CSIR – National Environmental Engineering Research Institute, Nagpur

Training Programme Report

On

Five days offline Training Programme on Integrated Vector and Pest Management (IVPM) and ToT (SPO, VBD Consultants & Entomologists from West Bengal)

Venue: *CSIR-NEERI, Nagpur*

Date: 24/07/2023 to 28/07/2023

Time: 09:30 AM to 17:30 PM

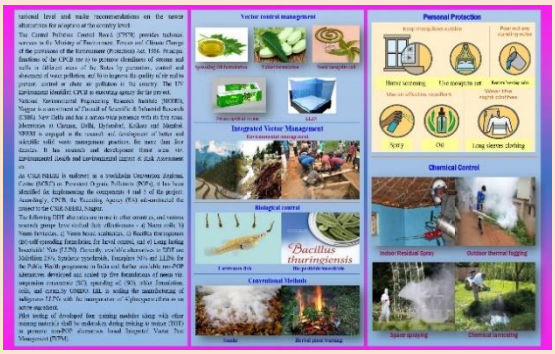


Table of Content

List of Abbreviations

BCC	Behaviour Change Communication
Bti	*Bacillus thuringiensis var. israelensis*
CCHF	Crimean-Congo Haemorrhagic Fever
CPCB	Central Pollution Control Board
CSIR	Council of Scientific & Industrial Research
DDT	Dichlorodiphenyltrichloroethane
EC	Emulsifiable Concentrate
FFS	Farmer Field School
GEF	Global Environment Facility
GoI	Government of India
HIL	Hindustan Insecticide Limited
ICMR	Indian Council of Medical Research
IEC	Information Education and Communication
IGRs	Insect Growth Regulators
IRS	Indoor Residual Spraying
IVM	Integrated Vector Management
IVPM	Integrated Vector and Pest Management
JE	Japanese Encephalitis
KFD	Kyasanur Forest Disease
LLINs	Long Lasting Insecticidal Nets
MoCF	Ministry of Chemicals and Fertilizers
MoEFCC	Ministry of Environment, Forest and Climate Change
MoH&FW	Ministry of Health and Family Welfare
NEERI	National Environmental Engineering Research Institute
NIP	National Implementation Plan
NVBDCP	National Vector Borne Disease Control Programme
NCVBDC	National Centre for Vector Borne Diseases Control
POPs	Persistent Organic Pollutants
RNA	Ribonucleic Acid
SC POPs	Stockholm Convention on Persistent Organic Pollutants
SIT	Sterile Insect Techniques
UNEP	United Nations Environment Programme
VBD	Vector-Borne Disease
WDP	Water Dispersible Powder
WHO	World Health Organization
WP	Wettable Powder
ZIKV	Zika Virus

1.0 Introduction

Stockholm Convention (SC) is an international treaty works for the protection of human health and environment from harmful Persistent Organic Pollutants (POPs). The Government of India (GoI) signed the Stockholm Convention on POPs and the Ministry of Environment, Forests and Climate Change (MoEFCC) was assigned as the National Focal Point. India has committed to fulfilling its obligations under the Convention, prepared its National Implementation Plan (NIP) and submitted it to the Secretariat of the Stockholm Convention on 21 April 2011. India assured in the NIP, that the development and promotion of non-POPs alternatives to DDT is one of the top priorities that require immediate action. Accordingly, the project entitled "**Development and promotion of non-POPs alternatives to DDT**" was jointly developed by United Nations Environment Programme (UNEP) and United Nations Industrial Development Organization (UNIDO). The project was approved by Global Environmental Facility (GEF) in April 2015 with two GEF implementing agencies *i.e.*, United Nations Industrial Development Organization (UNIDO) and the United Nations Environment Programme (UNEP), which are responsible for supporting delivery of specific project components. Following are the major project components to be implemented under the project:

I. Legislation, policy framework and institutional capacity (UNEP)
II. Alternatives to vector control (UNIDO)
III. Promotion and propagation of new cultivars of Neem (UNIDO)
IV. Development and Promotion of Integrated Vector Pest Management (IVPM)
V. Monitoring and evaluation of results (UNIDO / UNEP)

For components I and IV, MoEFCC has nominated Central Pollution Control Board (CPCB) as a national Executing Agency to look after a partial execution of the project. As per the project document, the other part will be executed by the UNEP Law Division. The components of UNEP prescribe broadly Legislative framework and development, and pilot application of a set of Guidelines for Integrated Vector and Pest Management. UNIDO is working on the development of non-POPs alternatives to DDT viz. Long-Lasting Insecticidal Nets (LLIN), Neem based insecticides, *Bti* based pesticides under its two components.

The Global Environment Facility (GEF) was established to tackle our planet's most pressing environmental problems. The GEF supports countries to build capacity for the implementation of the Stockholm Convention through introduction and demonstration of viable, cost-effective and sustainable alternatives to eliminate dependency on DDT and other POPs chemicals.

The United Nations Environment Programme (UNEP) is the voice for the environment and the primary driving force for international activities related to the sound management of chemicals in the United Nations system. The UNEP promotes chemical safety by providing policy advice, technical guidance and capacity building to the developing countries. UNEP Chemicals Branch has the leadership of the Global Alliance for the Development and Deployment of Alternatives to DDT. As such, UNEP is a well-placed partner with other organizations to phase out current use and avoid future practices of DDT use in India.

The Directorate of NCVBDC, central agency responsible for guidelines, policy for prevention and Control of vector-borne diseases in India has been implementing the Integrated Vector Pest Management (IVPM) strategy for effective management of vectors. It recommends Indoor Residual Spray (IRS) and Insecticide Treated Bed Nets (ITNs)/ Long lasting Insecticide Net (LLIN) for vector control in rural areas and anti-larval measures in urban areas.

IVPM is a tool for managing vector population to reduce or interrupt transmission of disease. IVPM is a way forward to improve cost-effectiveness, ecological soundness and sustainability of disease vector control. It emphasizes that the insecticides used in the programme must have negligible adverse human health effects, must be effective against the target species, must have minimal effect on non-target species and natural environment and their use must take into account the need to prevent the development of resistance. Key stakeholders involved in the project are the three Ministries viz. Ministry of Environment, Forests and Climate Change (MoEFCC), Ministry of Chemicals and Fertilizers (MoCF), and Ministry of Health and Family Welfare (MoH&FW) whose mandates and roles are given below:

The Ministry of Environment, Forests and Climate Change (MoEFCC) is the nodal ministry for planning, promoting and coordinating environmental programmes including the management of chemical disasters in India. The Ministry is mandated to protect the land, air and water systems and is responsible for the prevention and Control of pollution including hazardous substances. MoEFCC is the GEF and Stockholm Convention focal point in the country, which coordinates activities and cooperation between relevant stakeholders of the NIP.

The Ministry of Chemicals and Fertilizers (MoCF) is mandated to control the production and scaling up of alternatives to chemical pesticides. The Department of Chemicals and Petrochemicals of MoCF is entrusted with the responsibility of policy, planning, development and regulations of chemicals and petrochemicals. The public sector named HIL under the

MoCF is involved in the production, scaling up and setting up of the facility for industrial production of the alternatives, viz. production of synthetic pyrethroids, production of Long-Lasting Insecticidal Nets (LLINs), neem-based botanical pesticides and *Bti*-based biopesticides.

The MoH&FW mainly performs advisory role for matters related to public health including vector control programme in the country. The Ministry is responsible for the application, assessment and adoption of alternatives in public health activities; the State Health Departments coordinate and implement the project activities at the respective state level for the evaluation and assessment of newer alternatives to DDT in the field on the target pest; the National Centre for Vector Borne Disease Control (NCVBDC), National Institute of Malaria Research (NIMR) and the National Centre for Disease Control (NCDC) undertake activities at the national level and make recommendations on the newer alternatives for adoption at the country level.

The Central Pollution Control Board (CPCB) provides technical services to the Ministry of Environment, Forests and Climate Change of the provisions of the Environment (Protection) Act, 1986. Principal functions of the CPCB are a) to promote cleanliness of streams and wells in different areas of the States by prevention, Control and abatement of water pollution and b) to improve the quality of air and to prevent, Control or abate air pollution in the country. The United Nations Environment programme (UNEP) identified CPCB as executing agency for the project.

National Environmental Engineering Research Institute (NEERI), Nagpur is a constituent of Council of Scientific & Industrial Research (CSIR), New Delhi and has a nationwide presence with its five zonal laboratories at Chennai, Delhi, Hyderabad, Kolkata and Mumbai. NEERI is engaged in the research and development of better and scientific solid waste management practices, for more than four decades. It has research and development thrust areas viz. Environmental Health and Environmental Impact & Risk Assessment, etc. As CSIR-NEERI is endorsed as a Stockholm Convention Regional Centre (SCRC) on Persistent Organic Pollutants (POPs), it has been identified for implementing the components IV and V of the project. Accordingly, CPCB, the executing agency (EA) sub-contracted the project to the CSIR-NEERI, Nagpur.

2.0 Training Objectives

At the end of the training programme, the participants should be trained to:

- Describe the vectors and their role in Vector-Borne Diseases, the basic information about vector-borne diseases, how vector-borne diseases are transmitted, transmission cycle for respective vector-borne diseases and global distribution as well as the burden of the diseases in India.
- Define the vector, describe the morphological characteristics of adult and immature stages of mosquitoes and about the biology and ecology of vectors.
- Promotions and development of locally safe, effective, affordable and environmentally sound alternatives to DDT, Environment management methods for vector control: Biological control methods, Genetic control methods, Control of vectors by chemical, non-chemical methods, Natural and conventional vector control management strategies.
- Learn the role of Integrated Vector and Pest Management (IVPM), describe different control measures used to control vectors and pests, learn organization and management of IVM in different sectors including FFS and how IVM improves the awareness in the community through BCC.

3.0 Training Programme

This training programme was conducted for 05 days from 24/07/2023 to 28/07/2023, the total number of the training sessions was 05 and each session has 9-14 training parts. 25 participants from West Bengal were selected including SPO, DMOs, State Entomologists and DVBDC participated in the training programme. Dr. Gujju Gandhi, Project Scientist, coordinated all the training sessions. The training content covered from Training module-1: DDT and Vector-borne disease, Training module-2: Vector morphology and bionomics, Training module-3: Alternatives to DDT in vector control management, and Training module-4: Integrated vector and pest management developed by CSIR-NEERI under the project "Development and promotion of non-POPs alternatives to DDT."

4.0 Training programme- Inaugural Function

Inaugural function of the training programme for Integrated Vector and Pest Management and Training of Trainers (ToTs- SPO/Entomologists, and VBD Consultants from West Bengal State) was held on 24th July 2023, in CSIR-NEERI, Nagpur at Committee Room No:2, between 09:15 am to 10:45am. **Dr. A. Ramesh Kumar**, Principal Scientist and Project Leader, CHWMD, gave a brief regarding training and introduced the esteemed guests: **Dr. Shyam Nimgade** (Chief Guest), Asst. Director (Malaria & Filaria), DHS, Nagpur; **Dr. Narendra**

Bahirwar, Medical Officer in Health, NMC, Nagpur (Guest of Honour**)**; & Faculty Member; all the participant trainees. Dr. Ramesh Kumar requested Dr. A. N. Vaidya, Director of CSIR-NEERI, to welcome the Chief Guest and participants, and share their opening remarks while briefly introducing the training of trainers and the IVPM training program. He also discussed the Stockholm Convention (SC)- International treaty that works for protection of human health and environment from harmful effects of PoPs and Government of India is a signatory to this convention. One of the top priorities identified under this convention is the project entitled 'Development & promotion of non-PoPs alternative to DDT', which is jointly developed by UNEP & UNIDO, other key stakeholders in this project are MoEF&CC, Ministry of Chemicals and Fertilizers, Ministry of Health and Family Welfare etc. There are five major components under this project which includes: 1) Legislation, policy framework and institutional capacity (UNEP); 2) Alternatives to vector control (UNIDO); 3) Promotion and propagation of new cultivars of Neem (UNIDO); 4) Development and Promotion of Integrated Vector Pest Management (IVPM) and 5) Monitoring and evaluation of results (UNIDO / UNEP). CSIR-NEERI working on components 4 & 5 of this project. CSIR-NEERI has developed four training modules and several training materials for pilot testing & capacity building of state vector control officials. CSIR-NEERI is required to conduct a total of 10 training programmes. So far, NEERI has completed 10 training programmes via online mode due to COVID-19 restrictions and 9^{th} & 10^{th} training programme in offline mode. In all the training programme CSIR-NEERI emphasised that it should be an interactive programme rather than conventional training programme. This interaction of the participants with a subject expert will help us to continuously improve the training modules which will be further used by the trainers for training various stakeholders dealing with control of VBDs in the country. He requested to participant trainees to forward valuable interaction with experts to further improve the training modules and welcomed all the guests and participant trainees.

Dr. M. P. Patil, Chief Scientist & Head of CHWMD, CSIR-NEERI, Nagpur, briefed the project and extended a warm welcome to all the dignitaries. **Ms. Neha Dharmshaktu**, Programme Management Officer at UNEP-India Country Office, New Delhi, joined the Training and provided insights into the role of UNEP, offering valuable instructions to the participant trainees.

Dr. Narendra Bahirwar, Medical Officer in Health, NMC, Nagpur and Guest of Honour addressed all the participant trainees and express his deep gratitude for being part of such a great learning programme. He also gave a brief introduction of this training programme and its importance for minimizing DDT reliance and malaria eradication & other vector borne diseases. At the end, he thanked and gave best wishes to all the participants in this training programme (**Exhibit-1**)

Dr. Shyam Nimgade, Asst. Director (Malaria & Filaria), DHS, Nagpur, has inaugurated this training programme by releasing the training modules to promote non-POPs alternatives based on IVPM. He welcomed all the participant trainees (DMOs/Consultants/ Entomologists) from West Bengal State. He also welcomed all the subject experts and CSIR-NEERI team to organised an important training programme. He also discussed about DDT used for Vector Borne Disease control and its long-term harmful effects on environment as well as on human. It is very important to start looking for alternatives to DDT (**Exhibit-1**). At the end, he congratulates and wishes to all the participants for the success of the training programme.

Exhibit-1: Release of training modules

Dr. A. Ramesh Kumar (Principal Scientist & Project Leader, CHWMD) extended his heartfelt vote of thanks to all the dignitaries and participants. He also provided a brief introduction and explanation about the project, along with guidance on how the training can be effectively utilized by the trainees.

Exhibit-2.- Inaugural Session

5.0 Training sessions

The total training sessions were 5 including field visit, each session covered 9-14 parts and each part was conducted for approximately 30-40 minutes, the time was managed depending on a questionary discussion at end of the session. Every session from 24th July 2023 to 28th July 2023 was conducted from 09.30 AM to 05.30 PM and on 27th July 2023 field visit has been made from 08.00 AM to 01.00 PM

5.1 Training session-1 (Day -1: Monday - 24/07/2023)

Training part - 1: Introduction to Modules 1 to 4

Dr. Gujju Gandhi introduced the training modules 1-4 with specific titles to each module and their content in detail. He informed that training modules were made available to all the participants and same in form of booklets also, PPT on each module, IEC materials, awareness brochures and FAQ. He deliberated the focus of CSIR-NEERI to develop these training modules for pilot testing of these training modules (1-4). Under the training programme on Integrated Vector and Pest Management (IVPM) module No. 1 is dedicated to Vector-Borne Diseases and non-insect borne diseases, module 2 is dedicated to vector morphology and bionomics, module 3 is dedicated to alternatives to DDT in vector control management and module 4 is dedicated to integrated vector & pest management. He requested to all the participants to provide suggestions/ comments and on how to make these training modules more usable/ effective.

Training Module-1
DDT and Vector Borne Diseases

Developed under GEF Funded Project on

Development and Promotion of Non-POPs Alternatives to DDT
(GEF Project ID: 4612)

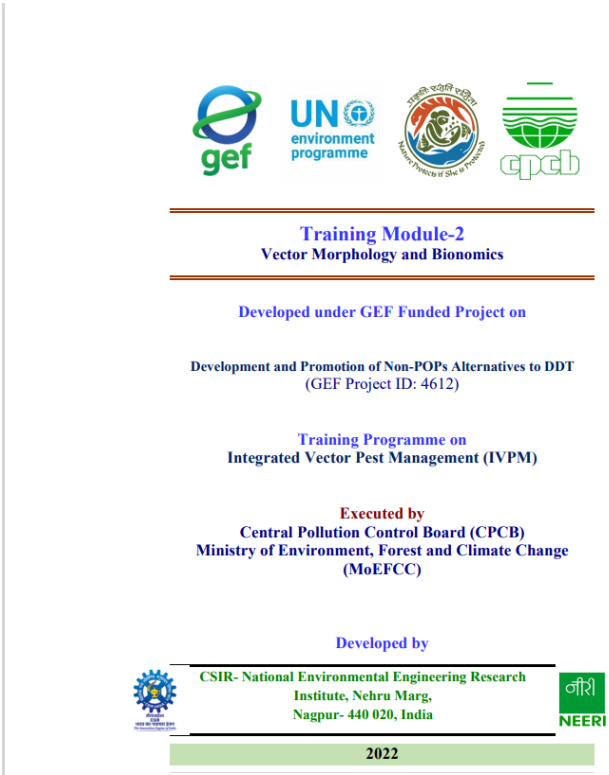
Training Programme on
Integrated Vector Pest Management (IVPM)

Executed by
Central Pollution Control Board (CPCB)
Ministry of Environment, Forest and Climate Change
(MoEFCC)

Developed by

CSIR- National Environmental Engineering Research
Institute, Nehru Marg,
Nagpur- 440 020, India

2022



Training Module-2
Vector Morphology and Bionomics

Developed under GEF Funded Project on

Development and Promotion of Non-POPs Alternatives to DDT
(GEF Project ID: 4612)

Training Programme on
Integrated Vector Pest Management (IVPM)

Executed by
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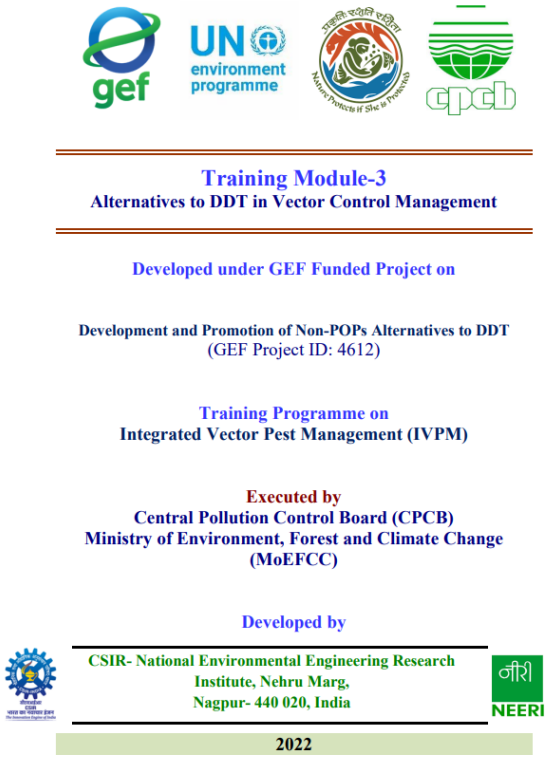

Training Module-3
Alternatives to DDT in Vector Control Management

Developed under GEF Funded Project on

Development and Promotion of Non-POPs Alternatives to DDT
(GEF Project ID: 4612)

Training Programme on
Integrated Vector Pest Management (IVPM)

Executed by
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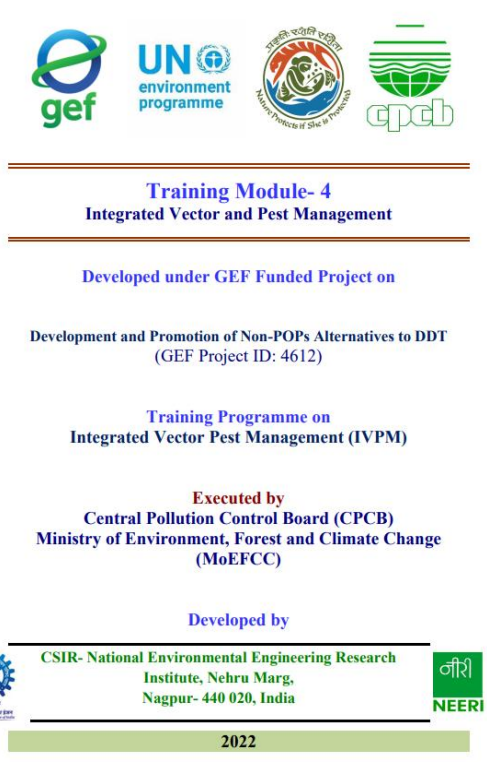

Training Module- 4
Integrated Vector and Pest Management

Developed under GEF Funded Project on

Development and Promotion of Non-POPs Alternatives to DDT
(GEF Project ID: 4612)

Training Programme on
Integrated Vector Pest Management (IVPM)

Executed by
Central Pollution Control Board (CPCB)
Ministry of Environment, Forest and Climate Change
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Developed by

CSIR- National Environmental Engineering Research
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Nagpur- 440 020, India

2022

Facsimile of Training Modules 1 to 4

Training part - 2: Introduction to DDT and its use in vector control

Dr. A. Ramesh Kumar briefly explained this GEF funded project 'Development & promotion of non-PoPs alternative to DDT' & its five components and the role of CSIR-NEERI in implementing two of the five components. During his training session the contents covered an introduction regarding Stockholm convention on PoPs, what is DDT, its structure; physicochemical and its current production status and usage in vector control management (Technical grade DDT 50 % for use in India and DDT 75% for export purposes mostly African countries). Why DDT needs phase-out; Monitoring study of DDT concentration in Human milk; WHO action plan for the reduction of dependence on DDT in disease vector control; Overview of Stakeholders; Current scenario of DDT production and use in India, State-wise consumption of DDT (2019-2020); Development and promotion of non-PoPs alternatives to DDT and alternatives to chemical pesticides in vector control were discussed (Exhibit-3).

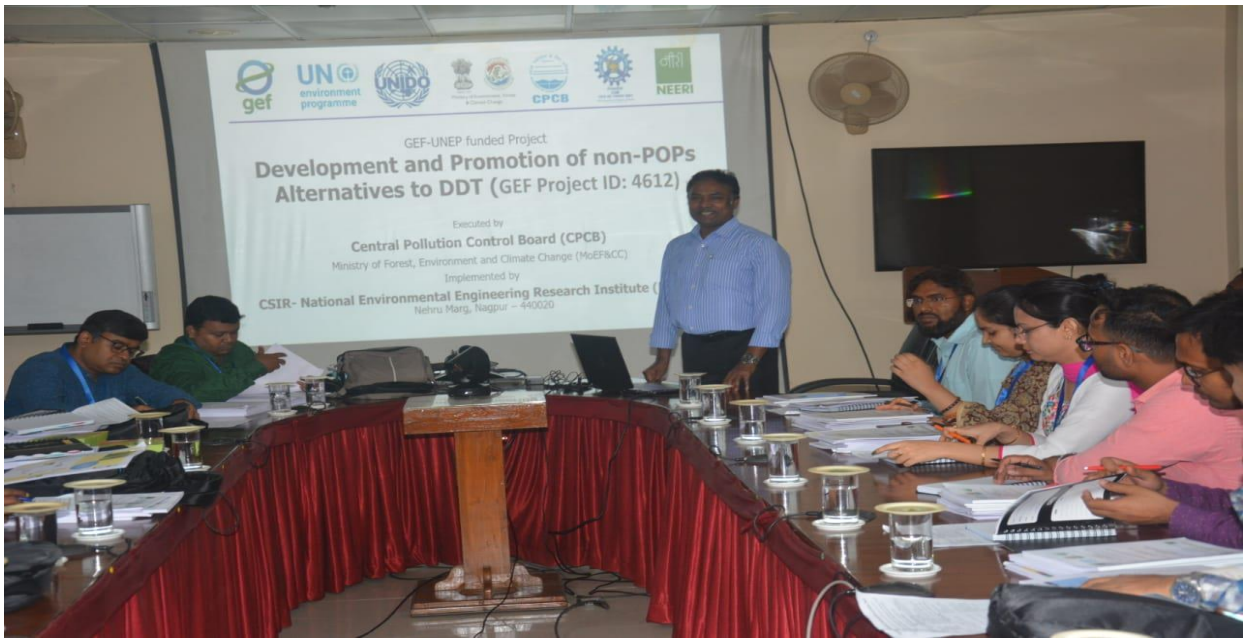

Exhibit-3: Lecture/Discussion on Training part-2

Training part - 3: Introduction to vector borne diseases: Japanese Encephalitis

Dr. L. J. Kanhekar, Former Jt. Director, NCDC deliberated on learning objectives of training module-1, a brief explanation about the introduction of Japanese Encephalitis, Causative agents: a virus (Flavivirus); J.E. vectors in India: *Culex tritaeniorhyncus, Cx. vishnui* etc.); Signs & symptoms (According to WHO, a headache, high fever, tremors, nausea, vomiting); Key players in JE transmission: Environment, Vector-Agent, Host (amplifying): primarily animal (Pig), Host carrier: birds & human incidentally; Transmission Cycle of J.E. Virus (Natural transmission, horizontal & vertical transmission); Epidemiology: Epidemic patterns

& Endemic patterns; Burden in India (JE endemic states, JE cases & deaths) and global disease burden; Prevention & Control were also discussed.

Exhibit-4: Lecture/Discussion on Training part-3

Training part - 4: Introduction to vector borne diseases: Malaria

Dr.R. S. Sharma, Former Addl. Director, NCVBDC & NCDC has deliberated this training session, a brief introduction about the vector borne disease: Malaria and its impact. Causative agents of Malaria: *Plasmodium* Parasite (*P. falciparum, P. vivax, P. ovale, P. malariae*) & its life cycle: Asexual & Sexual cycle; transmission of malaria; Vectors: Female *Anopheles* Mosquitoes (globally more than 70 vectors recorded out of which 9 in India (6- primary & 3-secondary vectors); Host: Human; Current status according to National Strategic Plan: Malaria elimination mode supported by organisation like NCVBDC, NCDC, NIMR etc., as per National framework for malaria elimination cases has been gradually decreasing from 2006 to 2020 approx. 70% decline, Global disease burden and burden in India. He deliberated regarding WHO documentation on Malaria elimination framework for Urban areas (Exhibit-5).

Exhibit-5: Lecture/Discussion on Training part-4

Training part-5: Introduction to Chandipura Virus (CHPV)

Based on the previous online training one chapter on Chandipura Virus has been introduced and Dr. P T Joshi has deliberated this training part with a brief introduction on Chandipura virus (CHPV) with its prevalence in India and at global level. Chandipura virus belongs to the genus Vesiculovirus placed in the order of Mononegavirales of Rhabdoviridae family. The vector is female sandfly,Phlebatomus papatasi. He deliberated on outbreaks of Chandipura virus infection, isolation of CHPV, its transmission and clinical features (Exhibit-6).

Exhibit-6: Lecture/Discussion on Training part-5

Training part - 6: Morphology and Bionomics of Vector Mosquitoes

Dr.R. S. Sharma & Dr. L. J. Kanhekar has deliberated in this training part, Introduction to mosquito vectors: *Anopheles, Culex, Aedes* and *Mansonia* spp.; Classification of mosquitos; Morphological characters of mosquitoes. He gave a brief lecture on vectors of malaria: *Anopheles* mosquito (*Anopheles culicifacies, An. stephensi, An. fluviatilis, An. minimus, An. dirus (baimai), An. epiroticus*); Morphological characters, classification (egg, larva, pupa and adult), vector biology (life cycle of vector mosquitoes) and ecology (Distribution, breeding places etc.); Vectors of lymphatic filariasis (LF) and Japanese Encephalitis (JE): Introduction on *Culex* spp. Most important vector of LF and arboviral disease such as JE, Culex vector; External morphology- Adult, egg, larvae, pupa; Vector of Brugian filariasis transmitted by *Mansonia* Mosquito & its external morphology (egg, larva, pupa, adult); Vector biology and ecology; Vectors of Dengue, Chikungunya, and Zika: Introduction; External morphology of vector; Vector biology and ecology: two medically important species *viz. Aedes aegypti* & *Ae. albopictus*; Introduction to bionomics of vector mosquitoes (feeding, resting, biting habits,

breeding, distribution, site of transmission (intra, peri, extra, domiciliary sites), gonotrophic cycle, insecticide resistance; Eco-Epidemiological aspects: - Entomological factors (Vector density, frequency of biting man, longevity) & Environmental factors (Temperature, Relative humidity, Rainfall).

Training part-7: Introduction to vector borne disease: Crimean Congo Haemorrhagic Fever (CCHF)

Dr. Ramesh Chandra, Former State has deliberated with a brief introduction about CCHF, History of CCHF; Causative agent (Nairovirus of the family *Bunyaviridae* and vector-*Hyalomma* ticks), Transmission (Transovarial and Transstadial transmission), Epidemiology and major risks factors; Major outbreaks in India and extensive global geographic distribution. Tick spp H. *anatolicum, H. asiaticum, H. dromedarii, H. impeltatum, H. marginatum, H. rufipes, H. truncatum, H. turanicum* are recognised as potential vectors to acquire, maintain and transmission of CCHFV; Virus incrimination from ticks; Clinical manifestation & Symptoms, diagnosis, and treatment; Controlling CCHF in animals & ticks, Insecticide recommended for the control of ticks (Malathion, Dichlorvos, Carbaryl etc.); Reducing the risk of tick to human transmission, animal to human transmission, human to human transmission (Exhibit-7).

Exhibit-7: Lecture/Discussion on Training part-7

Training part –8: Introduction to vector borne disease: Scrub Typhus

Dr. Ramesh Chandra, has deliberated a lecture on Section-9 (Scrub Typhus) of Chapter-2 of Training module-1. Brief introduction of Scrub typhus: History; Causative agent: a gram-negative, obligate intracellular bacterium *Orientia*; Vector: Mites genus- *Leptotrombidium*

diliense; Sign & symptoms; Diagnosis & treatment: diagnosis bases on bacterial culture, serology, molecular methods-rapid ICT, ELISA, PCR test, Antibiotics such as Azithromycin, Doxycycline are prescribed drugs & other effective drugs: chloramphenicol and tetracycline; Transmission: Trans-stadial and trans-ovarial transmission; Epidemiology & control; prevention & control using topical application of DMP, DEET etc. Burden in India and global disease burden. A brief on life cycle of mites also discussed.

Training part - 9: Integrated Vector Pest Management: IPM

Dr.Prof. Vilas Tambe, Agriculture College, Nagpur, deliberated this training part with a brief introduction about IVPM: IPM (agricultural sectors) & IVM (VBDs control programme)-knowledge about vectors, diseases & disease determinants; Integrated pest control measures: Biological, Cultural, Chemical, Mechanical & Physical Control; IPM implementation Programme consists suppression of harmful organisms, Monitoring, Adequate decision-making, non-chemical plant protection measures, specific pesticides and evaluation.

5.2 Training session-2 (Day-2: Tuesday- 25/07/2023)

Training part - 1: Introduction to vector borne disease: Lymphatic Filariasis

Dr. P. K. Srivastava, Former Jt. Director, NCVBDC deliberated on introduction to Lymphatic Filariasis, its causative agent, microfilarial periodicity, human filarial parasites, transmission cycle (in human and mosquito body), external morphology of the vector (egg, larva, pupa and adult), vector biology and ecology, resting and feeding habitats of the vector, its flight range and breeding places. He also discussed national and global burden of Filariasis, its history in India, salient features of the vector life cycle, elimination of Lymphatic Filariasis, Species of filarial infections prevalent in India, current status of Lymphatic Filariasis in India, difference in *W. bancrofti* and *B. malayi* species, Filariasis disease manifestation (acute & chronic), paradigm shift in LF control, elimination strategy: 1997 and guidelines about elimination of Lymphatic Filariasis in India.

Training part -2: Entomological surveillance of VBDs

Dr. Himmat Singh, Sc.'D' ICMR-NIMR has deliberated about training module- 4: Integrated Vector and Pest Management (IVPM). During his lecture he covered topics such as Entomological Surveillance of VBD's & its key elements: Introduction to Entomological Surveillance; Methods: detection & monitoring of larval and adult population- Collection of Adult mosquito, Larval collection & Eggs; Methods- Qualitative and Quantitative; Vector

Traps for disease surveillance & Surveillance tools; Sampling methods of larval collection- Netting method (surface collection), Dipping method; Siphoning method (Tree hole), well net collection, Larva collection by dropper/ pipettes were discussed (Exhibit-8).

Exhibit-8: Lecture/Discussion on Training part-2

Training part -3: IVM- Integrated vector control methods and IVM in different situations

This training session was covered by **Dr. P.T. Joshi**, lecture started with the basic introduction of VBDs in India, integrated vector and pest management. The main content covered was IVPM basics, fine key elements of IVM, methods of IVM, vector bionomics of IVM. Integrated vector control methods: environmental management (modification, manipulation and changes to human habitation (or) behaviour, personal protection (protective clothing, repellents, installation of vaporization), larval source management (chemical control- larvicides (dosage & formulation), insect growth regulators, biological control (larvivores fish-Gambusia, Guppy), IRS, LLINs, Spray formulation & dosage for impregnation of bed-nets. IVM in different situations: Epidemic and Endemic; Environmental Management, Anti-larval measures, adult control & personal protection; IVM epidemic preparedness and response for malaria- Rapid response team were discussed.

Training part - 4: NCVBDC Recommended insecticide: Larval source management and adult vector control

This training part was covered by **Dr. Kalpana Baruah,** Former Addl. Director, NCVBDC**,** the contents covered were introduction of larval source management and NVBDCP recommended insecticide, importance of larval source management, methods of larval source

management, Mosquito Larvicidal Oil (MLO), Temephos 50% EC, insect growth regulators (IGR) including pyriproxyfen 0.5% and Diflubenzuron 25% WP. He also deliberated a lecture on adult vector control: adulticides; LLINs; adult vector control (outbreak condition)- indoor space spray, outdoor fogging; preparation and application of ready to use suspension (insecticides).

Training part-5: Morphology and bionomics of Ticks and Mites

On the second day, **Dr.N. Balkrishnan**, Jt. Director, NCDC, deliberated on Morphology and bionomics of Ticks and Mites. He introduced about Ticks and its classification; capable of transmitting diseases: mainly Crimean-Congo Hemorrhagic Fever (CCHF), Kyasanur Forest disease (KFD); Type of ticks: Soft ticks and Hard ticks; life span (soft ticks- 15 yrs & hard ticks- about 3 yrs.), Soft Ticks: Introduction; External morphology; Biology & Ecology- Life cycle of soft ticks: Eggs→Larvae (6 legged)→Nymph (8 legged)– 4 instar→Adult; Population depends on various factors: climate, hosts, predators & competitors; Hard ticks (Ixodid); External Morphology; Life cycle of hard ticks: Eggs→Larvae (6 legged)→Nymph (8 legged)→Adult (life span- about 3 years); Introduction of Mites and its Classification; Life span, transmits Rickettsial Pox, Scrub Typhus, Dermatoses, chiggers and scabies; External morphology; *Leptotrombidium* (vector of Scrub Typhus) is medically important species. Biology and Ecology of Mites; Life cycle: Egg→Larva (Pre-larva)→Nymph- 3 instar→Adult; Collection of soft ticks (direct mechanical methods, vacuum collection & CO_2 traps), hard ticks (passive, systematic & special collection) & mites (Sherman trap) and their Identification.

Training part -6: Entomological parameters and its importance

Dr Himmat Singh briefed on introduction about Entomological parameters and their importance: Adult vector parameter; Entomological Indices: Malaria vector density; Vector incrimination; Mosquito life expectancy (longevity) etc.; Flea: Total flea index, percentage of hosts infested, Burrow index; Larval Survey: Indicator (Density of immatures), larval density, Pupal density; Dengue Larval survey- a) House Index, b) Container Index, c) Breteau Index, d) Pupae Index; Entomological Survey of Lymphatic Filariasis: Ten Man-hour Vector density, infectivity rate, infection rate, mean number of L3/infective mosquito) were discussed.

Training Part- 7: Equipment for Larviciding and Adulticiding:

This training part was introduced by **Dr P.K. Srivastava** contents covered were equipment/ tools for Larvicide and Adulticide; Various tools have been currently in practices: 1. Knapsack Sprayer (larvicides); 2. Hand Compression pump- Standard equipment for residual spray (Both

Adulticide & Larvicide); 3. Stirrup Pump; 4. Fogging Machines: a) Portable thermal fogging machine (PTFM), b) Ultra Low Volume (ULV); 5. Vehicle Mounted Fogging Machines: used in urban or sub-urban areas; 6. Vehicle Mounted Cold Fogging Machines were discussed (Exhibit-9).

Exhibit-9: Lecture/Discussion on Training part-7

Training part-8: Introduction to vector borne diseases: Dengue, Chikungunya and Zika

This training part was covered by **Dr. Kalpana Baruaha** deliberated on content covered under learning objectives of training module-1, brief explanation about the introduction of VBD's like Dengue, Chikungunya and Zika; what is Dengue? It's form (Dengue fever and severe dengue), Sign and symptoms; Causative agent: Flavivirus (Four strain- DEN-1, DEN-2, DEN-3 & DEN-4); Vector: *Aedes* Mosquitoes (Primary- *aegypti* & Secondary- *albopictus*); Transmission cycle of Dengue: Forest/Enzootic, Rural/Epidemic & Urban/Endemic/Epidemic; Burden in India and global burden. Introduction to Chikungunya & its symptoms: fever, chills, headache, nausea, vomiting, severe joint pain, rashes; Causative agent: Alphavirus; Vectors: *Aedes* Mosquitoes (*aegypti, albopictus*); Transmission cycle of Chikungunya: Sylvatic CHIKV transmission and Urban CHIKV transmission; Burden in India and global burden.

Introduction to Zika, History: 1st isolated in 1947 from a rhesus monkey in Kampala, Uganda from *Aedes africanus* mosquitoes and its sign & symptoms: high fever, Malaise, stomach ache, Diarrhoea, conjunctivitis, Dizziness, Anorexia; Causative agents (Exhibit-10).

Exhibit-10: Lecture/Discussion on Training part-8

Training part - 9: Alternatives to DDT in vector control management: Conventional methods and Environment management.

Dr. R. S. Sharma (Ex-Addl. Director, NCDC & NVBDCP) has deliberated on Introduction to Alternatives to DDT in vector control management; Learning Objectives; Vector Control Tools; NVBDCP vector management: Introduction to Environmental Management- personal protection, biological control, chemical control, legislative measures, health education etc.; Environmental Manipulation, Environmental Modification, Modification & manipulation of human habitation or behaviour; Types of Environmental manipulation: irrigation system, wet paddy cultivation, controlled vegetation, stream flushing, coastal flooding and impounding, physical alteration- man-made breeding sites; Types of Environmental Modification: Impoundments, irrigation, natural stream, drainage for agriculture and landfilling and grading; Introduction to Environment and Engineering methods; EMM Source reduction: *Ae. aegypti*, *An. stephensi*; EEM technology Irrigation malaria; Environmental approach to vector control pre DDT; Community based vector management; Vector control in tea garden Assam, Vector control in Delhi 1936-1940; EMM in Mumbai- Malaria control; Environmental control Sabarmati River's changing scenirio, Genesis of EEM in India; Risk factor Urbanization, Construction activities, Outbreak of Malaria (2010) were discussed.

Training part - 10: Introduction to vector borne disease: Plague

Dr. Balkrishnan gave a brief Introduction about vector borne diseases: Plague; Causative agent: *Yersinia pestis*- Gram -ve bacteria); Vectors: *Xenopsylla cheopis*, *X. brasiliensis*; Reservoirs: *Tatera indica, Bandicota bengalensis*; Susceptible hosts: *Rattus rattus*, *Mus musculus*, *Bandicota indica*; History; Transmission cycle; its current global status and types of plague (Bubonic plague, Pneumonic plague, Septicemic plague). He also deliberated on current

status of plague in India, cases and deaths, plague surveillance network (Rodent, Blood, Organ, Dog sera, Human blood), fleas; surveillance methodology (bacteriology, Serology, molecular & entomological), surveillance-investigation of seas and airports and endemic plague foci in India (1951), treatment, vector control, etc. were discussed.

Training part -11: Morphology and Bionomics of Flea and Flies

Dr. L. J. Kanhekar, Former Project Consultant also deliberated a lecture on morphology and bionomics of Fleas & Flies. He briefly explained about fleas, about 2500 species in about 220 genera, 37 species known to occur in India; *Xenopsylla spp.* Medically important flea (vector of plague and murine typhus); classification and external morphology; Difference between male & female vector; Bionomics of Fleas: Life cycle- Egg, Larva, Pupa and Adult. He also deliberated about vector of enteric diseases: introduction on House Fly (*Musca domestica*), can be a vector of Helminths, faecal bacteria, protozoan & viruses resulting in the spread of enteric diseases- gastrointestinal tract; classification of House fly: 4200 species, 190 genera, almost 70 species of house flies belonging to genus Musca; morphology of the house fly and its life cycle: Egg, Larva (Maggot), Puparium & Adult House fly and its breeding places were discussed.

5.3 Training session-3 (Day-3: Wednesday- 26/07/2023)

Training part - 1: Introduction to Kyasanur Forest Disease

Dr. Balkrishnan gave a lecture on Kyasanur Forest Disease (KFD) with an Introduction to KFD; Symptoms and Clinical features, Host factors, Diagnosis; History; Transmission: trans stadial mode (nymphal stage ticks), incubation period- 3 to 8 days; Transmission cycle of KFD; KFD virus ecology, Vector- ticks (*Haemophysalis spinigera* & *H. turturis*); Natural cycle of KFD: Egg→Larva→Nymph→Adult; Environmental factors increasing risks factor for KFD; Burden in India; Epizootiology of KFD in wild monkeys, amplifying host (*Semnopithecus entellus/ macaca radiata*), reservoirs: cattle, dogs & other domestic animals; Preventive protection measures & Control: advise not to go to the forest where monkey death reported, Hot spot spray- Malathion powder, use of tick repellent- DMP (dimethyl phthalate) oil, KFD vaccine; recent outbreaks of KFD were discussed.

Training part-2: Introduction to vector borne disease: Leishmaniasis (Kala-azar) and Morphology and bionomics of Sandflies.

Dr. Vijay Kumar (Consultant ICMR) gave a brief introduction of Leishmaniasis (Kala-azar) and its causes: Cutaneous Leishmaniasis, Mucocutaneous Leishmaniasis and Visceral Leishmaniasis & post kala azar dermal leishmaniasis (PKDL); Causative agent: Protozoa

Leishmaniasis (*L. donovani*- in India only, *L. infantum* and *L. chagasi*); Vector: only sand fly vector of kala-azar in India *Phlebotomus argentipes*; Life cycle within human (Amastigote) and Sand fly (Promastigate/ flagellate), Environment factors: altitude, season, rural areas, development projects; Burden in India and global burden.

Training part-3: Morphology and bionomics of Sandflies.

Dr. Vijay Kumar also deliberated this training session with a brief introduction of vector of kala-azar/ Leishmaniasis disease: Causative agent: protozoan parasite; *Phlebotomus argentipes* only known vector of visceral leishmaniasis or kala-azar in India and *Phlebotomus papatasi*- vector of cutaneous leishmaniasis for human; Classification of Sand Fly; External morphology; Vector biology: complete life cycle of sand fly; Vector ecology: Distribution, Breeding places, resting habits, feeding habit, biting habit, flight range.

Training part –4: IVPM- Behaviour Change Communication (BCC)

Dr. P.T. Joshi, Former State Entomologist Gujarat . has deliberated this training session, a brief introduction about Behavioural Change Communication- IEC strategies: IPC between community & Health workers, Social & Community; Objective of BCC; Outcomes of interventions, knowledge & skills, behaviour & activities, Impact- control of vector density & disease; Tools of BCC: Media Information (Radio/ TV Broadcast), Education & Communication, Communication for behavioural impact, and Farmer Field schools; Accredited Social Health Activist (ASHA) trained under National Health Mission (NHM); Multipurpose Health Workers (MPHW)- various kinds of IEC materials like posters, stickers, pamphlets, key materials- prepared to be displayed for BCC & IEC (preferably in local languages).

Training part - 5: Monitoring and evaluation of IVPM

This training part was covered by **Dr. P.K. Srivastava** with a brief introduction on Monitoring and evaluation of IVPM: Methods, Outcome indicators: Planning and implementation, Organization and management (Within health sector); Behavioral Changing Communication; Entomological surveillance; Insecticide resistance monitoring through susceptibility test, Surveillance of dengue/ malaria vector; Entomological survey of Lymphatic Filariasis Epidemiological surveillance: Incidence, Prevalence; Epidemiological parameters of malaria (API, ABER, AfI & SPR) and Epidemiological parameters of Filariasis (Microfilaria rate, Microfilaria density & Filarial endemicity rate) were discussed.

Training part - 6: Alternatives to DDT: LLIN, Biolarvicides & Neem derived products for vector control (UNIDO Project)

Dr. Y. P. Ramdev, National Technical Advisor, UNIDO covered this training part, he gave some introduction about UNIDO, an alternative to DDT in vector control, and in this training part, content covered was an introduction of neem, DDT, Stockholm convention on POPs, the status of ratification, DDT application, rational pesticide use (RPU), effective pesticide application (coverage, dosage and timing), droplet size, droplet density, spray retention, the contact angle of a droplet, concentration organism susceptibility, dosage temperature, humidity, air velocity. Application inefficiency existing strategy: adulticide-IRS, national implementation of suitable alternative products, methods and strategies. He also deliberated on introduction about non-POPs alternative to DDT: Problem associated with use of Synthetic Pesticide; Promote effective alternatives to DDT and synthetic pesticides: Neem (*Azadirachta spp.*) & *Bacillus thuringiensis* (Bt) as Bio-botanical pesticides; Objective of the Project; Mosquito Life Cycle; He also discussed progress made in project: Neem based formulations developed and process standardized for pilot plant production: 1. Process for coil formulation; 2. Process for Cream formulation; 3. Process for Suspension Concentrates formulation; 4. Process for spreading oil formulation; 5. Process for Tablet production; Bio-efficacy of neem-based Spreading formulation/ SC/Tablets/Cream; Technology, Transfer & Training; Bacillus thuringiensis (Bt) based formulation (**Exhibit-11**).

Exhibit-11: Lecture/Discussion on Training part-6

Training part - 7: Alternatives to DDT: Manufacturing, marketing and distribution-LLIN, Bio larvicides & Neem derived products for vector control.

This training part was deliberated by **Dr. Rajendra Thapar,** Manager, HIL (India) Ltd., with a brief introduction about HIL (India) Ltd. Business segment expansion in various sectors (Public health, agrochemicals, Fertilizers, seed etc.); HIL contribution in DDT phasing out as part of DDT alternative project; Agreement between UNIDO-HIL in 2015 to develop locally appropriate cost-effective and sustainable alternatives to DDT (LLIN, *Bti* based Biolarvicides & Neem derived products); Present status of HIL in production of DDT alternatives (**Exhibit-12**).

Exhibit-12: Lecture/Discussion on Training part-7

Training part - 8: Planning & Implementation of IVPM

In this session, **Dr. P. K. Srivatava** discussed about Planning & Implementation under IVPM: Learning objectives; Introduction to IVPM; Planning & implementation of vector control management (WHO)- Technical steps: 1. Disease situation: a) Epidemiological Assessment-Measures and Estimation of disease occurrence; b) Entomological assessment- Xeno-monitoring or xeno-surveillance; 2. Operational steps: a) Local determinants of disease: i) Parasite, ii) Vector, iii) Human activities & iv) Environment; b) Selection of vector control methods: Environmental, Mechanical, Biological and Chemical to reduce vector population or to reduce human vector contact; Need & resources; He also discussed roles of various sectors in IVM implementation strategy.

Training part - 9: IVPM: Vector management through Farmer Field School (FFS) approach

This training part under the integrated vector and pest management (IVPM), was covered by **Dr. R.S. Sharma**, content covered was background, rational and concept of FFS in IVPM. He gave training to trainees about how to implement FFS in the public health and agricultural community. Farmer Field School (FFS): Evolution of the farmer field school approach, integrated production and management through FFS, vector and VBDs management through FFS, farmers health risks associated with agriculture in India. Role of FFS at the field level for increasing continued monitoring and evaluation to reduce the vector and pest population. Management of mosquito breeding in rice field through FFS (Sri-Lanka). He also suggested FFS is a very important part in Integrated vector and pest management in the community.

5.4 Training session-4 (Day-4: Thursday- 27/07/2023)

Training part - 1: Field visit to the locality to explore vector prevalence, demonstration of vector breeding and collection method

CSIR NEERI has organised a field visit for all participant trainees from West Bengal to the locality (NEERI office premises and NEERI Colony) to explore vector prevalence, demonstration of vector breeding and collection method (**Exhibit-13**). Apart from participant trainees, Nagpur Municipal Corporation team , and Subject experts (Dr. R.S. Sharma, Dr. P.T. Joshi, Dr. L J. Kanhekar and Dr. Ramesh Chandra) were also present. Participant trainees were divided into two teams and asked them to perform entomological surveillance (vector biology and vector ecology) such as breeding places/sites, biotic/abiotic factors etc keeping in view landscape. All teams were equipped with collection tools (Ladle, Enamel bowl, Pipette, Larval vials, larval nets, Aspirators, Torch, paper cups with nets covers, Cotton wool, a pencil, a notebook, a bag to put all material etc.).

Exhibit-13: Photographs of Field visit NEERI office premises and NEERI Colony

Training part - 2: Vector control measures/ management: Biological and Genetic Control

Dr. P. T. Joshi, deliberated this training part and gave brief introduction about module-3: Alternatives to DDT in vector control measures/ management: Introduction to Biological control- Different Biological agents used in vector control such as Flatworms, Fungi, Invertebrate Predators, Micro-organism: Bacteria and Larvivorous Fishes (*Gambusia affinis,* guppy *Poecilia reticulata*) etc.; NIMR– suitable fish species used in different mosquito breeding habitats; Desirable attributes of Bio-control agents and Advantages of Biological Control. He also gave brief Introduction to Genetic Control: Mutagenesis, trans-genesis– gene delivery, Cis-genesis– Gene transfer, Para-transgenesis; Sterile Insect Techniques; Population replacement using Wolbachia; Gene Silencing using RNA interference; other genetic approach: gene drive; Advantages & disadvantages of genetic control were discussed.

Training part - 3: Epidemiological surveillance and parameters

Dr. Ramesh Chandra briefly introduced about the IVPM: Epidemiological surveillance and parameters; To determine the incidence and prevalence (point and period) of all vector borne diseases; Epidemiological parameters of Malaria: Annual Parasite Index (API), Annual Blood Examination Rate (ABER), Annual *falcipuram* Incidence (AFI), Slide positivity rate (SPR); Epidemiological parameters of filariasis: Microfilaria rate, Microfilaria density, Filarial endemicity rate were discussed.

Training part - 4: Preparation of the field report

During this session, all the participant trainees were engaged in the preparation of the field report with the CSIR-NEERI team, Dr R S Sharma, Dr. Gandhi and WB entomologists.

5.5 Training session-5 (Day - 5: Friday- 28/07/2023)

Training Part 1: Presentation of the field report

During this training part **Dr. Kaushik state entomologist**, West Bengal, and all participant trainees has given the presentation of the field report. Ms. Susmitha, VBD Consultant presented the field report which includes general topography of the NEERI colony, Biotic and abiotic factor (Temperature, Wind, humidity), Collection of Adult mosquitoes (12 mosquitoes of *Aedes* species), Larval collection (*Aedes* spp, *Culex* spp., *Anopheles* spp.), and some pupae also collected (*Aedes* spp.); other breeding sources for mosquito were empty containers, tyres, tree holes etc. were seen and informed the NEERI colony house holders to made arrangement to remove those things from the site. NEERI staff quarters holders thanked to Project team and WB trainees to understand the vector prevalence, demonstration of vector breeding and collection method. She also discussed importance of intersectoral coordination: BCC in the VBDs control.

Training Part 2: Pilot Testing of FAQs materials/ Glossary of all modules

Dr. P T Joshi / Dr. L J Kanhekar deliberated this training session, a brief introduction about FAQs material and glossary on Vector Borne Diseases and asked the participant trainees (DMOs, SPO/entomologists/VBD consultants) from Madhya Pradesh state to provide inputs on FAQs material and Glossary of all modules.

Training Part 3: Pilot Testing of IEC materials

Dr. R.S. Sharma, Dr. P T Joshi, Dr. L. J. Kanhekar and Dr. Gandhi deliberated this training session, a brief introduction about Information, Education & Communication (IEC) materials and its importance for IVPM: IEC campaign/ IEC Operation/ Programme, it should be in a local language/ terminology so that people can cooperate, participate and perform various activities to be done at their home particularly concerned to vector borne diseases (VBDs); IEC materials provided in the form of posters, pamphlets, stickers etc. are of great importance for awareness programme. IEC material included following topics: Mosquito life cycle *Aedes, Anopheles, Culex*; Mosquito transmitted diseases; How to use insecticide treated nets (ITNs); Awareness on insecticide treated nets (ITNs), Malaria (No Mosquitoes- No Malaria); ways to prevent mosquito bite; Diseases caused by mosquito bite; Awareness poster (Let's prevent breeding of mosquitoes and protect public health diseases); Introduction, Vectors and its life cycle, Sign & Symptoms, breeding sites, Transmission, Transmission cycle, and preventative measures of VBDs (Malaria, Chikungunya, Dengue, Filaria, Japanese Encephalitis and Zika); Kyasanur Forest Disease: Introduction, Vectors and its life cycle, Sign

& Symptoms, Transmission, Transmission cycle, and prevention. At the end of this session, **Dr Gandhi requested** participants trainee to provide inputs/ changes to make this IEC material more informative and helps people in the community to become aware about VBDs programme.

Training Part 4: Feedback on Modules and training materials from trainees

The training program concluded on the 28th of July with feedback from the participants. Dr. Gujju Gandhi asked the participants to provide their valuable responses and input on the training modules, booklets, PPTs, and the IEC material provided to them by filling out the Feedback forms (Part A - Pilot testing feedback and Part B - Training feedback) given to the NEERI team."

Training Part-5: Virtual valedictory session followed by group photo and certificates distribution

A valedictory session was conducted by Dr. A. Ramesh Kumar, during which Dr. M.P. Patil, Chief Scientist and Head of CHWMD, acted as the chief guest on behalf of the Director of NEERI. Dr. Patil then proceeded with the distribution of certificates to all the participant trainees. Dr. Dipankar Maji, Jt. DHS (PH&CD), Govt. of West Bengal, and Dr. Tushar Acharyya, DDHS (Malaria) & SPO (NCVBDC), Govt. of West Bengal, also joined via MS-Team, expressing their gratitude to NEERI for providing the training.

Dr. M. P. Patil proposed the vote of thanks to all the participants and experts, thus summarizing the training program. He also asked the participants for their opinions on the training program (Exhibit-14) by filling out the feedback form provided to them. Participant trainees were awarded certificates of participation (**Exhibit-15**).

Exhibit-14: Photograph of valedictory session feedback from trainees

Exhibit-15: Distribution of certificates to participating trainees

6.0 Annexures

6.1 List of organizing members

1. **Dr. A. N. Vaidya,**
   Director, CSIR – National Environmental Engineering Research Institute,
   Coordinator, Stockholm Convention Regional Centre, Nagpur

2. **Dr. M. P. Patil**
   Chief Scientist & HOD, Chemical and Hazardous Waste Management Division,
   CSIR – National Environmental Engineering Research Institute, Nagpur

3. **Dr. A. Ramesh Kumar**
   Principal Scientist cum Project Investigator),
   Chemical and Hazardous Waste Management Division,
   CSIR – National Environmental Engineering Research Institute, Nagpur

4. **Dr. Gujju Gandhi**
   Project Scientist-II,
   CSIR – National Environmental Engineering Research Institute, Nagpur

5. **Mr. Ashlesh Katpatal**
   Project Associate-I,
   CSIR – National Environmental Engineering Research Institute, Nagpur

6.2 List of faculties

1. **Dr. R. S. Sharma**
   Ex-Additional Director, National Centre for Disease Control

2. **Dr. L. J. Kanhekar**
   Ex. Joint Director NCDC & Ex. Project Consultant, CSIR-NEERI

3. **Dr. P. K. Srivastava**
   Ex-Joint Director, National Vector Borne Disease Control Programme

4. **Dr. Y. P. Ramdev**
   National Technical Adviser,
   United Nations Industrial Development Organization

5. **Dr. Rajendra Thapar**
   Manager, (Public Health & Export), HIL (India) Ltd

6. **Dr. Himmat Singh**
   Scientist – D, ICMR - National Institute of Malaria Research.

7. **Dr. Vijay Kumar**
   ICMR- Consultant, (Ex- Scientist E),
   ICMR-Rajendra Memorial Research Institute of Medical Sciences

8. **Dr. Ramesh Chandra**
   Former State Entomologist, Uttar Pradesh

9. **Dr. P. T. Joshi**
   Former State Entomologist, Gujarat state.

10. **Dr. Kalpana Baruah**
    Addl. Director, NCVBDC, New Delhi

11. **Dr. Balakrishnan**
    Ex. Jt. Director, NCDC, Bangalore

12. **Prof. Vilas Tambe**
    Professor & Head, Dept of Entomology, Agriculture College, Nagpur

6.3 List of nominated trainees

S. No	Names	Location
1	Mr. Tarun Lohar	Bishnupur HD
2	Mrs. Ananya Mandal	Dakshin Dinajpur
3	Mr. Somnath Banerjee	Paschim Bardhaman
4	Dr. Sankarsan Roy	Purulia
5	Mrs. Tanusri Maitra	Purba Bardhaman
6	Dr. Priyanka Maji	Paschim Medinipur
7	Mr. Sober Ahmed	Coochbehar
8	Mr. Debabrata Dutta	Darjeeling
9	Smt. Debarati Barman Roy	Diamond Harbour HD
10	Mr. Manas Prates Modak	Purba Midnapur
11	Sk Golam Mortuja	Basirhat HD
12	Smt. Susmita Ghosh	Nadia
13	Smt. Nure Asrafi	Murshidabad
14	Dr. Priyanka Mukhopadhyay	South 24 Parganas
15	Md. Badruddoja	Malda
16	Smt. Sweta Majumder	Howrah
17	Smt. Sudeshna Chakroborty	North 24 Parganas
18	Mr. Rahul Sarkar	Jalpaiguri
19	Dr. Kousik Chowdhury	Coochbehar
20	Dr. Debashis Pal	Dakshin Dinajpur
21	Dr. Subarna Goswami	Purba Bardhaman
22	Dr. Debabrata Das	Bankura
23	Dr. Atreyi Chakraborty	South 24 Parganas
24	Dr. Kallol Bhandari	State HQ (PH&CD)
25	Dr. Arnab Sarkar	State HQ (PH&CD)

6.4. Training Schedule

CSIR-National Environmental Engineering Research Institute, Nagpur

(*Project: - Development and promotion of non-POPs alternatives to DDT*)

Five Days Training Programme on Integrated Vector and Pest Management (IVPM) from 24th to 28th July 2023, for SPO/Entomologists/ Biologists and VBD Consultants from West Bengal

Venue: *Committee Room No-2, CSIR-NEERI, Nagpur*

Training Programme Schedule

Time	Topic	Resource Person
Day 1 (Monday) 24/07/2023		
0915-1000	Registration – Distribution of training materials (Committee Room No:2)	
	Inaugural Function	
1000-1030	**Welcome Address** : **Dr. Atul. N. Vaidya,** Director, CSIR-NEERI, Nagpur **Address by** : **Dr. M. P. Patil,** Chief Scientist & Head, CHWMD, CSIR-NEERI, Nagpur **Guest of honour:** **Dr. Narendra Bahirwar,** Medical Officer in Health, NMC, Nagpur **Inauguration by Chief Guest** : **Dr. Shyam Nimgade,** Asst. Director (Malaria & Filaria), DHS, Nagpur **Vote of Thanks** : **Dr. A. Ramesh Kumar**, Principal Scientist & PL CSIR-NEERI, Nagpur	
1030-1045	**High Tea & Group Photo**	
1045-1115	Introduction to Modules 1 to 4	Dr Gujju Gandhi, Project Scientist-II
1115-1155	Introduction to DDT and its use in Vector Control (Module-1: Chapter- 1)	Dr A Ramesh Kumar, Principal Scientist & Project Leader
1155-1225	Introduction to VBD: Japanese Encephalitis (Module-1: Chapter- 2: 2.3)	Dr L. J. Kanhekar, Former Jt-Director, NCDC & Former Project Consultant, CSIR-NEERI
1225-1255	Introduction to VBD: Malaria (Module-1: Chapter-2: 2.1)	Dr R S Sharma, Former Addl. Director, NCVBDC & NCDC
1255-1330	Introduction to Chandipura Virus (Module-1: Chapter-2: 2.12)	Dr P T Joshi Former. State Entomologist, Gujarat
1330-1430	**LUNCH BREAK**	
1430-1510	Morphology of Anopheline vector mosquitoes (Module-2: Chapter -2: 2.1)	Dr L. J. Kanhekar

1510-1540	Introduction to Crimean Congo Hemorrhagic Fever (Module-1: Chapter- 2: 2.10)	Dr Ramesh Chandra, Former State Entomologist, UP
1540-1610	Bionomics of Anopheline vector mosquitoes (Module-2: Chapter -2. Pg-15-22)	Dr R S Sharma
1610-1700	Introduction to VBD: Scrub Typhus (Module-1: Chapter -2: 2.9)	Dr Ramesh Chandra
1700-1730	Integrated Pest Management: IPM (Module-4: Chapter -1: 1.3-1.3.2)	Prof. Vilas Tambe, Agriculture College, Nagpur
Day 2 (Tuesday) 25/07/2023		
0930-1010	Morphology and Bionomics of Culicine vector mosquitoes (Module-2)	Dr L. J. Kanhekar
1010-1050	Introduction to VBD: Lymphatic Filariasis (Module-1: Chapter -2: 2.2)	Dr P K Srivastava, Former Jt. Director, NCVBDC
1050-1120	Entomological surveillance of VBDs (Module-4: Chapter- 3: 3.4)	Dr Himmat Singh, Scientist -D, ICMR-NIMR
1120-1150	Integrated vector management (Module-4: Chapter -1: 1.2.1.6 -1.2.1.7)	Dr P T Joshi
1150-1220	NCVBDC Recommended Insecticide: Larval Source Management (Module-3: Chapter- 7)	Dr Kalpana Baruah, Former Addl. Director, NCVBDC
1220-1300	Bionomics of Ticks and mites (Module-2: Chapter 9)	Dr N Balkrishnan, Former Jt Director, NCDC
1300-1330	Entomological parameters and its importance (Module-4: Chapter -3: 3.4.5-3.4.8)	Dr Himmat Singh
1330-1430	**LUNCH BREAK**	
1430-1520	Equipment for larviciding and adulticiding (Module-3: Chapter- 8)	Dr P K Srivastava, Former Jt. Director, NCVBDC
1520-1610	Introduction to VBDs: Dengue, Chikungunya and Zika (Module-1: Chapter- 2: 2.4-2.6)	Dr Kalpana Baruah
1610-1705	Alternatives to DDT in Vector Control Management – Conventional Methods & Environmental Management (Module-3: Chapter-1-3)	Dr R S Sharma
1705-1735	Introduction to VBD: Plague (Module-1: Chapter -2: 2.8)	Dr N Balkrishnan
1735-1800	Morphology and Bionomics of flies & Flea (Module-2: Chapter- 7 & 8)	Dr L. J. Kanhekar/ Dr. Ramesh Chandra

Day 3 (Wednesday) 26/07/2023		
0930-1010	Introduction to Kyasanur Forest Disease (Module-1: Chapter-2: 2.11)	Dr N Balkrishnan
1010-1100	Introduction to VBD: Leishmaniasis (Kala-azar) (Module-1: Chapter- 2: 2.7)	Dr Vijay Kumar, Former Scientist, ICMR-RMRIMS
1100-1130	IVPM: Behavior Change Communication (Module-4: Chapter-1: 1.5)	Dr P T Joshi
1130-1220	Morphology and Bionomics of sandflies (Module-2: Chapter- 6)	Dr Vijay Kumar
1220-1250	Monitoring and evaluation of IVPM (Module-4: Chapter-3: 3.1-3.3)	Dr P K Srivastava
1250-1330	Pilot Testing of FAQ- Lymphatic & Brugian Filariasis	Dr. Ramesh Chandra
1330-1430	**LUNCH BREAK**	
1430-1500	Alternatives to DDT: LLIN, Biolarvicide & Neem derived products for vector control (UNIDO Project) (Module-3: Chapter-9)	Dr Y P Ramdev, National Technical Adviser, UNIDO
1500-1530	Alternatives to DDT: Manufacturing, marketing and distribution – LLIN, Biolarvicide & Neem derived products for vector control	Dr Rajendra Thapar, Manager (Public Health & Exports), HIL (India) Ltd
1530-1600	Planning and implementation of IVPM (Module-4: Chapter-2)	Dr P K Srivastava
1600-1630	IVPM: Vector management through Farmer Field School approach (Module-4: Chapter-1: 1.4)	Dr R S Sharma
1630-1700	Pilot Testing of FAQ- Malaria, Dengue, Chikungunya & Zika	Dr L J Kanhekar & Dr P T Joshi
1700-1730	Integrated Vector Pest Management: IVM – Integrated vector control methods and IVM in different situations (Module-4: Chapter-1: 1.2.1-1.2.1.4 & 1.2.2-1.2.3)	Dr R S Sharma
Day 4 (Thursday) 27/07/2023		
0800-1330	Field Visit to the locality to explore vector prevalence, demonstration of vector breeding and collection method	Dr L J Kanhekar, Dr R S Sharma, Dr P T Joshi, Dr Ramesh Chandra, Dr. G Gandhi, Abhishek Chaudhary and Ashlesh Katpatal,
1330-1430	**LUNCH BREAK**	
1430-1520	Vector control management: Biological Control and Genetic Control (Module-3: Chapter-3 & 4)	Dr P T Joshi
1520-1610	Epidemiological surveillance and parameters (Module-4: Chapter 3- 3.5)	Dr Ramesh Chandra

1610-1745	Preparation of the field report	Dr R.S Sharma, WB State Entomologist, Dr G. Gandhi & Abhishek Chaudhary
Day 5 (Friday) 28/07/2023		
09.30-1030	Presentation of the field report	SPO West Bengal & Participant Trainees
1030-1130	Pilot Testing of IEC materials	Dr R S Sharma, Dr P T Joshi, Dr L J Kanhekar & Dr G Gandhi
1130-1230	Pilot Testing of FAQs: KFD, CCHF & Scrub Typhus	Dr L J Kanhekar, Dr G Gandhi & Abhishek Chaudhary
12.30-1330	Pilot Testing of FAQs: IVPM, Mosquito & Glossary of all modules	Dr Ramesh Chandra, Dr L J Kanhekar, Dr R S Sharma & Dr .G.Gandhi
1330-1430	**LUNCH BREAK**	
1430-1530	Presentation and Feedback on Modules and training materials from trainees	Dr L J Kanhekar, Dr G Gandhi, Abhishek Chaudhary & Ashlesh Katpatal
1530-1600	Valedictory session followed by group Photo and certificates distribution	Dr. A. Ramesh kumar

(Dr. Gujju Gandhi)
Project Scientist-II

Copy to: **1. SPO, West Bengal**
2. All Participant Trainees