipura virus	<i>P. papatasi</i>	First report of Chandipura virus (CHP) in 1954 from Jamshedpur (Jharkhand) in central India.  First isolation in 1965 at CHP (Nagpur) region of India- two adult patients and outbreak in 2007 in Nagpur division of Maharashtra.  CHP virus was isolated from a child with AES in Raipur (Chhattisgarh) in 1983.  Outbreak reported among children in Andhra Pradesh with case fatality rate > 55% in 2003; in Warangal District in 1997 and 2002.  Outbreak of encephalitis in children in Gujarat State in 2004.  Sporadic cases of CHP are reported from Gujarat, Andhra Pradesh, Maharashtra and Madhya Pradesh. It is an emerging tropical pathogen and outbreak reported recently in 2014, 2015, and 2017.
<b>Flea Borne</b>		
Plague	<i>Xenopsylla cheopis</i> <i>Xenopsylla astia</i>	Before emergence in 1994, the last human case of plague was reported from Kollar (Karnataka) in 1966. In 1994, plague emerged as an epidemic and outbreak was reported from Beed district of Maharashtra and Surat in Gujarat.  <ul style="list-style-type: none"> <li>• Outbreak of Pneumonic Plague was reported from Hatkoti village (Rorhu district, Shimla) Himachal Pradesh – February 2002, 16 cases and 4 deaths</li> <li>• Outbreak of Bubonic Plague was reported from Village Dangud (Uttarkashi district) Uttarakhand – October, 2004 - 6 Cases and 2 deaths</li> </ul> <p>Thereafter, no case of plague has been reported, but plague bacilli exists in natural cycle as sylvatic foci in India .</p>

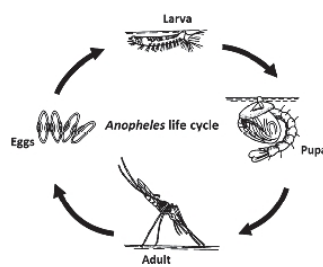
Tick Borne		
Crimean Congo Hemorrhagic Fever (CCHF)	<i>Hyalomma</i> ticks	In 2011, the first outbreak was reported from Ahmedabad in Gujarat. Thereafter, cases were reported from different districts of Gujarat almost every year. During 2012–2017, several outbreaks and cases of CCHF transmitted by ticks via livestock and as nosocomial infections were reported in the states of Gujarat and Rajasthan. Cases were documented from many districts of Gujarat (Ahmedabad, Amreli, Patan, Surendranagar, Kutch, Keda, Rajkot, Bhavnagar and Aravalli) and 3 districts of Rajasthan (Sirohi, Jodhpur and Jaisalmer). In 2015, one CCHF case was also reported from Gautam Budh Nagar district of Uttar Pradesh.
Kyasanur Forest Disease (KFD)	<i>Haemaphysalis</i> ticks and other species of hard ticks	Cases were reported for the first time in 1954 from Shimoga (Karnataka). Since then, cases and deaths due to KFD were reported every year. Highest number of cases reported in the year 1983 (2163 cases & 148 deaths).  Sporadic cases of KFD have been reported in recent years from new areas viz., Chamarajanagara district of Karnataka, Nilgiri district of Tamil Nadu, Wayanad & Malappuram districts of Kerala, Sindhudurga district of Maharashtra and in the state of Goa.
Tick Typhus	<i>Rhipicephalus</i> ticks	Rickettsial diseases commonly affect people who travel to endemic areas. In India, cases have been reported from Maharashtra, Tamil Nadu, Karnataka, Kerala, Jammu & Kashmir, Uttarakhand, Himachal Pradesh, Rajasthan, Assam and West Bengal.  In 2004, outbreak was reported from Kangra district of Himachal Pradesh. Sporadic cases are also reported from other districts of Himachal Pradesh, Pune (Maharashtra) and Haryana as well.
Lyme Disease	Soft ticks	Four sero-positive cases of lyme disease were reported from the Nilgiri Hills of Tamil Nadu in 1996. In a study conducted in north eastern India in 2008, 13% sero positive cases were found.  Five human cases of lyme disease were reported from Rohtak, Haryana, in 2014. Cases were also reported from Wayanad, Kerala, in 2016.
Mite Borne		
Scrub Typhus	<i>Leptotrombidium deliense</i>	Cases due to scrub typhus were reported in the country since India's independence from hilly forest tract.  In the early 1980s, cases of scrub typhus were reported in gentleman cadets of Indian Military Academy (IMA) from Dehradun (Uttarakhand).  Cases of scrub typhus were reported regularly from the hilly forest areas of Himachal Pradesh and Jammu & Kashmir.  Presently, outbreaks, cases and deaths due to scrub typhus are reported from >21 states including north east and southern states in the country including Delhi. In recent years, cases of scrub typhus are increasing and reported from newer geographical areas.

\* Source of information- available literature

# Annexure - II

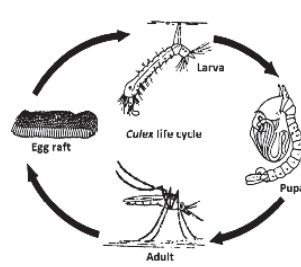
## Life Cycle of Various Vectors

### Mosquitoes



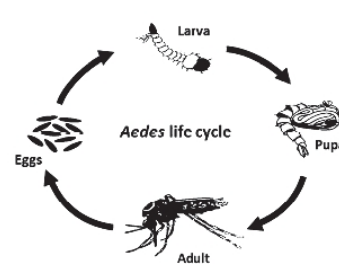
*Anopheles* generally breeds in clear and unpolluted water collections

Vector control measures are recommended against both adult and aquatic stages



*Culex* generally breeds in polluted water (LF vector), can breed in unpolluted water collections as well (JE vector)

Vector control measures are recommended against adult (for JE) and aquatic stages (for LF)

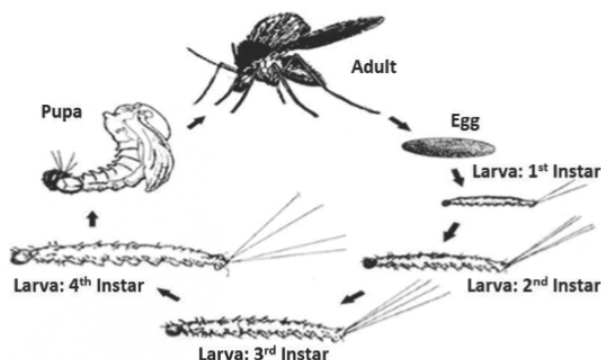


*Aedes* generally breeds in water collections in containers

Vector control measures are recommended against both adult and aquatic stages

### Sandfly

(Kala-azar, Visceral leishmaniasis)

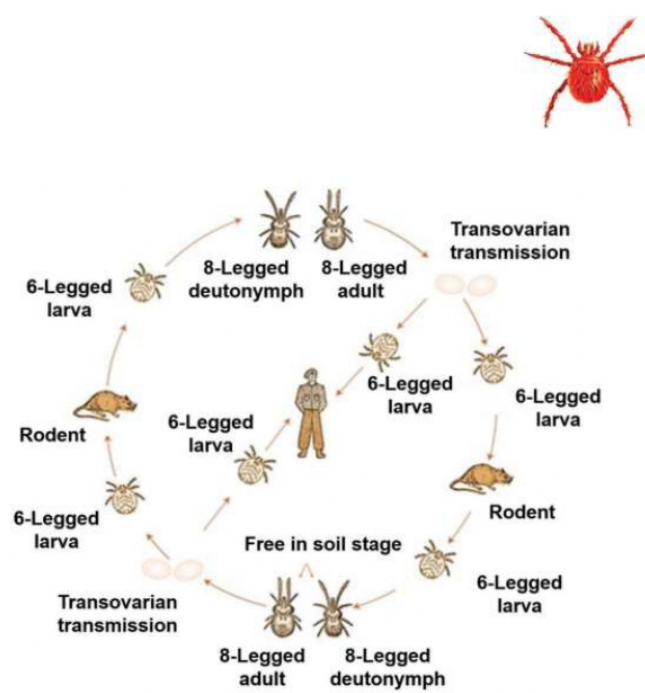


Life cycle – Sandflies have a four-stage life-cycle: egg, larva, pupa and adult. Larval development involves four instars, and is completed after 20-30 days (average one month) depending on species, temperature and nutrient availability.

Breeds in dying and decaying organic matter, cow dung heaps, cracks, crevices, rodent burrows, in and around houses/ cattle sheds, etc.

Vector control measures are recommended for adults (indoor residual spraying) as larval stages are terrestrial and widespread.





### Mite (Scrub typhus)

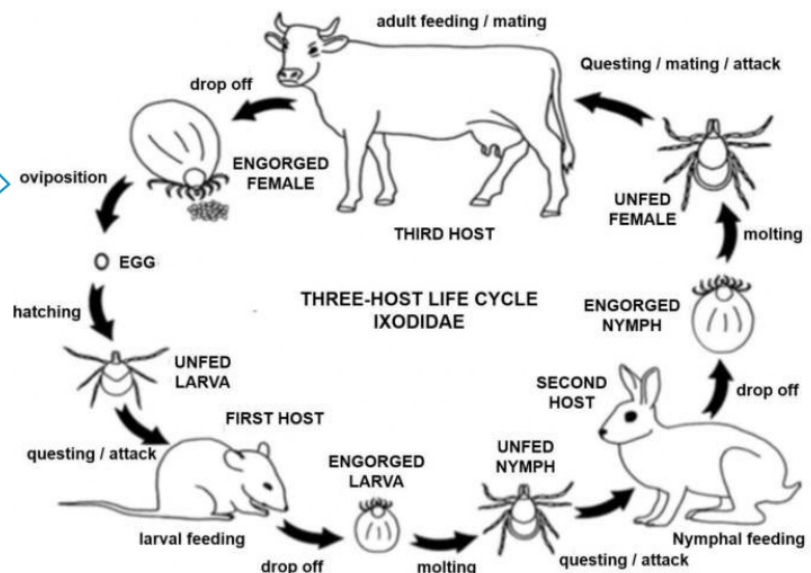
Life cycle of Trombiculid mites includes egg, larva (six legs), nymph with protonymph, deutonymph, tritonymph stages and adult. Total life cycle under normal conditions completes in 40-50 days. Adult mite lays eggs under low vegetations/herbs/shrubs in and near dying and decaying organic matter, rodent burrows and in cracks, crevices. Larva needs blood, thus feeds on rodent/small mammals and involved in disease transmission. Nymphs and adult do not take blood; they feed on dying and decaying organic matter and are not involved in diseases transmission.

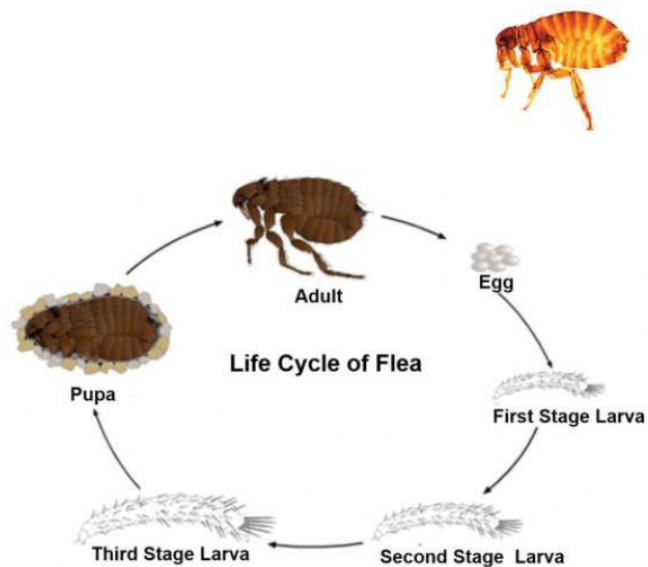
Control measures include personal protection measures (use of repellents), prophylactic measures and vector control in and around houses during epidemic/outbreaks targeting various stages.

Life cycle of hard ticks includes egg, larva (six legs), nymph and adult. Total life cycle under normal conditions completes in 80-120 days. After mating, adult female ticks lay eggs under low vegetations/herbs/shrubs in & near dying/decaying organic matter, rodent burrows and in cracks, crevices. Larva, nymph and adult (both male & female) ticks need blood. Immature stages generally feed on rodents/small mammals. Nymph and adults are involved in the transmission of diseases.

Control measures include personal protection measures (use of repellents), prophylactic measures and vector control in and around houses, around the hotspot in forest during epidemic/outbreaks.

### Hard Ticks (KFD, Tick Typhus and CCHF)





### Flea (Plague)

Flea's life cycle includes egg, larva, pupa and adult. Total life cycle under normal conditions completes in about 30 days. Adult female fleas lay eggs in bed material of rodent burrows and some in cracks and crevices. Both male and female fleas take blood and are involved in disease transmission. Larvae feed on dying and decaying organic matter while pupa is a non-feeding stage.

Control measures include personal protection measures (use of repellents), prophylactic measures and vector control against adult fleas as IRS up to the height of one metre in and around houses, insecticide dusting in drains, runways and path ways of rodents, rodent control (only during inter-epidemic period).

# Annexure - III

## Vector Control Measures

Mosquitoes complete life cycle in four stages, that is, egg, larva, pupa and adult. The first three stages viz., egg, larva and pupa are mainly aquatic, whereas, the adult stage is aerial. Some vector control methods are used for personal protection and others as public health measures. Under NVBDCP, the following vector control strategies are used for control of developmental stages of vectors:

- I. Source reduction & environmental management: This involves any change that prevents or minimizes vector breeding thereby reducing human-vector contact viz: Improved water supply, mosquito-proofing of overhead tanks/ cisterns/ underground reservoir/wells, flower pots/vases, mandatory water storage for firefighting, Solid waste disposal, tyre management and filling of cavities of fences
- II. Personal protection: Protective clothing, mats, coils and aerosols, insecticide-treated mosquito nets and curtains
- III. Biological (fish): The larvivorous fish (*Gambusia affinis* and *Poecilia reticulata*) extensively used for the control of *An. stephensi* and/or *Ae. aegypti* in large water bodies or large water containers in many parts of country
- IV. Chemical control measures -
  - a. Larvicide
  - b. Adulticide

Larviciding is recommended in permanent and big water containers where water has to be conserved or stored for a long period because of scarcity of water or irregular and unreliable water supply. On the other hand, adulticides are recommended only during emergencies or outbreak situations to eliminate infective mosquitoes and cut down or interrupt transmission.

Larviciding: It is recommended for eliminating the immature stages of vector mosquitoes. Under the programme, it is used in urban situation against larval stages of malaria, filaria, dengue, chikungunya vectors at their breeding sites. It is difficult and expensive to apply chemical larvicides on a long-term basis. Insecticides that can be used under the programme are:

- ⊙ Mosquito Larvicidal Oil (MLO): This oil had been used under the programme for a long time and is still in use. MLO suffocates the mosquito larvae by producing a surface film which cuts off their supply of air (suffocation), blocking of respiratory tubes by oil particles, and reduction of surface tension, making it difficult for larvae to remain at surface and thus causing them to drowned.
- ⊙ Temephos 50% EC & 1% GR: It is used as 50% emulsifiable concentrate under National Vector Borne Disease Control Programme. 1% granules are used in stored water like coolers, etc. for *Aedes* control.
- ⊙ Bti (5% WP) & Bti (aqueous suspension): These are effective mosquito control agents in polluted water. As it is a biological product, no harmful effect on the environment has been reported so far. It is effective against the II, III and early IV instar larvae.



- ⊙ Insect Growth Regulators (IGRs): These interfere with the development of the immature stages of the mosquito by interference of chitin synthesis during the molting process in larvae or by disruption of the pupal and adult transformation processes. Under the programme, currently Diflubenzuron 25% WP and Pyriproxyfen GR are recommended.

## Adulticide

- a. Indoor Residual Spraying (IRS): It is an important vector control strategy used to reduce the vector density, reduce the longevity of the vector and cut down transmission. Currently, it is used for the control of malaria and kala-azar.
- b. Vectors of other VBDs can also be controlled using this technique under emergency/epidemic situation as per the vectors' breeding, resting and feeding behaviour.
- c. Insecticide treated nets/long lasting insecticide nets (ITNs/LLIN): ITNs/LLINs provide protection for the occupants of house against malaria mosquito bites by repelling/knocking down them before they can take a blood meal.
- d. Space spray/fogging

Indoor space spray: This method is used to against infective mosquitoes resting in indoor to cut down transmission during epidemic/outbreak usually for *Aedes* borne diseases. Pyrethrum extract (plant extract) 2% and Cyphenothrin 5% EC are used in the programme.

Fogging: It is effective for interrupting transmission by eliminating infective mosquitoes particularly in outdoor situation. Fogging can be used where immediate, but transitory effects on the targeted adult population of the vector are required to reduce the transmission. Fogging is not advised under routine conditions, it is always advised for outbreak/epidemic situations. Fogging may be thermal or ultra low volume/cold aerosol.

Thermal fogging: This technique is based on the principle that when insecticide is vaporized by heat, it condenses to form a fine cloud of droplets upon coming in contact with cooler air. In this method, insecticide is vaporized at a very high temperature inside the machine. Once the fog comes out of the machine, it tends to spread in different directions by mixing with wind. Thermal fogging is psychologically more acceptable as it generates a highly visible fog. The insecticides currently recommended for fogging are Malathion technical and Cyphenothrin 5%EC.

Ultra low volume (ULV)/Cold aerosol: In this technique, the insecticide is broken down into aerosol by mechanical force alone, without the aid of heat. ULV sprays are commonly used to control the outbreaks of arboviral diseases. An advantage of cold aerosol application is that it does not produce a dense fog. The droplets of insecticide in the form of cloud will remain suspended in the air and will knock down the mosquitoes.

Note: The insecticides used under the programme may change if resistance is reported against the target species or newer insecticides may be introduced in the programme. Refer NVBDCP website ([www.nvbdc.gov.in](http://www.nvbdc.gov.in)) for formulations and dosages.

### Vector borne diseases, vector control measures and insecticides used under programme in India (as on July 2020)

Disease	Vector Control intervention	Name of insecticides & formulations*
<b>Mosquito borne</b>		
Malaria	Indoor Residual Spray (IRS) In Rural areas	DDT 50% WP, Malathion 25% WP, Synthetic Pyrethroids- Deltamethrin 2.5% WP, Cyfluthrin 10% WP, Alphacypermethrin 5% WP, Lambdacyhalothrin 10% WP and Bifenthrin 10% WP.
	Indoor Space spray	Pyrethrum extract, Cyphenothrin 5% EC
	Outdoor fogging	Technical Malathion, Cyphenothrin 5% EC
	Larviciding in Urban Area	Mosquito larvicidal oil (MLO), Temephos 50% EC
	Biological control	Fish and Bti
	Long Lasting Insecticidal Net (LLIN)	Synthetic Pyrethroid
Dengue & Chikungunya	Source reduction	Detection & elimination of <i>Aedes</i> breeding containers
	Larviciding in +ve containers	Temephos 50% EC
	Indoor Space spray	Pyrethrum, Cyphenothrin 5% EC
	Outdoor fogging	Technical Malathion, Cyphenothrin 5% EC
Japanese Encephalitis	IRS in and around piggeries Environmental modification Indoor focal Space spray Outdoor fogging	Insecticides used under the programme
Filariasis	Anti-larval activity	Insecticides used under the programme
<b>Sandfly borne</b>		
Kala-azar (Visceral leishmaniasis)	IRS in affected areas	DDT 50% WP, Alphacypermethrin 5% WP

\* For details consult NVBDCP website

# Annexure - IV

## Newer Vector Control Tools

Several promising potential new vector control tools are under development. These new tools have the potential to reduce vector populations and/or viral multiplication to minimal levels and thereby preventing transmission. Though several tools showed strong evidence for entomological effect, given the absence of strong data on epidemiological impact for any *Aedes* borne viruses, full-scale programmatic deployment is not currently recommended for any of these new tools by WHO Vector Control Advisory Group (VCAG). The VCAG in its meeting held on 4-16 May 2018 at WHO HQs, Geneva, observed that the development process was still underway for all these tools and recommended to generate necessary evidence about epidemiological impact of these newer tools. The tools under development are as under:

- i. **Use of *Wolbachia*:** It is a bacteria (family Rickettsiaceae), which infects arthropod species, including a high proportion of insects. However, major vectors of dengue and malaria (*Ae. aegypti* and various Anopheline mosquitoes respectively) are not naturally infected by *Wolbachia*. It is being tried in adult vectors as a microbial control of human pathogens. Laboratory studies indicate *Wolbachia* infection (symbiotic) affects the longevity of the infected mosquito and when introduced into *Ae. aegypti* populations, reduce the mosquitoes' ability to transmit arboviruses to humans. Laboratory results show that *Wolbachia* infection reduces viral replication of dengue, chikungunya and Zika viruses within *Aedes* mosquitoes, and eliminates or substantially delays appearance of virus in mosquito saliva, reducing its competence for transmitting dengue viruses. The strategy involves establishing and sustaining *Wolbachia* in *Aedes* mosquito populations, thereby providing ongoing protection from virus transmission. Two methodologies are being used to study the efficacy of *Wolbachia* on *Aedes* mosquitoes— population alteration (using wMel strain *Wolbachia* in *Aedes aegypti*) and population reduction (*Ae. aegypti* & *Ae. albopictus* infected with *Wolbachia* species using sterilized male technique).
- ii. **Genetic manipulation of mosquito population:** A transgenic strain of *Ae. aegypti* engineered to carry a dominant, repressible, non-sex-specific, late-acting lethal genetic system, together with a fluorescent marker using a population reduction (self limiting) approach. This technology has demonstrated the ability to reduce the *Ae. aegypti* populations in small-scale field trials in several countries, but there is an absence of data on epidemiological impact. Additionally, sustained release of transgenic male mosquitoes is needed to maintain suppression of wild *Ae. aegypti* populations.



- iii. Sterile insect technique (SIT): This technique involves the mass production, sex-separation and sterilization of male mosquitoes. Males are sterilized by exposing them to low doses of radiation. These males are then released into the field to mate with wild female mosquitoes of the same species. This results in production of unviable eggs leading to decline in wild mosquito populations. When the sterile males outnumber the fertile males in a natural environment, the target mosquito population is reduced. SIT technology has been successfully used for agricultural and veterinary pests.
- iv. Vector traps: This technology may reduce mosquito populations by attracting and killing egg-laying female mosquitoes and also has the potential for improved vector surveillance. The entomological efficacy of these traps has been demonstrated in limited field trials. Evidence for the public health value of vector traps needs to be established to address the operational considerations.
- v. Attract-and-kill baits/attractive toxic sugar bait (ATSB): It is a novel application method involving use of insecticide classes that act as stomach poisons for mosquitoes. This technology is based on an "attract and kill" principle, where mosquito attractants are combined with oral toxins that kill the target insects. ATSB products are intended for spraying on vegetation harbourages for mosquitoes in and around houses or, in their absence, putting up treated bait stations to attract and kill sugar-seeking mosquitoes.

# Annexure - V

## List of Urban Malaria Towns

S.No.	State	No. of Towns	Towns
1	Andhra Pradesh	8	Guntur, Hyderabad, Khammam, Kurnool, Nalgonda, Vijayawada, Visakhapatnam and Warangal
2	Gujarat	18	Ahmedabad, Anand, Bharuch, Bhavnagar, Bhuj, Dabhoi, Dahod, Dholka, Gandhidham, Gandhinagar, Godhra, Khambhat, Morbi, Nadiad, Rajkot, Surendra Nagar, Upleta and Vadodara
3	Haryana	17	Ambala, Bhiwani, Faridabad, Gurugram, Hissar, Jind, Kaithal, Karnal, Narnaul, Palwal, Panchkula, Panipat, Rohtak, Sirsa, Sonapat, Thanesar and Yamuna Nagar
4	Jammu & Kashmir	1	Jammu
5	Jharkhand	4	Bokaro, Chaibasa, Daltonganj and Hazribagh
6	Karnataka	8	Bengaluru, Belgaum, Bellary, Chikamgudur, Hassan, Hospet, Raichur and Tumkur
7	Madhya Pradesh	6	Bhopal, Indore, Mandsaur, Ratlam, Shivpuri and Ujjain
8	Maharashtra	15	Ahmednagar, Akola, Aurangabad, Beed, Bhusawal, Dhule, Gr. Mumbai, Jalgaon, Manmad, Nanded, Nashik, Pandharpur, Parbhani, Pune and Sholapur
9	Manipur	1	Imphal
10	Nagaland	1	Dimapur
11	Odisha	3	Berhampur, Rourkela and Sambalpur
12	Punjab	13	Amritsar, Bhatinda, Ferozepur, Gurdaspur, Hoshiarpur, Jagraon, Jalandhar, Kapurthala, Ludhiana, Malerkotla, Nabha, Patiala and Rajpura
13	Rajasthan	6	Ajmer, Bharatpur, Bikaner, Jaipur, Jodhpur and Kota
14	Tamil Nadu	12	Chennai, Dindigul, Elampillai, Erode, Komarapalayam, Rasipuram, Salem, Tiruchengode, Tiruchirapally, Tiruvottiyur, Tuticorin and Vellore
15	Tripura	1	Agartala
16	Uttar Pradesh	14	Aligarh, Agra, Allahabad, Badaun, Bulandshahar, Ghaziabad, Jhansi, Kanpur, Lucknow, Mathura, Meerut, Moradabad, Mujaffarnagar and Varanasi
17	West Bengal	1	Kolkata municipal corporation
18	Chandigarh	1	Chandigarh
19	Delhi	1	Delhi
<b>TOTAL</b>		<b>131</b>	

# Annexure - VI

## Entomological Zones in India




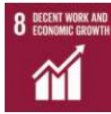
Sr No	State with Zone/s	No. of Zones	Name of the 78 Zones
1&2	Andhra Pradesh (+Telangana)	6	Hyderabad, Rajahmundry, Visakhapatnam, Warangal, Guntur, Cuddapah (Kadapa)
3	Arunachal Pradesh	2	North Zone, South Zone*
4	Assam	3	Guwahati, Jorhat, Silchar
5	Bihar	4	Patna, Darbhanga, Muzzafarpur, Bhagalpur
6	Chhattisgarh	2	Bilaspur, Raipur
7	Gujarat	6	Ahmedabad, Bhavnagar, Rajkot, Vadodara, Surat, Gandhinagar*
8	Haryana	2	Ambala, Hissar
9	Himachal Pradesh	1	Dharmshala
10	Jharkhand	2	Ranchi, Hazaribagh
11	Karnataka	4	Bengaluru, Belgaum, Gulbarga, Mysore
12	Kerala	1	Thiruvananthapuram
13	Madhya Pradesh	5	Bhopal state HQs, Bhopal Division, Indore, Gwalior, Jabalpur
14	Maharashtra	4	Mumbai, Pune, Nagpur, Aurangabad
15	Odisha	3	Sambalpur, Cuttack, Behrampur
16	Punjab	3	Firozpur, Jalandhar, Patiala
17	Rajasthan	7	Jaipur, Jodhpur, Bikaner, Kota, Udaipur, Ajmer* Bharatpur*
18	Tamil Nadu	9	Vellore, Salem, Coimbatore, Dindigul, Tiruchirapalli, Cuddalore, Tirunelveli, Thanjavur*, Virudhunagar*
19	Uttar Pradesh	9	Lucknow, Agra, Gorakhpur, Bareilly, Meerut, Jhansi, Faizabad, Allahabad, Varanasi
20	Uttarakhand	2	Pauri Garwal, Nainital
21	West Bengal	3	Kolkata, Burdwan, Jalpaiguri








\* 6 zones identified subsequently



# Annexure - VII

## Relationship between Sustainable Development Goals and VBDs

SDG	Relationship	Examples
 1 NO POVERTY	Reducing malaria and other vector borne diseases will reduce poverty and increase economic prosperity	<ul style="list-style-type: none"> <li>Population in low economic strata is more likely to be affected by malaria and kala-azar</li> <li>Elimination or reduction of VBDs will improve the social well-being by reducing expenditure on treatment and loss of man-days</li> <li>More manpower (man-days) will be available to industry, development projects contributing in the nation's development</li> </ul>
 2 ZERO HUNGER	Ending VBDs improves nutritional intake and healthy population & increases agricultural productivity	<ul style="list-style-type: none"> <li>Among children of the same socio-economic status, those infected with malaria, kala-azar and JE have poorer nutritional status than non-affected children</li> <li>Adults suffering from chikungunya, malaria, kala-azar and filaria have a reduced labour output, influencing food production</li> <li>Agricultural practices strongly influence transmission of VBDs</li> </ul>
 3 GOOD HEALTH AND WELL-BEING	VBDs are major contributor of morbidity and mortality	<ul style="list-style-type: none"> <li>VBDs account for &gt;17% of the global burden of infectious diseases</li> <li>At any one point of time and place, there is a potential risk of 2-3 VBDs in an area.</li> <li>Improving VBD situation will lead to decline in child and mother mortality rate</li> </ul>
 4 QUALITY EDUCATION	Ending VBDs improves school attendance and educational outcomes	<ul style="list-style-type: none"> <li>5-20% of those who recovered from cerebral malaria and Japanese Encephalitis experience neurological sequelae and are unable to undertake normal activities and carry out educational tasks</li> <li>Health education can reduce larval habitats of different vectors by changing the behaviour of the community through schools, colleges and universities</li> </ul>
 6 CLEAN WATER AND SANITATION	Investment in clean water and sanitation can reduce the risk from VBDs	<ul style="list-style-type: none"> <li>Open stored water containers are a major habitat for immature dengue and chikungunya vectors worldwide and for malaria vectors in urban areas</li> <li>Provision of piped water and/or mosquito proof water storage containers can reduce the transmission of these diseases</li> <li>Improved solid waste management and sanitation can reduce breeding of vector mosquitoes</li> </ul>
 8 DECENT WORK AND ECONOMIC GROWTH	Reduction in VBDs increases productivity, efficiency and losses due to death and disability	<ul style="list-style-type: none"> <li>VBDs cause morbidity and mortality, thereby loss of man-days, affecting economic development</li> </ul>

	<p>Enhancing infrastructure will help in controlling VBDs</p>	<ul style="list-style-type: none"> <li>• Cities and towns need planned construction activities and improved infrastructure with piped water supply, well-designed toilets, closed drainage system, proper solid waste management, efficient drainage and use of wire mesh on windows and doors</li> <li>• Developmental projects need to be designed in a manner to avoid mosquitogenic conditions. Every development project should have a committee to assess the impact on vector-genic conditions and remedies</li> </ul>
	<p>Ending VBDs reduces inequality in health and economic outcomes</p>	<ul style="list-style-type: none"> <li>• VBDs affecting mainly the bottom strata and marginalized population</li> <li>• Rural/tribal populations and the poor are more likely to be affected by malaria and kala-azar. Therefore, VBD control programme gives priority to these section of the populations, reducing inequality in access to services</li> <li>• Controlling VBDs will help the poorest to prosper</li> <li>• Health inequality is an important factor in urban slums</li> </ul>
	<p>Ending VBDs makes cities (and slums) safer and resilient</p>	<ul style="list-style-type: none"> <li>• Proper planning of cities provide environment with less potential for vectors resulting in decline in VBDs</li> <li>• Improved and coordinated intersectoral approach involving the urban communities will further reduce VBD burden</li> <li>• Strategic plan for development of smart cities needs to avoid mosquito breeding and health impact assessment</li> </ul>
	<p>Sustainable waste removal will contribute to the reduction of VBDs</p>	<ul style="list-style-type: none"> <li>• Proper planning for safe waste disposal including domestic and industrial junk will reduce vector breeding especially <i>Aedes</i> mosquitoes</li> </ul>
	<p>Mitigating the impacts of climate change has the potential to reduce VBDs</p>	<ul style="list-style-type: none"> <li>• VBDs are highly sensitive to climatic conditions, especially temperature, rainfall and relative humidity</li> <li>• Aligning VBD control policies with the change in disease epidemiology owing to climate change</li> </ul>
	<p>Ecological changes - faunal and floral ecosystems and halting biodiversity loss will help reduce VBDs in some places, but increase it in others</p>	<ul style="list-style-type: none"> <li>• Rubber plantation impact on dengue and chikungunya by increasing breeding habitats for <i>Aedes albopictus</i></li> <li>• Deforestation and rice cultivation have resulted increase in malaria in forest fringe and foothills</li> <li>• Rice cultivation is also a cause of JE in some endemic districts of the country</li> </ul>
	<p>Mobilizing financial resources will help end VBDs</p>	<ul style="list-style-type: none"> <li>• Improved budgetary provision to control and eliminate VBDs will accelerate the goal of Ayushman Bharat</li> </ul>

VBD: vector-borne disease

# Annexure - VIII

## Inter- Ministerial Convergence

MVCR requires availability of effective inter and intrasectoral collaboration with strong political and financial commitments from central and state governments beyond the health sector including earmarked funds to support activities with synergistic efforts. Ministries/ departments which can play crucial role in MVCR and a few suggested activities are listed below:

SI No	Agencies	Examples of Suggested Areas of Work
1.	Ministry of Health and Family Welfare	<ul style="list-style-type: none"> <li>Nodal Ministry to coordinate with all other ministries/ departments by sensitizing on VBDs for active participation and resource sharing</li> <li>Take stock of the activities carried out</li> </ul>
2.	Ministry of Drinking Water and Sanitation	<ul style="list-style-type: none"> <li>Linking mosquito control with Swachh Bharat Abhiyan activities in rural areas</li> <li>Improved water supply to avoid storage</li> <li>Maintenance of pipelines to avoid leakage and stagnation</li> <li>Proper disposal of solid waste</li> </ul>
3.	Ministry of Urban Development	<ul style="list-style-type: none"> <li>Linking mosquito control with Swachh Bharat Abhiyan activities in urban localities</li> <li>Health impact assessment of all construction activities before issuing clearance certificate to avoid mosquitogenic conditions</li> <li>Building bye-laws to be enacted and implemented in all urban areas</li> <li>Introducing civic bye-laws by local bodies of cities and towns for proper disposal of refuse, junk materials and solid waste to prevent mosquitogenic conditions</li> <li>Screening of migrant workers for malaria, filaria and kala-azar</li> <li>Orientation training of Public Health Engineers to prevent mosquitogenic conditions in construction areas and buildings maintained by CPWD/PWD</li> <li>Provisioning sufficient budget for implementation of MVCR activities in the urban local bodies</li> </ul>
4.	Ministry Housing & Urban Poverty Alleviation	<ul style="list-style-type: none"> <li>Improved water supply and sanitation in slum areas</li> <li>Maintaining mosquito free slum areas</li> </ul>
5.	Ministry of Rural Development	<ul style="list-style-type: none"> <li>Maintenance of rural water supply, sanitation campaign</li> <li>Closing of dysfunctional wells, filling of unwanted ponds, ditches with MGNREGA</li> <li>Construction of pucca houses in kala-azar endemic areas</li> </ul>
6.	Ministry of Panchayati Raj	<ul style="list-style-type: none"> <li>Monitoring of surveillance &amp; interventions</li> <li>Advocacy on vector control</li> <li>Community education and awareness</li> <li>Motivating community for acceptance of indoor residual spraying (IRS)</li> <li>Promotion of larvivorous fishes in permanent water bodies</li> <li>IEC and source reduction activities through Village Health, Sanitation and Nutrition Committee</li> <li>Improved drainage and sanitation programme in rural areas</li> </ul>

7.	Ministry of Human Resource Development (Department of School Education)	<ul style="list-style-type: none"> <li>• Vector control teaching in educational curriculum, eg. CBSE mandatory 15 days SEWA activity for community service for Class-IX to XII be adopted by other education boards.</li> <li>• Students need to be encouraged to motivate the community for safe water storage practice and adoption of personal protection measures to avoid mosquito bites</li> <li>• Maintaining mosquito free school premises</li> <li>• Ensuring full sleeved uniform particularly during dengue transmission period</li> <li>• Education boards of various states &amp; ICSE Board would be encouraged to include student engagement activities, as CBSE did, in their respective curriculum</li> </ul>
8.	Ministry of Environment, Forest & Climate Change	<ul style="list-style-type: none"> <li>• Vector control measures in areas under social forestry (plantation areas)</li> <li>• Coordination for vector control in interstate boarder areas</li> <li>• Undertake studies on climate change and correlation with VBDs with provision for timely sharing of findings with NVBDCP for policy decision</li> </ul>
9.	Ministry of Earth Sciences	<ul style="list-style-type: none"> <li>• Weather forecasting</li> <li>• Regular information on rainfall, temperature and humidity</li> </ul>
10.	Ministry of Railways	<ul style="list-style-type: none"> <li>• Prevent mosquito breeding in railway yards/tracks and residential colonies</li> <li>• Prevention of water stagnation in railway construction areas</li> </ul>
11.	Ministry of Road Transport and Highways	<ul style="list-style-type: none"> <li>• Timely disposal/proper storage of broken and tow away vehicles kept at police station Malkhanas</li> <li>• Vector control measures for mosquito free tyre godowns</li> <li>• Timely disposal/proper storage of the junk material including unused vehicles</li> <li>• Timely filling of the ditches along roads and highways to avoid mosquito breeding</li> <li>• Policy for reuse of old tyres</li> </ul>
12.	Ministry of Tribal Affairs	<ul style="list-style-type: none"> <li>• IEC for enhancing acceptance of vector control measures (IRS &amp; LLIN) and personal protection measures to avoid mosquito bite</li> <li>• Mosquito breeding free villages</li> </ul>
13.	Ministry of Civil Aviation	<ul style="list-style-type: none"> <li>• Maintaining no mosquito zone in the airports</li> <li>• Avoid mosquito breeding in construction areas, hangers and residential areas</li> </ul>
14.	Ministry of Information and Broadcasting	<ul style="list-style-type: none"> <li>• Dissemination of messages on VBDs to increase community participation</li> <li>• Organizing programmes on VBDs focusing on preventive measures and services provided by the government</li> </ul>
15.	Ministry of Home Affairs	<ul style="list-style-type: none"> <li>• VBD free establishments of paramilitary forces</li> <li>• IEC for personal protection during night duty and in forest and forest fringe areas</li> </ul>
16.	Ministry of Defence	<ul style="list-style-type: none"> <li>• Control of VBDs in defence establishments</li> <li>• IEC for personal protection during night duty and in forest and forest fringe areas</li> </ul>



17.	Ministry of Commerce and Industry	<ul style="list-style-type: none"> <li>• Set up of Public Health Unit in industries to ensure mosquito free industries and development projects</li> <li>• Health impact assessment for new mining project for prevention and control of VBDs measures to prevent accumulation of water</li> <li>• Screening of labourers at the time of recruitment and thereafter at repeated intervals for sign and symptoms of VBDs</li> <li>• Education campaigns on prevention and control of VBDs for the employees and their families</li> <li>• Avoid accumulation of industrial junk and waste to prevent mosquito breeding</li> </ul>
18.	Ministry of Agriculture and Farmers Welfare	<ul style="list-style-type: none"> <li>• Alternative Wet and Dry Irrigation in rice fields</li> <li>• Information sharing on insecticide policy</li> <li>• Providing facilities for larvivorious fish hatcheries</li> <li>• Promote proper drainage of irrigation channels by farmers to avoid water stagnation</li> </ul>
19.	Ministry of Science and Technology	<ul style="list-style-type: none"> <li>• Development of newer technology and novel vector control tools</li> <li>• Studies on mosquito behaviour, genetic variation, etc.</li> </ul>
20.	Ministry of Agriculture and Farmers Welfare - Department of Fisheries	<ul style="list-style-type: none"> <li>• Maintenance of mother hatcheries for larvivorious fish in coordination with VBD control officials</li> </ul>
21.	Ministry of Water Resources, River Development & Ganga Rejuvenation	<ul style="list-style-type: none"> <li>• To minimize the vector breeding sites in irrigation channels</li> <li>• Encouraging intermittent irrigation to avoid mosquito breeding particularly JE vectors</li> </ul>
22.	Ministry of Women & Child Development	<ul style="list-style-type: none"> <li>• Incorporation of vector control activities in the training curriculum of Anganwadi workers as well as their involvement in vector control activities</li> <li>• Inclusion of messages on VBDs focusing on preventive measures and services provided by the government during the community sensitization sessions</li> </ul>

# Annexure - IX

## Involvement of Little Champs (school children) for prevention and control of dengue

Social mobilization is essential for any programme to achieve the desired goal and objective. Social mobilization in the society is broad scale movement to engage children as 'Little Champs' to motivate the community in source reduction activities through self-reliant efforts.

### Objective

- ⊙ Engagement of 'Little Champs' for prevention and control of dengue

### Strategy

- ⊙ To sensitize students and teachers of schools, etc.
- ⊙ Visit to schools at least two days in a week. Having interactive sessions through interpersonal communication and organizing group discussion, etc.

### Methodology

- ⊙ The schools (6<sup>th</sup> to 12<sup>th</sup> standard) will be selected for the localities from where more dengue cases were reported.
- ⊙ The team comprising VBD officials, other health staff, CCCO at the national level and concerned municipal corporation staff need to visit the selected schools.
- ⊙ At least two schools in a week need to be visited with prior consultation/consent of concerned school principals. The concerned Education Officer of zone/District VBD Officers/other district officials and Consultants will also be consulted for instructions and participation for active involvement.
- ⊙ School Principal, Administrative Officer will be motivated for quiz competition, drama, IPC and group meeting, street play, road show, rallies by the school children with display messages, hit slogans about prevention and control of dengue.

### Proposed activities

1. Sensitization on dengue and source reduction
2. Live demonstration of *Aedes* mosquito and larvae
3. Sensitization on personal protection measures
4. Do's and Don'ts for dengue

### Details of the proposed activities

Activities	Actions	Resource persons
Sensitization on Dengue	<ul style="list-style-type: none"> <li>• Organization of quiz show, essay writing, street play, drama, nukkad natak, bal sabha, rally, etc.</li> <li>• Encouragement of IPC, group meetings, etc.</li> <li>• Organizing workshop, open sessions and case studies with the help of Health Departments</li> <li>• Distribution of pamphlets and other IEC material</li> <li>• Initiation of 'Mosquito Free School and Premises' and also link with Swachh Bharat Abhiyan (display the message i.e. Hamara School Mosquito Free)</li> </ul>	Little Champ & Teachers
Sensitization for 'National Dengue Day' and 'Anti Dengue Month'	<ul style="list-style-type: none"> <li>• Awareness about the importance of observing 'National Dengue Day' on 16 May and July as 'Anti Dengue Month' every year and spreading the message in the community</li> </ul>	Little Champs, Teachers & Health Workers
Identification of breeding sources	<ul style="list-style-type: none"> <li>• Ensuring covering of water tanks and containers with tight lids</li> <li>• Checking and sensitization about stagnation of water in coolers, buckets, barrels, flower pots, bird baths, freeze trays, coconut shells, etc. in school premises &amp; their houses and encourage for source reduction activities</li> <li>• Ensuring the involvement of 'Little Champs' for cleaning of their school, home and mohalla once in a week will be known as Source Reduction Week (SRW) i.e., Swachh week/Dry week</li> <li>• Sensitization through story, audio-visual show on Saturday/Monday for source reduction activities and linking with Swachh Bharat Abhiyan followed by feedback session</li> </ul>	Little Champs under the supervision of any adult member (family member/Teacher/Health Worker)
Live demonstration of <i>Aedes</i> mosquitoes and larvae	<ul style="list-style-type: none"> <li>• Live demonstration of <i>Aedes</i> mosquitoes and larva in class room/common hall, during morning prayer, events, etc.</li> <li>• Demonstration of possible breeding sites</li> </ul>	Health staffs
Personal protection measures	<p>Practice, encourage and adopt:</p> <ul style="list-style-type: none"> <li>• Wearing full sleeved clothes to protect from mosquito bites</li> <li>• Use of repellants in day time</li> <li>• Use wire mesh on windows</li> </ul>	Parents, Teachers and Students
Do's and Don'ts	<ul style="list-style-type: none"> <li>• Consult a doctor</li> <li>• Take plenty of liquid</li> <li>• Take bed rest</li> <li>• Keep observing patient's condition; for high fever, use cold sponging on the forehead and body</li> <li>• If rashes are seen on the body, consult a doctor immediately</li> <li>• Avoid self-medication</li> </ul>	Parents and Teachers

Capacity building for prevention and control of dengue	<ul style="list-style-type: none"> <li>To organize workshop and training at different levels i.e. state/districts, and at schools for principals, Education Officers, teachers, students and other stakeholders. It could be executed as Training of Trainers (ToT) model</li> <li>Little champs may act as 'Brand Ambassadors' or 'Change Agents' for prevention and control of dengue</li> </ul>	National, State and District Health Officials
Recognition and appreciation	<ul style="list-style-type: none"> <li>On the basis of their active involvement in source reduction/mosquito free premises/engagement of school, Little Champs need to be rewarded at least half yearly/yearly basis. In the same way, every student will be getting their score which will be added to their annual score card</li> </ul>	State and District Health Officials

In addition to the above, the following activities can also be considered:

- ⊙ Practising Participatory Learning Appraisal tools among 'Little Champs' for identifying and solving various community issues (especially more dengue cases reported), in their cities, wards, villages, slums, etc.
- ⊙ In prevention and control of dengue, every student may be involved including NSS, NCC, etc.
- ⊙ Need to strengthen and promote Balsabha, cultural programme, script writing and local talent, etc. and organize these at least once a week. This may be published in local print media or broadcast on community radio.
- ⊙ To recognize their participation/work/best story/best picture/documentary/exhibition/poster/banner and best practices, etc. at the state and national levels.

Note: State programme officers are requested to formulate such programmes in their respective states, especially for urban areas/semi-urban areas for social mobilization of communities for prevention and control of dengue.



# Annexure - X

## Community engagement for effective mosquito and other vector control response

A community participation approach is valuable as it fulfills people's rights to participate and to determine their well-being. It enables local solutions to local problems, which are more sustainable than external solutions which may not fit well with the local situation, culture and practices. A community defines their problem, set common goals and work together on their own to achieve the goals in a way to bring sustainability. 'Engagement' can be in terms of consultation, communication, education, empowerment, decision-making, utilization of pooled local resources, public participation, participative democracy or formal/ informal working in partnership.

### Objectives

- ⊙ To connect the programme to people by educating and mobilizing each individual of the society to adopt positive behaviour towards VBDs control
- ⊙ Build support for the programme across influential sectors of society (corporate houses, political representatives, social activists, media, civil society organizations, etc.) towards prevention of VBDs
- ⊙ Stimulate increased and sustained demand for prevention and control

### Methodologies to be followed are

- ⊙ Sensitization and advocacy programme
- ⊙ Interpersonal Communication (IPC)
- ⊙ Small group and focal group discussion
- ⊙ Involvement of Village Health Sanitation & Nutrition Committee
- ⊙ Involvement of PRI members, SHG and Anganwadi workers
- ⊙ Community participation in source reduction activities
- ⊙ Rally and drawing competition among school children
- ⊙ Involvement of RWA for source reduction activities
- ⊙ Involvement of ASHAs, FBOs, CBOs and local self-bodies
- ⊙ Facilitating an enabling and empowering environment for support, leveraging, partnership, alliances and networks for prompt action for community

## Social Mobilization and Communication

The concept of Communication for Behavioural Impact (COMBI) is integral to social mobilization and needs to be developed across multiple channels to ensure that information is passed throughout all the levels of the society. Social mobilization integrates different members of the community, from householders to political leaders, in order to raise awareness of VBDs, deliver resources and services and ensure sustained community participation. The initiative aims to affect social behaviour by helping in the planning, implementation and monitoring of communicated actions which promote healthy behaviour.

Sustainable programmes and modification of individual behaviour are essential in vector control initiatives. This means that individual households must accept responsibility for the control of mosquitoes in their surroundings. However, to maintain sustainability, such efforts should continue as long as the risk of VBDs exists. To enable this, capacity-building and training of individuals in surveillance, laboratory diagnosis, case management and vector control are important for effective community interventions to be carried out. COMBI has been used successfully in other regions.

### Key communication strategies

- ⊙ Promotion for improved adoption and practice e.g. sleeping under LLIN, getting IRS done, safe water storage practices, source reduction activities, etc.
- ⊙ Building effective communication skills and competencies of local stakeholders, NGOs, partners for improved acceptance and response actions from the community

### Role of various levels

#### Governmental level

- ⊙ Sensitization programme for the decision makers and implementers on the Mosquito and other Vector Control Response
- ⊙ By incorporating and mandating the general subject on awareness in academic curriculum
- ⊙ By mandating a fix number of sessions and activities outside the textbook and classroom to learn and create awareness among community
- ⊙ Government need to encourage and facilitate recycling of waste materials
- ⊙ IEC/BCC booklets need to be developed and distributed to schools and colleges
- ⊙ Constitute Core Committee of key stakeholders at various levels (national, state, district, block and village)
- ⊙ Capacity building to the implementer on suitable and sustainable methodology for increasing awareness for vector control activities

#### School level

- ⊙ School children need to be provided with health education on all aspects of VBDs: what they are, how they spread, the role of mosquitoes, where and how they breed/rest, and how they can be controlled

- ⦿ School children need to be trained on how to detect and eliminate the breeding sites in and around the schools, in their homes and in the neighbourhood
- ⦿ School children need to be advised to wear protective clothing-full sleeves shirts and full pants during the day (during school as well as before and after school)
- ⦿ Weeds and tall grasses need to be cut short; adult mosquitoes look for these shady places to rest during the hot daylight hours

*MVCR envisages encouragement of the school children as 'Little Champs' to reach the households and neighborhood to spread the messages on preventing mosquito breeding and make it a practice. Details are at Annexure IX.*

## Community level

- ⦿ People should form groups to supplement and reinforce efforts at the household and societal levels.
- ⦿ Such groups can identify commercial activities such as traders dealing in used tyres, which may be contributing larval habitats for the vector.
- ⦿ They can create awareness about dengue and seek co-operation for the removal of breeding places. Community activities against mosquitoes can include:
  - » Cleaning and covering water storage containers
  - » Keeping the surroundings clean and improving basic sanitation measures
  - » Burning mosquito coils to kill/knock down or repel the mosquitoes
  - » Screening houses, particularly bedrooms
  - » Making available hand aerosols for mosquito control
  - » Cleaning weeds and tall grass to reduce the available outdoor resting places for adult mosquitoes near houses
  - » Using mosquito nets to protect infants and small children from bites

## Household level

Intensify efforts to reduce actual or potential larval habitats in and around houses

- » Do not allow stagnation of water in and around the house
- » Use commercially available repellants
- » Sleep under bednet/LLIN to avoid mosquito bites
- » Practice source reduction activity at least once in a week
- » Cover water containers in the house to prevent fresh egg laying
- » Have infants sleep under bednets
- » Wear protective clothing (full sleeves shirts and full pants during the day)

- » Use tight-fitting screens/wire mesh on doors and windows
- » Clogged gutters and flat roofs that may have poor drainage need to be checked regularly
- » Water in bird baths, plant pots or drip trays should be changed weekly
- » Larvivorous fish need to be introduced in ornamental water tanks, fountains, etc.

### **Involvement of educational institutions and corporate**

There is need to involve and motivate students, youth federations, parents, family, teachers, entomologists, doctors, businessmen and women groups to understand the problem fully and participate in prevention and control of dengue and chikungunya. In addition, efforts should be made to involve schools, colleges, medical & nursing colleges, Universities, NCC, NSS, corporates, Women and Family Welfare (DPOs, CDPOs and AWWs), etc. for strengthening awareness among community at various levels.

Central Board of Secondary Education (CBSE) has taken an initiative for mainstreaming Health and Physical Education (HPE) in schools, wherein, schools were advised to reserve one period every day for health and physical education especially for class IX to XII. It has formatted four strands as under:

- I. Games/sports: At least one of them, for example, athletics and swimming, team games, individual games and adventure sports
- II. Health and fitness
- III. Social Empowerment through Work and Action (SEWA)
- IV. Health and activity card

As the CBSE has taken an initiative for improving the awareness regarding health, especially through SEWA project by involving class IX to XII students. To incorporate prevention and control activities for VBDs, especially source reduction activities under the SEWA project, efforts need to be made to include vector control activity in the students' SEWA project.



# Annexure - XI

## Mosquito Abatement Committee: historical perspective and the current significance

Malaria has been endemic in the City of Mumbai, then referred to as Bombay, since time immemorial. The then British Government recognized that malaria fever was the cause of a very large percentage of sickness in the city. A committee consisting of 11 members of the Bombay Municipal Corporation was formed in the year 1901, to deal with the problem of the presence of Anopheline mosquitoes in Bombay. The committee did not investigate the prevalence of malaria but recommended the steps that should be taken to destroy all kinds of mosquitoes.

During the year 1908, Captain W.G. Liston, I.M.S. and Captain F.P. Mackie, I.M.S. published a report regarding their investigation about a severe outbreak of malaria carried out in the neighborhood of Alexandra Dock. They recorded that 80% of the children in the locality examined by them showed enlargement of the spleen and that 50% were found to have malaria parasites in their blood. Their most important observation, however, was the fact that 25% of the specimens of *Anopheles stephensi* dissected by them were found to harbour the parasites of malaria.

Early in 1909, Captain A.G. McKendrick, I.M.S. was appointed as a Special Officer to investigate the cause of the outbreak of malaria in the city. A committee consisting of representatives from the Municipal Corporation, the Bombay Port Trust, the City of Bombay Improvement Trust, the G.I.P. Railway and the B.B. & C.I. Railway was formed for the purpose of carrying out any measures which might appear necessary for the immediate mitigation of malaria.

It was Dr. C.A. Bentley, who took over from Captain A.G. McKendrick, and submitted his report in the year 1911 which gave several recommendations, one of which was creation of a Special Department engaged solely in mosquito destruction. A special Malaria Department was created in the year 1912 which was successfully able to curb the incidence of malaria in Bombay. In the year 1918, the Special Malaria Department was disbanded as the incidence of malaria in Bombay had greatly diminished. As was expected, the abolition of the department proved to be disastrous. The incidence of malaria again began to increase. In June 1922, the heads of about 40 commercial houses sent a petition to the Corporation drawing the attention to the serious increase of the disease in their neighbourhood.

In 1923, the Special Malaria Department was reconstituted. In January 1925, a note was issued by the Executive Health Officer on the subject of malaria in the city. In the note he laid stress on the inadequacy of the existing laws and the importance of 'Unity of Control and Co-operation' in carrying out anti-malarial measures. In this connection he recommended that, failing the appointment of one officer endowed with adequate powers for effective action in every part of the city, a Central Anti-malaria Committee should be appointed, consisting of members nominated to represent the various authorities which control different areas in the island, such as Port Trust Authority, Military Authorities and Railways. The Government of Bombay decided to appoint this Committee, which held its first meeting on 23<sup>rd</sup> February 1926.

### Need for the constitution of the committee

Besides the municipality, other public bodies in Mumbai carry out anti-malarial work in their respective areas. As a result of Bentley's recommendations, the various authorities appointed their own staff for anti-malaria work. These teams carried out their work in isolation which resulted in poor control over malaria and trading of charges against each other for incidence of malaria in the vicinity of their areas.

The principal obstacles to the work of malaria prevention appear to have been the absence of unity of control of anti-malarial operations along with apathy and lack of co-operation on the part of these authorities. Another factor has been the inadequacy of legal powers, and in particular the fact that such legal powers as have existed have not been applicable to government departments.

The 'Malaria Advisory Committee' now known as 'Mosquito Abatement Committee' was brought into existence with the object of attaining co-operation in malaria control. This body has been of great service as it is constituted of individuals who have the power to give orders to the Executive Engineers concerned to carry out necessary measures for malaria prevention. The original committee, as recommended by Major G. Covell, I.M.S., who studied the work carried out by Dr Bentley and submitted his report 'Malaria in Bombay, 1928', consisted of 10 members: President of the Corporation, Municipal Commissioner, Executive Health Officer, Chairman of the Port Trust, Chief Officer of the City Improvement Trust, Chairman of the Development Directorate, a representative of the Mill-owners Association, A.D.M.S., Bombay Brigade, Agent of the B.B. & C.I. Railways and the Agent of the G.I.P. Railway. Major G. Covell recommended that every authority in Bombay would be represented by its Chief Officer. He was convinced that the creation of this body would be one of the most important steps towards the eradication of malaria in Bombay, a result which can only be attained by active and loyal co-operation on the part of all the authorities concerned.

### Conducting a Mosquito Abatement Committee Meeting

Presently, the Municipal Corporation of Greater Mumbai (MCGM) conducts the Mosquito Abatement Committee meeting mostly in the month of March each year under the Chairmanship of the Municipal Commissioner. Chief Officers of those authorities whose work related to mosquito proofing of water storage tanks is pending are invited for this meeting. The preparation for this meeting starts in the month of January when all water storage tanks in premises of all government and semi-government authorities are inspected and reports are compiled authority-wise, for all wards of M.C.G.M. The list of defective water storage tanks in their premises is issued to each authority. Power Point presentation is made by the Insecticide Officer highlighting the issues that need to be addressed immediately. Each authority is expected to carry out the work of mosquito proofing of water storage tanks as per the list provided to them by the last week of April. The premises are again re-inspected jointly with the staff of the respective authorities. If defects are still observed, action is initiated as per the provisions of M.C.G.M. Act, 1888.

## Annexure - XI

The details of intersectoral partners/departments involved and areas reviewed are as below:

Sr. No.	Name of the Department/Institute
1	Public Works Department
2	Central Public Works Department
3	Central Railway
4	Western Railway
5	Maharashtra Housing & Development Authority
6	Mumbai Metropolitan Regional Development Authority
7	Airport Jurisdiction
8	Mumbai Port Trust
9	Navy
10	Army
11	Air Force
12	Bombay East State Transport
13	Maharashtra State Road Transport Corporation
14	Indian Postal Services
15	Mahanagar Telephone Nigam Limited
16	Bharat Sanchar Nigam Limited
17	Reserve Bank of India
18	Bhabha Atomic Research Centre
19	Life Insurance Corporation
20	National Textile Corporation, Rashtriya Chemical & Fertilizer, Mazgaon Dock
21	Mint Premises, Maharashtra Industrial Development Corporation, Santacruz Electronics Export Processing Zone
22	Oil and Natural Gas Corporation, Bharat Petroleum Corporation Limited, Maharashtra State Electricity Distribution Company Limited
23	SBI, National Institute of Industrial Engineering, Indian Institute of Technology
24	Bharat Heavy Electricals Limited, Indian Space Research Organisation, Power Grid
25	National Test House, Indian Oil
26	HP, ESIS, EATL
27	Pilot Test House, Bureau of Indian Standard, WR Power Committee
28	Telecom Factory, Hindustan Petroleum Corporation Limited, GPO
29	PF Staff Qtrs., BP Premises, Maharashtra State Road Development Corporation
30	University, SRA, National Bank for Agriculture and Rural Development
31	GIC, New India Insurance, Salt Commission
32	Port Office, ESIC, Aakashwani
33	Food Corporation of India, ASI, Indian Coastal Guard
34	Forest Department, Khadi & Village
35	CIRCOT, Canteen Store Department, CISF
36	Sports Foundation, Mumbai Metro One Pvt Limited, Dairy

(Source: Pest Control Unit, Municipal corporation, Greater Mumbai)

# NOTES



A series of horizontal dotted lines spanning the width of the page, providing a template for handwritten notes.



# NOTES



A series of horizontal dotted lines spanning the width of the page, providing a template for handwritten notes.

# NOTES



A series of horizontal dotted lines spanning the width of the page, providing a template for handwritten notes.



532, A - Wing, Nirman Bhawan  
Maulana Azad Road, New Delhi-110011  
[www.who.int/india](http://www.who.int/india)



National Vector Borne Disease Control Programme  
Directorate General of Health Services  
Ministry of Health & Family Welfare, Government of India  
22-Sham Nath Marg, Delhi-110054  
[www.nvbdc.gov.in](http://www.nvbdc.gov.in)