

**ENVIRONMENTAL MANAGEMENT PLAN
FOR THE VECTOR BORNE DISEASE
CONTROL PROJECT
INDIA**

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Acronyms

ANM	:	Auxiliary Nurse Midwife
API	:	Annual Parasite Incidence
CHC	:	Community Health Centre
CIB	:	Central Insecticide Board
CPCB	:	Central Pollution Control Board
DDT	:	Diethyl Dimethyl Trichloroethane
DDC	:	Drug Distribution Centre
DMO	:	District Malaria Officer
EMP	:	Environmental Management Plan
FTD	:	Fever Treatment Depot
HW	:	Health Worker
IRS	:	Indoor Residual Spray
ITMN	:	Insecticide Treated Mosquito Net
ITM	:	Insecticide Treated Material
MoEF	:	Ministry of Environment & Forests
MC	:	Municipal Corporation
NVBDCP	:	National Vector Borne Disease Control Program
NGO	:	Non governmental Organization
NIMR	:	National Institute of Malaria Research
POP	:	Persistent Organic Pollutants
PPE	:	Personal Protection Equipments
RC	:	Registration Committee
SMI	:	Senior Malaria Inspector
VBD	:	Vector Borne Disease

Acknowledgements

The National Vector Borne disease Control Programme use various categories of insecticides for indoor residual spray, larvicides, fogging and treatment of mosquito nets for vector control of malaria, kala-azar, filariasis, Japanese encephalitis and even Dengue in India. It is well known that chemical insecticides, if not used as per recommendations, can cause adverse health impact to the persons involved, communities and contaminate the environment. The venture of developing Environmental management Plan to mitigate the adverse health impacts of insecticides being used in vector control programme in India is a welcome move.

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**-Prof A P Dash
DIRECTOR**

Executive Summary

Malaria, visceral leishmaniasis, filariasis, dengue and japanese encephalitis are the major vector borne disease in India resulting in millions of cases and thousands of deaths annually. Indoor residual spray by DDT, Malathion and Pyrethroids are used for vector control in Malaria and Kala-azar in rural areas, while larviciding by Temephos and Fenthion and fogging of Technical malathion is done in urban areas. In some areas where settlements are scattered and it is not feasible to undertake IRS due to difficult terrain, Insecticide treated mosquito nets are used. It is a well known fact that chemical insecticides are toxic to human beings. If not used as per recommendations, they cause adverse health impact to the persons involved, community and contamination of environment.

After the successful implementation of Enhanced Malaria Control Programme in 101 districts in India, National Vector Borne Disease Control Programme, (the central agency responsible for guidelines, policy and implementation of vector borne disease in India) envisages to launch Vector borne disease control project in the country with assistance from World Bank. In order to ensure that the insecticides and insecticide treated material (ITM) used in the project does not cause threat to health of persons involved, community and environmental contamination, it was proposed to undertake environmental assessment of the use of insecticides and ITM for development of Environmental Management Plan(EMP).

NVBDCP has already developed guidelines for safe handling and disposal of insecticides, however, there were reports of the presence of insecticide in blood of spray workers and contamination of soil and water. Therefore, visits were made to the state of Orissa and Karnataka (representating low capacity and high capacity state respectively) and to maharashtra states to understand the gaps in implementation of guidelines, scope of improvement so that EMP may be developed for environmentally sound project. Health officials right from Joint Directors (which is state Programme Officer for vector borne disease control), State entomologists, store keepers, District malaria Officers, Medical officers of Primary Health Centres, Senior Malaria Inspectors, supervisors, health workers and Anganwadi workers were contacted for understanding the intricacies of programme and the problems faced in implementation of guidelines. Stakeholders at community level like spray workers, village chiefs, teachers, shopkeepers and villagers in general were also contacted. It was found that a system of sound spray operations, implementation and monitoring programme exists in all states up to subcentre and village level. The programme is affected in some areas due to vacant posts of health workers, which are key supervisory posts at community level, and lack of awareness and training to some categories of stakeholders. Some spray workers were not adhering to use of protective gears particularly while spraying DDT and malathion. Insecticide storage conditions were found far from satisfactory in most of the areas. An EMP incorporating legal framework, procurement, storage & transport, application activities, occupational health and safety measures, environmental impacts related to treatment for VBDs, capacity building, IEC, intersectoral collaboration, reporting & Monitoring has been developed for implementation at centre, State/District level . Recommendations/ actions required at various levels for mitigation measures, occupational health and safety measures , remedial measures for storage& transport etc have been emphasized. Constitution of national surveillance system for effective reporting and monitoring of various aspects has been proposed . Constitution of village level committees for social participation and monitoring at central, state and district level has been suggested for effective auditing of the insecticide use operations. Training plan for different categories of personnel has been suggested. Implementation schedule for various components of EMP has also been provided. With the implementation of EMP, it is hoped that health and environmental related hazards due to use of insecticides and insecticide treated materials would be reduced to negligible level.

1. Introduction

The proposed Vector Borne Disease Control project (VBDCP) will support Government of India (GOI) in achieving its stated goal of reducing mortality and morbidity from vector borne diseases (VBD), namely malaria, dengue, Japanese encephalitis, visceral leishmaniasis, and lymphatic Filariasis. The project will consolidate the gains and build on lessons learnt from the Enhanced Malaria Control Project, and support GOI in achieving the above mentioned goal.

The proposed project aims to expand access and enhance quality and performance of VBD control services—prevention, care and treatment of VBDs, integrated vector management, strengthened surveillance, Monitoring & Evaluation (M&E), and operational research. It would have a national scope, and will cover not only rural but also urban areas, as malaria and dengue are increasing problems for the cities. The proposed operation is aimed to support the National Program in following three areas of intervention:

1. Increasing access and quality of care and treatment through strengthening capacity of health facilities, medical and health personnel in public and private sectors, village level functionaries, ensuring adequate supplies of drugs and laboratory supplies, and introducing ACT in malaria drug resistant areas.
2. Preventing VBDs and Improving Integrated Vector Management which will result in scaling up of source reduction, increased utilization of insecticide treated bed-nets, and targeted continuation of indoor residual spraying (IRS). These outputs would be achieved through the implementation of community based education programs as stipulated in the integrated vector management strategy which also includes behavioral change communications, advocacy with local and community leaders, public-private partnership with NGOs and informal health service providers, and inter-sectoral collaboration between health and other departments.
3. Strengthening institutional and information systems for improved surveillance, M&E, and Operational Research.

This proposed project is categorized as Category B from the viewpoint of environmental risk, as provision of preventative and treatment services under this project involves the use, storage, transportation, and disposal of insecticides and pesticides in various applications. The management of these insecticides requires stringent and systematic cradle to grave management, otherwise there could be direct environmental and public health implications. A Medical waste management plan will be required for environmental impacts associated with treatment of vector borne diseases. There are no expected issues related to construction, as there are no major civil works envisaged. In accordance with the World Bank's Operational Policies on Environmental Assessment, this project has to be environmentally sound and sustainable by recommending measures needed to prevent, minimize, mitigate, or compensate for adverse impacts and improve environmental performance.

Under the Pest Management Policy, the Bank supports a strategy that promotes the use of biological or environmental control methods and reduces reliance on synthetic chemical pesticides. It emphasizes that the pesticides used in bank financed projects 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. The Policy requires that pesticides procured

under this operation be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards acceptable to the Bank. The Bank also assesses the capacity of the country's regulatory framework and institutions to promote and support sound, effective, and environmentally viable pest management.

2. Regulatory Framework:

National:

In India, the principle objective of the primary legislations on pesticide use is to regulate the import of insecticides with a view to prevent risk to human beings and animals. There are two principle legislations (Insecticides Act 1968 and Destructive Insects and Pests Act 1914) and at least two other cognate Acts which relate to pest management and control.

The Insecticides Act (1971) grants license to manufacture or to sell stock or exhibit for sale or distribute any insecticide. It lays down a detailed procedure for regulating the use, manufacture and sale of insecticides and pesticides and also has a penalty clause for violations. The Central Insecticides Board (CIB) and Registration Committee (RC), are government agencies entrusted with the task of registration regulation and usage of pesticide in the country. The CIB has been constituted under the Insecticides Act, to advise Central Government and State Governments on technical matters, including safety measures necessary to prevent risk to human beings or animals in manufacture, sale, storage, distribution and use.

The Registration Committee (RC) registers insecticides after scrutinizing formulae, verifying claims of efficacy and safety to human beings and animals and also specifies the precautions against poisoning and any other function incidental to these matters. It has wide powers and there is a system in place which is highly regulated, which provides enough safeguards for the insecticides sector. To assess efficacy of the insecticides and their safety to human beings and animals, the RC has evolved guidelines/data requirements which inter- alia includes residue in crops on which the insecticides are intended to be used. While the RC registers pesticides for their usage, their Minimum Risk Levels (MRL) in food and commodities are prescribed by the Ministry of Health and Family Welfare under the prevention of Food Adulteration Act (PFA), 1954. The MRL is established taking into account the toxicological data of the pesticide as well as the trials on crops under good agricultural practices.

As per the findings of a Joint Committee¹ report published in 2004, of the 181 pesticides registered in India, MRLs for only 71 pesticides have been fixed under the PFA Act. The report also states that residues of certain pesticides like DDT and Lindane, which are totally banned for use in agriculture and permitted for restricted use in health programs only, were found in food and vegetable products. It is recognized that that the health departments of various State Governments have the ultimate responsibility of managing the flow of pesticides and insecticides for use in public health purposes. Additionally, the report states, that neither

¹ Report of Joint Parliamentary committee of the Lok Sabha on pesticide residues in the safety measures for soft drinks, fruit juice and other beverages: dated February 14, 2004

the Ministry of Agriculture nor the Ministry of Health & Family Welfare have any data about the usage of banned pesticides in the States.

The NVBDCP determines insecticide use based on certain epidemiological and entomological criteria, and only those insecticides approved by the CIB are used. Before procurement, the specifications are approved by a Technical Committee headed by the Additional Director General of Health Services, MOHFW, for application and appropriate policy decision. They refer to the WHO's "Recommended Classification of Pesticides by Hazard and Guidelines". NVBDCP also ensures quality control certification of insecticides at HIL before distribution to states, through an institutional set-up at HIL, headed by a scientific officer. As per Bank Policy that procurement of pesticides (i.e. No class I pesticides or POPs) should be undertaken in compliance with and within the framework of the Stockholm Convention.

The Prevention of Food Adulteration Act (PFA Act) deals specifically with the adulteration in food articles. Though it lays down norms of minimal residual presence of pesticides in food items, it does not have any provision on the assessment and mitigation of impact of these pesticides on human health and environment. While the RC registers pesticides for their usage, the MOHFW under PFA (Act) prescribes their Minimal Residual Limit (MRL) in food and commodities.

The Manufacture, Storage and Import of Hazardous chemical Rules, 1989 (amended in 2000) applies to the manufacture and use of DDT and is thereby applicable to this project. However these Rules are still much weaker than the standardized guidelines established by FAO as per the "International Code of Conduct on the Distribution and Use of Pesticides".

The Hazardous Waste (Management and Handling) Rules (1989) is applicable for the disposal of unused insecticides and empty containers. For emission standards due to incineration of obsolete insecticides bags etc Stockholm convention requires the parties to reduce the total release of unintentionally produced POPs etc (WHO [www.who.int/mediacentre; www.healthcarewaste.org](http://www.who.int/mediacentre/www.healthcarewaste.org)).

In addition to the legislative measures, a National Conservation Strategy and the Policy Statement on Environment and Development was formulated which envisages several measures including development of pesticides and insecticides policy for the country; development of integrated pest management and nutrient supply system and phasing out and stoppage of persistent and toxic pesticides and substituting them with environmentally sound and appropriate pesticides. However this is not a legally enforceable policy.

There is a need for a comprehensive pesticide and insecticides policy for the country to include mechanisms for assessment of pest management issues, impacts and risks and to promote the use of demand driven ecologically based biological or environmental pest management practices especially Integrated Vector Management [IVM] in public health. There is need for better implementation of the registration process of insecticides and better adherence to set standards, by central and state governments, and users². India has considerable legislation for protection of workers rights and health. But despite this, India has a very poor health and safety record because of poor implementation of regulations and of occupational health and safety measures.

² "Equivalence Assessment of World Bank's Objectives and Operational Principles with India's legal framework on Health Sector": Draft report by Sanjay Upadhyay, 2006

In general, the workforce is abundant, unskilled, but easily available due to the high rate of unemployment with greater importance being given to obtaining work than to the health risks involved³.

The National Vector Borne Diseases Control Program, (NVBDCP) has framed prescriptive guidelines on safe handling and storage of insecticides and for promoting IVM in public health. There are model civic by-laws in urban areas for creation of breeding habitats instituted by Municipal Corporations. However, the implementation of these guidelines and their efficacy in improving work conditions has not been rigorously assessed.

International:

The revised FAO International Code of Conduct on the Distribution and Use of Pesticides (2003) establishes a set of global standards of conduct for all public and private entities engaged in or associated with the distribution and use of pesticides. It reflects the responsibility of governments, industry, international organizations and traders in reducing the health and environmental risks associated with pesticides. The Code is designed for use within the context of national legislation as a basis whereby government authorities, pesticide manufacturers, those engaged in trade and any citizens concerned may judge whether their proposed actions and the actions of others constitute acceptable practices. The Code calls upon Governments to enforce laws related to pesticide distribution and use, undertake health surveillance programs of those who are occupationally exposed to pesticides and implement programs to monitor pesticide residues in food and the environment.

While many prescriptions of this Code such as registration of pesticide for use and manufacture, record keeping, collection of data as regards import and export have been addressed under the Insecticides Act, there is need to update the Act which was promulgated in 1971, so as to meet minimum essential international standards.

The GOI also applies the FAO Pesticides Guidelines on Storage, Labeling, and Disposal (1985), which have been amended as part of the International Code of Conduct on the distribution and use of pesticides. But the national guidelines need to be revised according to the three new guidelines issued by FAO in July 2006, which include - Guidelines on monitoring and observance of the revised version of the Code of Conduct; Guidelines on efficacy evaluation for the registration of plant protection products; and Guidelines on compliance and enforcement of a pesticide regulatory program.

The Global Strategic Framework for Integrated Vector Management (IVM), issued by the WHO in 2004 stipulates that IVM provides a basis for strengthening vector control in a manner that is compatible with national health systems. Through evidence-based decision-making, IVM rationalizes the use of human and financial resources and organizational structures for the control of vector borne disease and emphasizes the engagement of communities to ensure sustainability. It encourages a multi-disease control approach, integration with other disease control measures and the considered and systematic application of a range of interventions, often in combination and synergistically. Significant aspects such as assessing the extent of any possible effects on human health or the environment and implementing integrated approaches to manage pests, such as in IPM, are currently part of the national legislation linked only to

³ Asian Labour Update – India: health and Safety at work: 2001

agricultural pesticides. IPM principles should also be applied for public health pesticides, within the context of IVM.

India is committed to the WHO Pesticide Evaluation Scheme (WHOPES), whose primary objective is to facilitate the search for alternative pesticides and application methods that are less harmful to humans and the environment and cost-effective. The trials are conducted by various research institutions to determine the safety, efficacy and cost-effectiveness of chemical larvicides and adulticides before introduction into the program. Based on the details of the trial, national and international data available in respect of the product, approval of CIB is sought through a valid registration by the manufacturers.

The Government of India has signed and ratified the Stockholm Convention on Persistent Organic Pollutants (POPs). India, as a party to the Convention, is obligated to restrict DDT production and use for disease vector control in accordance with WHO recommendations and guidelines on the use of DDT and when locally sound, effective and affordable alternatives are not available. The Convention advocates the use of “best available techniques” and “best environmental practices” when dealing with pesticides such as DDT. “Best available techniques” are the most effective and advanced operational activities and methods for reducing the release and subsequent environmental impact of pesticides whereas “Best environmental practices” are the most appropriate combination of environmental control measures and strategies that can be applied. The latest decisions on the use of DDT under the Stockholm Convention are given in **Annexure-I**.

3. Baseline Data:

The following section is based on findings from an Environmental Assessment report and from consultations with relevant stakeholders:

3.1 General Findings of Environmental Assessment report: In 2004, the NVBDCP commissioned NEERI to undertake an assessment of Impact of Pesticides used under Public health program in a selected number of states. The main findings of the study showed that systems for insecticide storage, use and disposal are inadequate and worker practices are poor. Precautionary measures to ensure worker safety are not in place and use of protective gear is inadequate. The NEERI report found that there is significant increase in the concentration of pesticides in the blood, milk, animal tissue and environmental samples which is also reflective of continuous use of pesticides in agriculture. In general the report indicates that inadequate practices in the use of insecticides may be causing contamination of the environment and may pose threat to health of service providers and community as well. The NEERI report also mentions one of the weaknesses being the sound management of pesticides. Storage of the stocks is a bottleneck, leading to pesticides being stored together with food items, or in houses where people sleep, etc. The report’s findings are mainly reflective of use of pesticides in agriculture. To overcome the problem of contamination of environment and health workers, this EMP for the new VBDC project advocates safe storage, proper handling and protection of spray workers and sound disposal methods.

- Field visits were undertaken to the states of Orissa, Maharashtra and Karnataka. Consultations and discussions were held with SPOs, District Malaria Officers, Store keepers, Senior malaria inspectors (Health supervisors), Medical Officers and Health

workers of Primary Health Centres, Junior health assistants, Auxillary Nurse & Midwife (ANM), teachers, Villages chiefs, Shop keepers, spray workers and community. 313 opinion leaders and community persons and 18 health staff were contacted and information was elicited through structured questionnaires meant for different categories (**Annexure II**).

A brief discussion on the current vector practices will provide an understanding of their potential adverse impacts on environment and health based on which an Action Plan can be defined.

3.2 Current vector control practices:

3.2.1 Procurement of DDT and other insecticides:

The GOI procures all its DDT from the state-owned enterprise, Hindustan Insecticides Limited. There has been a gradual reduction in DDT procurement from 18,000 MT in 1990 to 8,560 MT in 2005. HIL is member of International Chemical Manufacturing Association and follows international specifications. It is the sole supplier of DDT to 24 states in India, except Gujarat, Jammu & Kashmir, Maharashtra, Tamil Nadu and Haryana.

Discussions with HIL officials revealed that quality control of insecticide is done by NVBDCP staff deputed with HIL. During the field visit, it was informed that monthly checks are undertaken of all employees. However, according to a Greenpeace report, production of DDT at the HIL factory in Eloor, Kerala has resulted in severe pollution of the endangered Periyar waterways, due to the unabated release of toxic and persistent organic pollutants.⁴

Insecticides are transported by trucks and drivers are provided with Manufacturers Safety and Distribution Schedule. DDT is packed in 50 Kg gunny bags which are double lined with thick paper in between the two layers. The supply is made directly to various districts as per NVBDCP instructions on the order forms.

An examination of the procurement process by NVBDCP from HIL was undertaken. The quantity and choice of insecticides (based on susceptibility status of local malaria vector and epidemiological impact on malaria) are determined by the states and sent to NVBDCP by March/April of each year. After compilation of all state requirements, NVBDCP send out the request to HIL in June/July. Additional delays occur due to late receipt of Consignee lists and addresses from the states, and distribution from HIL commences only in September and is completed by January of the following year.

The main period of the incidence of malaria extends from July to January. Considering the persistence of insecticidal action and the variation of transmission period from area to area, two rounds of spraying with insecticides (Pyrethroids such as. Bifenthrin and Deltamethrin) provides effective reduction in malaria transmission. Malathion is sprayed in 3 rounds. However, in tribal forested areas, where transmission is stable, even three rounds of deltamethrin are advisable.(MAP,1995) It would be pertinent to undertake spraying in early June and complete the first round as early as possible, preferably by the end of June to interrupt the transmission of malaria⁵. Due to the delay in delivery of the consignment, not only does the

⁴ Toxic Hotspots: Investigation of HIL and other factories in Kerala, Greenpeace 1999

⁵ Field evaluation of conventional and new insecticides: Bioenvironmental strategy for Malaria Control: MRC

first spraying season get delayed, but it also results in supplies being kept in storage till the first round of spraying of the next year. There are potential environmental and health issues associated with storage of DDT for such a long period, especially if the storage facilities are inadequate (over-stacking, dampness, ruptured bags etc). This also causes delays in the second round of spraying, which may consequently reduce its intended impact on vector control.

3.2.2 Transportation:

Insecticides used to be transported from manufacturers to District HQ by rail until 2003. But due to limited connectivity of railways to all storage and application sites, the mode of transportation has been changed to road. Insecticides are now delivered by trucks from manufacturing units to district HQs of different states. The frequency of delivery varies from once to 3 times in a year. The transportation of insecticide from district HQ to different PHCs is done by official vehicle of District Malaria Officer. From PHCs to sub-centres and villages, the insecticide is transported either by official vehicle of the PHC or by the spray workers on their own bicycles. Leakage of insecticide bags has been noticed and reported. While there has been no reported incidences affecting health of workers during transportation of insecticides, there is need for strengthening the transportation system and monitoring mechanism.

3.2.3 Storage:

Insecticides are stored only at district HQ, PHC and sub centres and villages. However none of these places have dedicated storage areas for insecticides and items like drugs, insecticides, bed-nets etc are all stored in general stores. Owing to scarcity of storage areas, it has been found that hospital wards, toilets and garages are being used as stores at some places, strictly against international guidelines. At sub centre/ village level the spray workers store the insecticides and spray bags/cans in Panchayat's room or at the residence of Health worker/ANM/Anganwadi worker. Poor labeling of storage areas and of insecticide bags was noticed. The field visit to the storage facility (in MH) indicated that there is little knowledge about storage protocols for insecticides. No Material Safety Data Sheets (MSDS) was available in the stores.

Stocks of insecticides were found in some sites, all dumped in a haphazard manner. There is a high possibility that many of these stored insecticides have passed their expiry dates, making them obsolete. The field visits showed that 46% of families in Mandya district in Karnataka had small stocks of insecticides in their houses intended for use in agriculture. As many of the bags were found to be torn and leaking, it can be deduced that the possibility of contamination and pilferage is high. The disconnect between the cycle of spraying cycles and the procurement schedule has been stated as one of the key reasons for such stockpiles

3.2.4 Disposal of empty containers/obsolete insecticides:

Though there are clear-cut guidelines for disposal of empty bags/containers, the spray workers seem unaware of the methods of disposing empty jute bags of DDT. It was informed that people use the bags as raincoats during rainy season. The spray workers reported that they return the metal containers of Malathion, Alphacypermethrin/ deltamethrin to PHCs, but there is no clear arrangement as to how these are disposed. There is possibility that such containers are reused for water storage etc.

While the NVBDCP has framed guidelines for safe handling, storage and disposal of insecticides

(Annexure III), they need to be strengthened and effectively implemented.

NVBDCP has an implicit policy of **Integrated Vector Management** and uses a range of different approaches in its program dependent on the specificity of the area and vector to encourage a balance usage of cultural and insecticidal methodologies and habitat manipulations. Indoor Residual Spraying (IRS), use of insecticide treated bed-nets (ITN), larviciding and thermal fogging methods are all utilized, and a brief description of each is provided below:

1. IRS:

Vector control for malaria and other vector borne diseases like Kala-azar, filariasis etc depend upon the use of IRS in India. There are different categories of insecticides used for the control of vector-borne diseases. Wettable powder (WP) formulations are used for indoor residual sprays while emulsion concentrate (EC) formulations are used for larval control⁶.

- Organochlorine (chlorinated hydrocarbon) insecticides such as DDT (50%WP), Hexachlorocyclohexane (HCH), Benzene hexachloride (BHC) (both banned since 1997) and Dieldrin (banned since 2001).
- Organophosphates, such as Malathion (25%WP), Fenitrothion, Fenthion, Pirimiphos-methyl, and Temephos Chlorpyrifos
- Synthetic Pyrethroids such as Deltamethrin (2.5%WP), Cyfluthrin (10%WP), Lambdacyhalothrin (10%WP), Alphacypermethrin (5%WP), Etofenprox (10%WP) and Bifenthrin (10%WP). Synthetic pyrethroid insecticides are also used for impregnation of bed nets.

Dosage and annual consumption of different insecticides used for IRS are given in **Tables 1 and 2**.

Table 1: Insecticide Formulations and their dosages for indoor residual spray in India⁷

Insecticide	Preparation of suspension in 10 Lit water	Dosage per Sq Meter of active ingredient	No of spray rounds per annum	Requirement per million population per round	Area to be covered by 10 lit of suspension
DDT 50% WP	1 kg	1 gm	2	75 MT	500 Sq m
Malathion 25% WP	2 Kg	2 gm	3	300 MT	250* Sq m
Deltamehtrin 2.5% WP (K-Othrine)	400 gm	20 mg	2	30 MT	500 Sq m
Cyfluthrin 10% WP (Solfac)	125 gm	25 mg	2	9.38 MT	500 Sq m
Lambdacyhalothrin 10% WP (ICON)	125 gm	25 mg	2	9.38 MT	500 Sq m
Fenitrothion 40% WP	1.25 kg	1 gm	3	93.75 MT	500 Sq m
Pirimiphos-methyl 25% WP	2 kg	2 gm	3	300 MT	250* Sq m

*To be sprayed in two coats

⁶ Wettable powder formulations. All data from “Indoor Residual spray (IRS) in Malaria Control” by NAMP

⁷ MAP, NMEP, 1995

Table 2: Annual allocation of insecticides for IRS (metric tons)⁸

Insecticides		2002-03	2003-04	2004-05	2005-06
DDT	for malaria	5800	6000	6000	6000
	for Kala Azar	1180	2500	2650	2560
Malathion	25%	-	50	45	50 (proposed)
	Technical		25	25	25
Synthetic Pyrethroids	2.5%WDP (in MT)	417	257	673	
	Flow (in Lts.)	6100	30000	103500	

DDT, BHC and Malathion have been used extensively for IRS against vectors of malaria and Kala-azar for transmission risk reduction and containment of outbreaks during the past four decades. However, due to their extensive use, varying degrees of resistance to them among disease vectors have been reported from different areas. Along with DDT, other organochlorine insecticides such as dieldrin and BHC were also introduced simultaneously for IRS against malaria vectors, but dieldrin was soon withdrawn, while BHC continued to be sprayed in some areas until it was banned in 1997. Organophosphates such as Malathion and Pirimiphos-methyl have also been used for IRS.

Synthetic pyrethroids are fast-acting insecticides and produce a quick knockdown effect against vectors and have been used for IRS in some high-risk areas and areas with triple resistant (DDT, HCH and malathion) vectors and also in some areas to tackle malaria outbreaks and epidemic situations. Synthetic pyrethroids are also used to impregnate bed-nets, which protect populations from malarial mosquito bites at night. These pesticides are less toxic to wildlife and biodegrade far more efficiently than DDT, but are more expensive.

The choice of insecticide for areas is done based mainly on the vectorial influence of *Anopheles culicifacies*, the main rural vector of malaria in India.⁹ In areas with sibling species A of *An. culicifacies*, Malathion is used. In areas with sibling B, DDT is used; if there is no epidemiological impact, Malathion is recommended. In areas with A, C and D which are resistant to DDT and Malathion, Pyrethroids are used. In areas with *An. fluviatilis*, *An. minimus*, *An. philippinensis*, *An. dirus* and *An. sundaicus*, DDT is used as these vectors are susceptible to DDT. Spray operations are to be carried out in all areas with API 2 or above, though priority is given to high-risk areas. Epidemiological data of preceding 3 years is considered for selecting the population to be sprayed.

During the field visits, 27 spray workers were interviewed to understand practices related to making of suspension, spray methods, wearing of protective gears and disposal of empty containers and leftover insecticides. The spray workers are usually temporary labourers, many of whom are illiterate and who are hired regularly every year during spraying season. Most of them do not get any formal training except briefings from health supervisors. About 41% workers interviewed in Mandya and Tumkur experienced irritation with Malathion or Lambdacyhalothrin and there was no incidence of hospitalization due to insecticide use. The workers do not use protective gear while spraying DDT and Malathion. The field visit showed

⁸ NVBDCP, Delhi

⁹ MAP, 1995

that spray workers, who had no access to protective gear, had to cover their faces with cloth while spraying. Many were seen to be using local non-standardized products such as face masks made of thick nylon material, completely unsuitable for respiratory protection. It should be noted that workers wear protective gear when using synthetic pyrethroids, because these come included in all insecticide packages.

All spray workers were diligent about washing their hands after spraying operations. The community is not involved in spray operations and there is no advice on post spraying actions. Additionally the community seems to be against IRS using DDT and Malathion. According to the findings during the field visits, the enormous work load assigned to the field health workers and the inadequate traveling allowance is a key factor hindering supervisory work in spray operations.

Due to the special requirements for DDT, this document includes separate sections on various aspects of DDT usage:

DDT

In India, DDT has been used for malaria control operations since 1946. The introduction of DDT in public health, first as a larvicide and later as an adulticide through IRS, brought about a revolution, and Malaria eradication was thought to be an achievable task. Spraying of DDT, particularly as IRS, almost eradicated malaria in difficult areas. India has utilized 350,000 tons of DDT since 1985, mainly for agricultural and public health purposes. However, since 1989, GOI banned the use of DDT in agriculture and restricted its use in public health to 10,000 metric tons a year. It is used only in rural areas in indoor spraying applications. There has been gradual reduction of DDT use for IRS. (Table 2)

However, continued and extensive use of DDT over the past 40 years has led to the development of physiological resistance in certain vectors while a behavioral change to avoid contact with insecticide was noticed among other vectors. *Anopheles culicifacies* s.l., the main rural vector of malaria in most parts of the country, has developed widespread resistance to DDT, Dieldrin/HCH, and also to Malathion in several districts. *P. argentipes* is resistant to DDT in some districts of Bihar, though it is still susceptible in West Bengal and some of the districts of Bihar. Most of the *Culex vishnui* group of mosquitoes which transmit Japanese encephalitis (JE) have been reported to be resistant to DDT in most parts of the country.¹⁰ In areas with *An fluviatilis*, *An minimus*, *An philippinensis*, *An dirus* and *An sundaicus* (Fig 1), DDT is used as these vectors are still susceptible.

Residual spraying is the easiest and most cost effective approach for breaking man vector contact. DDT on house walls shortens the longevity of mosquitoes coming in contact with wall surface and also prevents adult mosquitoes from entering houses due to excito-repellency action. A recently published probability model shows that of these three actions, the repellent and irritant actions are more important in breaking man-vector contact inside houses. As per WHO expert Committee on Malaria in 2000, it has been recommended that DDT may be used only for IRS, if it is effective, and if the material is manufactured to the specifications issued by WHO and necessary safety precautions are taken into its use and disposal.

¹⁰ Status of Insecticide Resistance of Malaria, Kala-azar and Japanese Encephalitis Vectors in Bangladesh, Bhutan, India and Nepal: Activity report 129

According to WHO, elimination of Visceral Leishmaniasis (Kala-azar) is possible in the south Asia region. One of key intervention strategies is IRS with DDT, as the vector continues to be sensitive to DDT. Kala-azar is endemic in 48 districts in Bihar, Jharkhand, Uttar Pradesh and West Bengal and puts an estimated 165.4 million people at risk, mostly those from poor socio-economic groups living in rural areas. The National Health Policy goal is to eliminate Kala-azar by 2010, which requires targeted intervention through IRS with DDT up to 6 feet height from the ground twice a year in conjunction with early diagnosis and treatment; IEC and capacity building.

Table-2 Annual allotment of DDT for IRS in metric tons ¹¹

DDT	2002-03	2003-04	2004-05	2005-06
For malaria	5800	6000	6000	6000
For Kala Azar	1180	2500	2650	2560

2 Larviciding:

Use of larvivorous fish in identified water bodies is being promoted as a cost-effective environment-friendly vector control measure towards control of malaria. In all, 1193 district level hatcheries and 25644 sub-district level hatcheries are functioning in EMCP states. One of the most successful and widely used biological control agents against mosquito larvae is the larvivorous fish like, top water minnow or mosquito fish *Gambusia affinis and Poecilia reticulata*, the common guppy. It has been demonstrated that use of larvivorous fish resulted in reduction of malaria in Karnataka (Ghosh et al 2005). Guidelines on use of larvivorous fish has been circulated to states. There is scope for more and better participation of communities in these projects, especially in the biological control of larvae. Organophosphates such as Fenthion and Temephos have been used as larvicides under the urban malaria scheme. Bti, a bacterial insecticide has also been used as a larvicide during the past decade to control malaria and the mosquito nuisance in some towns. In cities and towns under Urban Malaria Scheme in India (Table-4) Temephos (Abate) and Fenthion (Baytex) insecticides are sprayed for larval control (Table-5) and their annual consumption for the year 2004-05 was 35,000 and 61,970 Litres respectively.

Table- 4: Insecticide based Larvicides formulations and their dosages ¹²

Larvicide	Commercial formulation	Preparation of ready to spray formulation	Dosage per		Frequency of application
			Sq metre	Hectare	
Temephos (Abate)	50% EC	2.5 cc in 10L of potable water	20 c.c.	200 L	Weekly
Fenthion (Baytex)	100% EC	5 c.c. in 10 L of potable water	20 c.c.	200 L	Weekly

¹¹ NVBDCP, New Delhi

¹² MAP, NMEP, 1995

The doses may be doubled or tripled in case of water bodies having more than 50 cm. depth

3 Insecticide treated bed-nets:

Insecticide treated bed-nets (ITN) are being used as an alternate strategy for malaria control. Since 1998, there has been gradual increase in supply of ITN in high-risk malaria endemic states (Fig 2). The impregnation of bed-nets is done by synthetic pyrethroids (Deltamethrin 2.5% flow) and Lambdacyhalothrin (10%) and Cyfluthrin. Schemes on bed-net distribution, insecticide impregnation of community owned bed-nets have been developed for involvement of civil society organizations (NGOs/Faith Based Organizations/Community Based Organizations/Local Self-Governments). Till date, 17, 95,000 bed-nets have been supplied to the high risk areas of endemic states. The NVBDCP has also introduced synthetic pyrethroid tablet formulation for individual use.

Table-3 : Insecticides used for impregnation of mosquito nets¹³

Insecticide	Formulation	Dosage	Frequency of re-impregnation
Deltamethrin	2.5%	25 mg per sq m	6 months
Lambdacyhalothrin	10%	25 mg per sq m	6 months
Cyfluthrin	10%	50 mg per sq m	6 months

In order to facilitate impregnation of bed-nets, vials of deltamethrin in packs of 10 ml are being produced. 10 ml of insecticide is required for impregnation of one single size bed net dosed at 25mg/sqm.). The problem of unused insecticide does not arise for impregnation of bed-nets as the package of bottle is of 900 ml. The required amount of insecticide may be taken from the bottle for dilution in a tub and then the bottle capped.

The community has been trained in impregnation of bed-nets through village level demonstrations though regular monitoring remains weak. The impregnation of mosquito nets was observed in SIDCO, Navi Mumbai area. The supervisory staff was well versed with impregnation techniques and precautionary measures.

4 Thermal Fogging:

For space spray, thermal fogging by technical Malathion (5 parts of Malathion in 95 parts of diesel oil) is done in urban areas. The workers involved are exposed to Malathion and generally do not use protective gears while operating the machine.

IV. Potential environmental and health impacts in the vector control program:

While the perceived undesirable impact of use of insecticides in public health is far less than their use in agriculture, yet their usage may result in increase in contamination of soil and water, if precautionary guidelines are not adhered to. In many developing countries, the use of pesticides remains a major risk. The WHO estimates that each year there are 25 million cases of pesticide poisoning and as many as 20,000 unintentional deaths, primarily in developing

¹³ NVBDCP, Delhi

countries. Long-term effects of regular exposure to pesticides often cause chronic illnesses, including cancer, reproductive and neurological effects.

The interrelationships of organisms within an ecosystem are complex. For instance, the food of many marine organisms consist of small arthropods or organisms which are similar in size to mosquito larvae, and such organisms differ greatly in their susceptibility to pesticides. Some may be more sensitive to pesticides than mosquitoes. Many marine, estuarine, and freshwater species often share the same habitat as mosquito larvae. Impacting any portion of this food web may affect other parts or even the entire web. Impacts on fish, wildlife, and native plants are some of the risks. The NEERI report states that there has been a decline in fish populations in some areas. There is also growing concern about the risks to humans from exposure to pesticides in general. These potential impacts to both natural communities and to humans need to be sufficiently understood to help risk/benefit analysis that can result in informed decision making.

It would be apt to keep in mind WB's key preamble¹⁴ that, i) all insecticides harm the environment to some extent and ii) environmental risk from insecticides use in agriculture far outweigh those of spraying for malaria control.. There is no doubt that the risk of increased death and morbidity from not using insecticides exceeds their potential negative public health and environmental impacts. Nevertheless, it is as important that these impacts are reduced as much as possible, especially in the rural areas.

Organochlorines such as DDT are environmentally stable compounds which are highly soluble in lipids, making it possible for them to accumulate in the body fat of non-target organisms. DDT is also a Persistent Organic Pollutant (POPs), which has distinct properties, making them among the most dangerous pollutants released into the environment. They are bioaccumulative – being accumulated through ingestion and retained in organisms at concentrations higher than in the food and water by which they were transmitted. POPs can be transported over long distances through air and water, and concentrate in the environment and biota of regions far removed from the original source of emission. DDT is a known endocrine disruptor, which has the potential for causing reproductive failure in wildlife. It is a probable human carcinogen and is suspected of causing liver damage, developmental disorders and disorders of the central nervous system. It is classified as a Category II pesticide by WHO, i.e. being moderately hazardous. Indian dietary intake of DDT is amongst the highest in the world, estimated at 231 µg/person/day as compared to the allowable daily intake of 35 µg/person/day, as specified by the Agency for Toxic Substances Disease Registry.¹⁵

It is internationally recognized that DDT usage for public health is essential, but effective safeguards need to be put in place to protect human health adequately and to prevent insecticide release into the environment. However, its use in public health vector control should meet the three basic criteria: effectiveness, safety and acceptable cost. As per international norms, DDT spraying in India is restricted to Indoor Residual Spraying and there is gradual reduction in use(Fig 3).

¹⁴ The World Bank and DDT use in India, 2000

Although Organophosphates (OPs) are generally less persistent than organochlorines, some have higher acute toxicities, both for mammals and other organisms (Pimentel & Lehman 1993). Currently recommended OP compounds are the adulticides, Malathion and Fenthion and Temephos as larvicides. These compounds have relatively low mammalian toxicity and most usually break down rapidly; however, some breakdown products are also toxic. Malathion used appropriately in public health mosquito control programs does not pose unreasonable risks to the general population or to wildlife and the environment. It degrades rapidly in the environment, especially in moist soil, and it displays low toxicity to birds and mammals. However Malathion is highly toxic to insects, including beneficial insects such as honeybees¹⁶. According to EPA estimates, due to the small amount of active ingredient released per acre of ground, exposures to Malathion are much below an amount that might pose a health concern. However, at high doses, Malathion, like other OPs, can overstimulate the nervous system causing nausea, dizziness, or confusion. Severe high-dose poisoning with any OP can cause convulsions, respiratory paralysis, and death.

Synthetic Pyrethroids, such as Permethrin are broad-spectrum toxicants that are very toxic to fish, aquatic organisms and most other cold-blooded animals. Due to their high and broad range of toxicity to insects, they may affect beneficial species, thereby lessening natural controls, and for some pests may actually increase the need for further chemical control (Edwards 1993). However, to date, a need for increased chemical control because of pyrethroid use for mosquito control has not been demonstrated. Carbamates are broad-spectrum, tend to be more persistent than OPs in soil, and thus have the potential for considerable environmental impact (Edwards 1993)

Handling of insecticides from stores to places of use involves transportation, spraying and disposal of empty containers and unused insecticides. Spray workers are often the most exposed by contact during making of the suspension and by inhalation while spraying. When empty containers are used for storing water and food, pollutants get a direct entry into the human body. If insecticide is not sprayed accurately or if left-over insecticide solution is spilled, it can contaminate environment and result in potential health impacts. Inaccurate collection of water for making suspension of insecticides may contaminate the water source, resulting in wider and long-term contamination and health impacts.

The Synthetic Pyrethroid insecticides used for impregnation of bed-nets are also toxic and may cause irritation in eyes and skin if not properly used. While Deltamethrin on ITNs can be a relatively high chronic risk (beyond the US EPA standard of 100) was shown to exist for newborns sleeping under ITNs.¹⁷ The toxicity of pyrethroids is due to their affinity for, and intrinsic effect on, receptors or targets within the sodium channels for nerve conduction. Given that pyrethroids are highly lipophilic, they pass through cell membranes and are absorbed through the skin, by inhalation and by ingestion. Thus, individuals are at risk of exposure to pyrethroid insecticides through accidental swallowing or drinking of the product, inhaling solvent vapors, splashing the product into the eyes or onto the skin during net treatment and insecticide residues during bed-net use. Correct doses of insecticides, accurate angle of spray pump and discharge rate of insecticide are important points of application efficacy in IRS.

¹⁶ Chapter 9: Mosquito control benefits and risks from Florida Mosquito Control: Florida Coordinating Council on Mosquito Control

¹⁷ Mass use of insecticide-treated bednets in malaria endemic poor countries: Public health concerns and remedies John Ehiri, Ebere Anyanwu, and Henroy Scarlett

Organophosphates do not persist or recycle in the environment but prolonged use of some them has also resulted in the development of resistance in some vectors. Larvicides' management also involves constant exposure of health workers to insecticides and poses health risk.

Acute toxicity refers to the adverse effect that may result from single or multiple exposures to a chemical over a relatively short period of time and may occur through treatment and handling of insecticides for treatment of nets. As would be expected, individuals involved in dipping large numbers of nets are most at risk, whereas those who occasionally treat their own nets are less exposed to this level of risk. Acute effects reported by net dippers include tingling and burning sensations, eye pain and irritation, swelling of the face, headache and dizziness. Transitory side effects have also been reported by householders mainly during the first few days after net treatment, including skin itching, eye burning, nasal irritation and sneezing.

Impregnation of mosquito nets with insecticides is carried out by dipping the nets in basins or plastic bags containing the insecticide mixed with water. The general procedures can be any of the following: i) Do-It-Yourself kits, where anyone can treat nets using treatment kits available through shops and health centers. Analyses by the WHOPES shows that ingestion of the contents of even a single application pack of permethrin 10% EC could be lethal to a child, and without adequate precaution, the potential for realization of this risk is high. ii) Pre-treated, long-lasting nets, which are treated by the manufacturer prior to packaging and sale. Since currently available pre-treated long-lasting nets lose their efficacy over time, and from washing, they require re-treatment every 6 months to one year to maintain their efficacy over their life span. Washing large quantities of treated nets in bodies of water increases the risk of acute toxicity among net dippers and could be hazardous to both humans and the aquatic environment. iii) Mass treatment of ITN are usually done by trained personnel at dipping centers, where people bring their nets for treatment and re-treatment. Persons who dip large quantities of nets are exposed to acute toxicity of insecticide products, especially if prescribed precautions are not followed.¹⁸

Controlling a brood of larval mosquitoes, when concentrated in the water, is easier and more efficient than controlling dispersed adults. Some of the environmental risks associated with the use of larvicides include both direct and sub lethal toxicity to non-target organisms, and in some instances, the loss of mosquito larvae as prey. However, using biorational materials (*e.g.*, *Bti*, methoprene) minimizes non-target effects because of the specificity of these materials.

V. Bank requirements:

Vector Management in public health projects is governed by the World Bank's Operational Policy 4.09 on *Pest Management* and Bank Procedures 4.01 **Annex C: Application of EA to Projects Involving Pest Management**. The OP and BP apply to all projects involving vector management, whether or not the project finances pesticides. The Bank requires that any pesticides it finances be manufactured, packaged, labeled, handled, stored, disposed of, and applied according to standards acceptable to the Bank. It does not finance formulated products that fall in WHO classes IA and IB, or formulations of products in Class II, if

- (a) the country lacks restrictions on their distribution and use; or
- (b) they are likely to be used by, or be accessible to, lay personnel, farmers, or others without training, equipment, and facilities to handle, store, and apply these products properly.

DDT is in WHO class II, and its procurement and use are thus subject to the above criteria. The Bank discourages the use of DDT but can finance DDT in those countries, such as India, that still rely upon DDT for malaria control under agreements whereby these governments are exploring alternative chemicals or strategies¹⁹. For all aspects of vector management related to DDT use, the Bank refers to WHO recommendations and to the Stockholm Convention. With the goal of reducing and ultimately eliminating the use of DDT, party countries are encouraged to develop and implement an Action Plan which includes

- i) Developing regulatory and other mechanisms to ensure that DDT use is strictly restricted to disease vector control;
- ii) Implementing suitable alternative products, methods and strategies, including resistance management strategies to ensure the continuing effectiveness of these alternatives;
- iii) Measures to strengthen health care and to reduce the burden of the disease.

In collaboration with WHO, Ministry of Health and Family Welfare have developed a project entitled “Reduction in the use of DDT by Enhancing Capabilities for the implementation of Integrated Vector Management. This project, which builds on WHO’s IVM multi disease strategy, is funded under the Global Environment Facility, and will enter its 12 month implementation phase in early 2007, after approval of the final official submission by India to GEF. WHO has also developed an “Action plan for the reduction of reliance on DDT in disease vector control” to support countries in this activity.

The procurement of any pesticide in a Bank- financed project is contingent on an assessment of the nature and degree of associated risks, taking into account the proposed use and the intended users. With respect to the classification of pesticides and their specific formulations, the Bank refers to the WHO’s “Recommended Classification of Pesticides by Hazard and Guidelines to Classification.”

The following criteria apply to the selection and use of pesticides in Bank-financed projects:

- i) They must have negligible adverse human health effects.
- ii) They must be shown to be effective against the target species.
- iii) They must have minimal effect on non-target species and the natural environment.
- iv) Pesticides used in public health programs must be demonstrated not to cause ill health effects to inhabitants and domestic animals in the treated areas, as well as for personnel applying them.
- v) Their use must take into account the need to prevent the development of resistance in pests.

¹⁹ Guidance Note for Application of OP 4.09 in Malaria Booster Projects: Draft 2005

VI. Institutional Arrangements:

The NVBDCP is the central body, which provides guidance for implementation of the program through an Operational Manual for Malaria Action Plan (MAP) prepared in 1995. The MAP provides guidelines for the all components of the vector management program and defines roles and responsibilities of the different institutional levels involved. The MAP is the basic document on which the EMP for the VBDC project has been based. The MAP defines the following institutional structure:

- At the *State level*, the program is managed by the Director, Health Services, with support from the Additional Director/ Joint Director (NVBDCP).
- At the *District level*, District Health Officer/Chief Medical Officer is the head of health services followed by District Malaria Officer and/or Assistant Malaria Officer and Senior Malaria Inspector (Supervisor).
- At *Primary Health Centre (PHC)* level, Medical officer is in charge, with one supervisor/Malaria inspector and Laboratory Technician. Each PHC has about 6 sub-centres with population of 5,000 each in plains and 3,000 in hilly areas.
- Each *Sub centre* has 2 health workers (one male - junior health assistant and one female- Auxiliary Nurse and Midwife (ANM)). Anganwadi workers, employed under the ICDS program are also available at village level. All the staff provide support in implementation of the vector control program.

IRS is usually undertaken in rural areas based on the criteria of 2 API or above. The program for spray operations is planned by the Medical officer of PHCs and sent to District Malaria Officers who forward it to State Program Officer (Joint Director) for perusal and approval. After approval, the advance program is sent to Zonal officer, District collector, Block Development Officer, PHC medical Officer, MPW (Health worker) and Gram Panchayat. After making advance program, the seasonal spray staff are appointed on daily wage basis from villages at sub-centre levels.

The distribution system involves State Program officers (NVBDCP), District Malaria Officers, store keepers, senior malaria inspectors (Health supervisors), Medical Officers of PHCs, Health workers of PHCs, Junior health assistants, ANM), teachers, Villages chiefs, Shop keepers, spray workers and community. Medical officers of PHC make the plan for distribution of insecticides to various sub-centers (Examples of advance plans at various levels are attached- **Annexure – IVa, b, c, d**))

Usually two squads of spray workers are deputed, each squad comprising a superior field worker, 2 workers for handling spray pumps, 2 for spraying and 1 for bringing water for making suspension. Spray operations are supervised by DMO/AMO/Sr MI/MO PHC and health supervisors. MPW supervises the spray program at community level. In the same way the impregnation of mosquito nets is supervised by Health workers who work at the level of community and are based at sub centres.

Trainings are organized at state, zonal and district levels and are targeted at Medical Officers, District malaria officers, Entomologists, District Surveillance Officers, supervisors and health workers. NVBDCP and states have developed IEC material in English, Hindi and especially in local languages about the spray doses and techniques but inadequate attention is provided on adverse impacts of unsafe handling and disposal of insecticides on the health and environment.

The MAP delineates basic steps for the sound handling and storage of insecticides. NVBDCP has also issued a number of guidelines which include the following: i) Insecticides Treated Bed-Net distribution; ii) Use of Larvivorous Fish for Vector Control; iii) Treatment and use of Insecticide-treated Bed Nets and iv) Indoor Residual Spraying for Vector Control. All these guidelines have been disseminated to all state governments for implementation. However, there is reported evidence that these guidelines are not been appropriately utilized. Additionally, the implications of poor handling of insecticides on human health and the environment is inadequately detailed and need highlighting. Establishment of a systematic system for implementation of these guidelines and monitoring is also necessary.

In India, there are two main institutions devoted to occupational health and safety:

- Central Labour Institute, Mumbai and Regional Labour Institutes in Kolkata, Kanpur and Chennai under Ministry of Labour;
- National Institute of Occupational Health, Ahmedabad and regional institutes in Kolkata and Bangalore under the Indian Council of Medical Research (ICMR), Ministry of Health.

The National Institute of Occupational Health (NIOH) is quite active as a research institute but has no system for consultation with employers or trade unions.

VII. Environment Management Plan:

Though the obvious benefits relate to public health protection, improved human comfort from mosquito annoyance, and economic benefits, vector control activities does entail important public health and environmental risks. The Environmental Management Plan (EMP) consists of a set of mitigation, monitoring, and institutional measures to be taken during implementation and operation of the project to eliminate these adverse environmental and social impacts, offset them, or reduce them to acceptable levels. Many of these requirements are provided for in GOI's *Insecticides Act*, but the EMP defines the specific mitigation, monitoring, and capacity development measures and also includes an implementation schedule and the capital and recurrent cost estimates for implementing the EMP. This budget estimated for the EMP will be integrated into the total project cost.

All agreed actions defined in this EMP will need to be appropriately reflected in the VBDCP PIP, project budget, legal agreements and contractual documents.

7.1 Legal Framework :

NVBDCP, through this project needs to recommend and support the Government of India in updating the various regulations related to its activities (as referred to in Section II of this document).

Recommended Actions:

- i. Review and update the Insecticides Act, so as to meet minimum essential international standards.

- ii. Review and amend the Manufacture, Storage and Import of Hazardous chemical Rules to be consistent with the standardized guidelines established by FAO as per the “International Code of Conduct on the Distribution and Use of Pesticides”.
- iii. Review the National Conservation Strategy and the Policy Statement on Environment and Development and improve program with recommended measures for development of pesticides and insecticides policy for the country; development of integrated pest management and nutrient supply system and phasing out and stoppage of persistent and toxic pesticides and substituting them with environmentally sound and appropriate pesticides.
- iv. Develop standards for improving implementation of the registration process of insecticides and better adherence to national standards.
- v. Revise the national guidelines (based on FAO’s Pesticides Guidelines on Storage, Labeling, and Disposal), to include - Guidelines on monitoring and observance of the revised version of the Code of Conduct; Guidelines on efficacy evaluation for the registration of plant protection products; and Guidelines on compliance and enforcement of a pesticide regulatory program.

7.2 Procurement:

Pesticide procurement is highly specialized and complex. Because of the quantities involved and the necessary lead time to ensure timely inventory replacement, experienced and knowledgeable staff should be dedicated to procurement for vector control products. As recommended by WHO, procurement is undertaken at the central administrative level of NVBDCP and WHO guidelines are used when planning vector control pesticide procurement. The NIMR is an active member of the CIB and is involved in assessment and evaluation of public health pesticides and in the assessing the safety of all pesticides intended for use in the country.

According to WHO (WHO, 2001a) and FAO, some 30% of pesticides marketed in developing countries for agricultural and public health use, with an estimated annual market value of US\$ 900 million, do not meet internationally accepted quality standards and can pose a serious threat to human health and to the environment. Good product quality is essential to the effectiveness of pesticides, and to minimizing any risk involved in their use. Quality control of pesticides to minimize risks associated with their handling and use, as well as their efficacy and stability in storage, is crucial in efficient and effective vector management.

The procurement of substandard public health pesticides has been a driver in the accumulation of obsolete stocks. While the exact volumes have not been recorded so far, these stocks represent a public health risk as they would be leaking into the environment, exposing unaware personnel and the public in general if they are brought, illegally, back to the market. FAO’s guidelines for the Prevention and Disposal of obsolete stocks of pesticides need to be taken into account during the procurement process.

The GOI’s Insecticide Rules provide specifications about packaging and labeling. Inaccurate or inadequate labeling of products can also cause a variety of application and safety problems. Industry also needs to review the feasibility and economic viability of changing packaging materials to environmentally sound and degradable ones. Involvement of the industry in post-sales activities can be an important support for the NVBDCP to ensure proper management and use of insecticides.

Recommended Actions:

- i. Guidelines for pesticide application and disposal of used bags/containers should be included in tender specifications/contracts with insecticide producers, following a “Return to Sender” Principle.
- ii. NVBDCP should ensure quality control and proper and adequate labeling of products by manufacturers before dispatch, including translation in the local language of destination.
- iii. Materials and quality of packaging by insecticide manufacturers should be reviewed by NVBDCP to ensure efficacy, shelf-life, human and environmental safety in strict compliance with GOI requirements.
- iv. Manufacturers should provide independent certification of chemical and physical analysis, product and formulation acceptability to NVBDCP.
- v. Given that use of protective gear is vital for this program, NVBDCP should stipulate all insecticide producers to provide protective gear along with their products, as is being done by synthetic pyrethroids manufacturers.
- vi. VBDCP should establish a list of pesticides authorized for procurement under this project, which should be finalized and submitted to the Bank.
- vii. The long lasting nets which obviate the repeated impregnation of mosquito nets by insecticides may be incorporated in the programme for personal protection against mosquito bites.

7.3 Storage and transport

Field visits and report have shown that insecticides are stored inappropriately in many areas in many states. Additionally stockpiles of old and probably banned insecticide products and damaged bags resulting in spill-out of insecticide has also been observed and recorded. Not only does this have high potential for contamination of surroundings, but it can also encourage pilferage of insecticides into inappropriate applications. Presence of obsolete insecticides and their usage can result in additional public health risks (side-effects, inefficacy, vector resistance etc). As far as possible, storage areas for insecticides and insecticide-treated materials must be located away from food and drug storage areas and from water sources. Store areas should be secure and well ventilated, with minimum exposure to sunlight and moisture. Training in proper stacking and utilization is essential for minimizing damages, leakages and accumulation of stocks.

Appropriate means of transportation of insecticides needs to be ensured, particularly at stages where the volumes being transported are larger and where the possibility of contamination (of worker and of the environment) is higher. At all times, insecticides should not be transported in proximity with agricultural produce, food, clothing, drugs etc. Vehicles transporting pesticides should carry prominently displayed warning signs. It is important that the pesticide load is checked during transit and at point of delivery. Any leaks, spills or other contamination should be immediately reported. The quality of packaging by insecticide manufacturers is critical, to ensure that minimal damage during handling and transportation. The NVBDCP has requested HIL to changeover DDT packaging from gunny bags to fibre-board drums to reduce ruptures, spills and also loss of efficacy during storage. There is discussion of shifting to Long-life benders for more efficient mosquito control and to reduce risks associated with regular impregnation of mosquito nets.

Licensing of insecticide manufacturers, distributors, retailers, and pest control operators is an important aspect of pesticide management. Industry should ensure that distributors are adequately trained and have access to sufficient information. Licensing is the responsibility of the regulatory authorities but active involvement and oversight by the NVBDCP, through the relevant ministry, is essential.

Recommended Actions:

- i. The FAO manual on “Pesticide storage and stock control” details the most appropriate methods of labeling, choice of site, design and structure of buildings, stacking positions, pesticide shelf life, record systems, spills, leakage and disposal of containers and use of protective clothing. This manual should be translated and utilized in the NVBDCP.
- ii. The NVBDCP should review and revise the annual procurement and distribution cycle and synchronize it to spraying cycles. HIL and other insecticide manufacturers should be required to distribute their products within a specified time-frame. This is critical to prevent stockpiling.
- iii. States should undertake a survey of existing storage facilities and inform NVBDCP of the requirements. Based on the survey, funds should be allocated from the program for construction and/or up-gradation of appropriate storage areas for district HQ and PHC facilities.
- iv. During the survey, the states should also provide information on amount of stockpiled insecticides in larger storage areas particularly at district and PHC levels. Based on information compiled, NVBDCP should develop a plan of action for disposal of these stockpiles, in consultation with the Bank.
- v. The manufacturers should ensure that their distribution network comprises of trained and licensed distributors with appropriate transportation vehicles. The NVBDCP should include this requirement into the contractual agreements with the manufacturers.
- vi. A systematic tracking system of volumes of insecticide from factory to point of delivery needs to be established by the manufacturers, along with a system for reporting spills and leakages during transit. NVBDCP should include this requirement in their contracts to be monitored by the consignee state governments.

7.4 Application activities:

Application of insecticides (space spraying and IRS, impregnation of bed-nets, larviciding etc) needs to be undertaken in a safe and environmentally sound manner. The only way this can be achieved is by intensive training of all the workers and handlers in proper mixing of suspensions, use and disposal of insecticide and insecticide-treated materials and by easy and timely availability of protective gear. Equipment management to prevent rusting and leakages is also very important. Costly delays can be avoided if spray equipment are checked, maintained and calibrated before start of spraying season. Old and expired pesticides and unserviceable equipment needs to be disposed of in accordance with international standards for disposal of hazardous materials.

The NVBDCP has produced a number of guidelines, but as the field reviews and consultations have **shown that these guidelines are not being fully utilized and effectively implemented**. As most field health and spray workers either have demanding work schedules or are illiterate, simple and clear instructions and pictorial guidelines are essential for easy utilization. Close supervision of application activities are essential and district and PHC level

officials should be provided adequate funds and training to ensure good practices are being followed. One way of reducing wastage and preventing environmental contamination is by provision of appropriately sized packages for spraying and impregnation activities.

Recommended actions are detailed below.

- i. NVBDCP should require manufacturers to provide instructions for disposal of pesticide containers as label requirements, consider inclusion in tender contracts provisions. Wherever possible, suppliers should be contracted to dispose off larger used containers.
- ii. Malaria officers at district and PHC level and spray operators must review all spray equipment and protective gear before start of each spraying season and keep appropriate records. States should maintain these inventories of equipment, PPE and replacement parts.
- iii. NVBDCP should request states to monitor this activity and the records on an annual basis.
- iv. States should be asked to allocate resources (time and financial) for maintenance, repair and replacement of old equipment and protective gear.
- v. Funds should be allocated to develop clear pictorial instructions to health and spray workers on use, applications, preparation of suspension and disposal of insecticides, insecticide treated materials, insecticide containers etc.
- vi. NVBDCP should discuss with insecticide manufacturers possibility of supplying insecticides in the appropriate sized ampoules for impregnation of bed-nets and sachets for IRS.

7.5 Occupational Health and Safety Measures:

Insecticides are toxic to both pests and humans. However, they need not be hazardous to humans and non-target animal species if suitable precautions are taken. Most pesticides will cause adverse effects if intentionally or accidentally ingested or if they are in contact with the skin for a long time. Worker health and safety is a critical issue in a program such as this one, which involves large amounts of insecticide use.

There are three principal routes that chemicals enter the body: through skin, eyes, mouth and nose while handling, inhaling and accidental/deliberate exposures. Of these, the most common risk is through dermal exposures, which can be minimized by the use of protective equipment, attention to personal hygiene by washing exposed parts of the body after work. Spray workers and others who come in contact with insecticides must be trained in safety measures and be provided with personal protective equipment (PPE) to avoid hazardous exposures. The MAP specifies that cholinesterase level of all workers using Malathion should be monitored regularly, but these directions should be made more specific and need to be enforced. There seems to be no clear directives on the monitoring of health of spray workers who use DDT. It is important to ensure that PPE available in the program is made of appropriate material to prevent penetration of the pesticide, should be comfortable to wear and use and should be used in appropriate circumstances.

While the commonly recommended solution is to provide health education and training to promote the use of PPE and teach workers on good practices, there is no linear relationship between the transfer of knowledge and a change in behavior, as many of the factors that contribute to pesticide poisonings in developing countries are out of workers' control (e.g., use of backpacks to spray, hot and humid climate that makes it almost impossible to wear PPE.)²⁰

²⁰ Acutely Toxic Pesticides: IFCS

It is therefore proposed to constitute a National Surveillance Committee to review health and environmental impacts of vector control activities, which can review issues related to worker health and safety and recommend solutions which are applicable and feasible in Indian conditions. The reviews will include the following aspects including quality and content of guidelines and instruction manuals; implementation of good practices in accordance to the guidelines; status of spray equipment and availability of antidotes and first-aid; worker health and safety surveillance systems and their regular implementation; and systems for recording and monitoring pesticide poisoning. Systems for information collection from spray workers, village health committees, householders etc could also be instituted.

The recommended constitution of committee could be as follows:

- **National:** Director General Health Services, representatives from Central Pollution Control Board and from Department of Medical Services, Ministry of Environment, Ministry of Agriculture, Central/regional Labour Institute and National Institute of Occupational Health, NIMR and Director NVBDCP as secretary. The national Committee should also include representation from WHO, the World Bank, FAO and a sound Environmental NGO.
- **State level committee:** Director Health Services, One public health specialist, One NGO, CPCB, ROHFW (if exists), representative from NIMR and state entomologist as member secretary. District level committee: DHO, one public health specialist, one NGO, environmentalist if any, DMO as member secretary.
- **District level committee:** DHO, one public health specialist, one NGO, environmentalist if any, DMO as member secretary. DHO will constitute committee in consultation with DHS.

Resistance to pesticides is a major concern in vector control and pests of public health importance: extensive resistance to common pesticides has been documented. Regular monitoring of resistance to pesticides would ensure continued efficacy of the products for vector management and minimize both the hazards associated with use of “non-effective” products and waste of limited financial resources. As the NVBDCP will be monitoring pesticide resistance as a part of the overall project, this component is not being addressed in the EMP.

Recommended actions are detailed below:

- i. NVBDCP should provide specifications for PPE required for the program, which should be selected in accordance with the label recommendations²¹.
- ii. As recommended above, NVBDCP should stipulate all manufacturers to provide appropriate PPE, which will be included with their products packages and maintenance of PPE and equipment should be mandated.
- iii. State authorities must undertake routine monitoring of health staff and temporary workers for pesticide exposure at frequencies and with methods recommended by WHO. NVBDCP should indicate clear time-lines for this activity and ensure reports are maintained;

²¹ Guidelines on Good Practice for Ground Application of Pesticides: Food and Agriculture Organization Rome, 2001

- iv. The Medical Officers at PHCs and/or District Health Officer should maintain records of poisoning events and report such events to the NVBDCP. The IPCS INTOX Program provides guidance for diagnosis and treatment of pesticide poisonings, preventive measures, and decision-making for management of pesticides. WHO has developed a new database, and their support on this activity will be required.
- v. Recommended antidotes such as Diazepam for OP insecticides and Atropine Sulphate for pyrethroids such as Cypermethrin and Deltamethrin must be kept available at PHCs to address any untoward incidences of insecticidal poisoning.
- vi. NVBDCP should commission a study of impact of vector control activities after 2 years of project implementation. The study will include primary data collection and analysis. The study TOR should be prepared in close consultation with Bank and WHO and the report should be ready in time for the project's Mid-Term Review.
- vii. NVBDCP will develop and finalize TOR for the National Surveillance Committee, in consultation with relevant stakeholders and the Bank. The Committee should be in place within first year of project implementation.
- viii. The NVBDCP needs to strengthen liaison with the Ministry of Agriculture for quality control and stocks management of pesticides.

7.6 Environmental Impacts related to treatment of Vector Borne Diseases:

Provision of preventative and treatment services for Vector Borne Diseases is expected to generate infectious bio-medical wastes such as sharps (infected needles and syringes), laboratory and pharmaceutical wastes. These wastes, if not managed and disposed properly, can have direct environmental and public health implications. Healthcare workers are at maximum risk as most blood-borne occupational infections occur through injuries from sharps contaminated with blood through accidents or unsafe practices. Systematic management of such clinical waste from source to disposal is therefore integral to prevention of infection and sound environmental management.

The Ministry of Health and Environment, through its various programs, has developed a number of detailed guidelines for implementation of sound infection control and waste management practices. These include the following:

- Infection Management and Environmental Plan (IMEP) under the Reproductive and Child Health Program;
- Infection Control and Waste Management (IC-WM) plan under the National AIDS Control program
- Infection Management & Environmental Plan under the Second National Tuberculosis (TB) Control Program

In addition, states which have and are implementing State Health Systems projects, also have state specific healthcare Waste management Plans. Additionally, there are standardized guidelines on this issue which have been prepared by WHO (www.who.int/mediacentre; www.healthcarewaste.org), the World Bank, CDC etc. Therefore the VBDCP does not need to develop its own waste management plan, but instead utilize these existing national and international guidelines to institute proper infection control and waste management practices within its health service delivery activities.

7.7 Capacity building:

Capacity building for good worker practices is an integral and essential part of integrated vector management. Achievement of the necessary expertise and implementation of good practices at all levels of public health pesticide management requires formal and repeated training. Capacity building must include provision of rigorous and regular training for different levels and types of workers and certification of staff and operators in the following activities: stock management; good storage practices; proper handling of pesticides during transport and disposal; application of insecticides; surveillance methods; signs and symptoms of poisoning, emergency measures; PPE usage; accident reporting, data management and monitoring and reporting. Such capacity building should target those involved in the production, distribution, use and application of insecticides, householders and health personnel.

The Guidelines and manuals need to be made available to all levels of officials and workers, especially the seasonal spray worker who are usually temporary and should be trained at the beginning of each season. Guidelines for Junior Health Assistant/ Health worker/supervisors and spary workers are provided in **Annexure V and VI**. Knowledge of the contents of the manuals and guidelines should be demonstrated through a certification process for all supervisory and managerial staff.

Recommended actions are detailed below:

- i. Generic training plan should be developed by NVBDCP, which ensures regular (annual) training is provided to all workers in good practices and proper application methods. States will develop their own schedules of training.
- ii. Certification and refresher/update training should be required at all management and supervisory levels. In addition to good worker practices, training should include record keeping of application sites, amount and dosages of insecticides used, inventories of pesticides, equipment, and replacement parts, worker exposures, etc
- iii. Appropriate funds should be allocated for this training component.
- iv. Seasonal and part-time spray workers must be trained before the start of the spraying season. As these workers are the most critical players and the most vulnerable, the District Malaria Officer should be responsible for this activity and should submit reports of this activity to Director Health Services and to NVBDCP.
- v. As stated above, NVBDCP should develop simple pictorial training and resource manuals for workers which should be translated into local languages at the state level.
- vi. NVBDCP should develop a detailed training plan and modules for different levels of workers and the community. States will then need to submit their plans for implementation of the training plan. Funds have to be allocated from the program for implementing training and for monitoring. A generic Training plan is provided in **Table-10**.

7.8 IEC:

Public support for the use of public health pesticides is an important factor both for the effective management of vector-borne diseases and for control of pests of public health importance. Long-term health education and communication approaches are required to educate the community, create general awareness and provide accurate information to elicit

support for sound and effective use of insecticides. Such approaches are absolutely vital for field level activities such as spraying and bed-net impregnation. A village level committee comprising of the village chief, Anganwadi worker/ANM, junior health worker and village teacher could be constituted to supervise the proper storage, spraying, environment management including disposal of used containers etc at sub centre/village. Community should also be educated to understand the importance of IRS and not to mud plaster their houses after spray. Domestic and peri-domestic sanitation may be an important component where individual and community cooperation is essential. It often requires legislation and enforcement, but above all public information and education.

7.9 Intersectoral collaboration:

A key feature of integrated vector management is the recognition that reduction in the burden of vector-borne disease cannot be seen as exclusively the responsibility of the health sector. This is primarily because major development programs (such as dam construction, forest clearance, road building, housing development irrigation and industrial expansion) can all lead to increased transmission of vector-borne disease unless potential risks are addressed at the planning stage. There is need to engage and empower communities to ensure their active participation and foster collaboration within the health sector and with other relevant public and private sectors.

Such inter-sectoral (agricultural, industry, health water management, urban development, infrastructure etc) collaboration is currently not well-organized or well-structured. Lack of coordination of activities and inadequate delineation of responsibilities can result in considerable overlapping of activities and waste of resources. Additionally mobilization of vector control activities requires human and financial resources beyond those currently available in a health sector that is struggling with demands of other infectious diseases, particularly human immunodeficiency virus (HIV) and tuberculosis.²²

The NVBDCP should take a lead in building this inter-sectoral collaboration at various levels. In urban areas, collaboration/interaction between District Malaria Office and the Municipal Corporation is important for vector management activities. At the village level, under the Panchayat Raj system, the constitution of a village level committee should be a healthy collaboration between health and national rural health programs. Collaboration with NGOs at state and district level is already being done for IEC activities, impregnation and social marketing of ITN.

7.10 Reporting and Monitoring:

The key to effective monitoring is setting up of a national-level surveillance system that makes data available on insecticide production, sales, pre and post delivery volumes, application location, applications methods and stockpiles. In this program, such a data management system will need to inclusive of all levels of the insecticide chain – manufacturer, distributor village, primary, district, and state offices. Reporting systems for adverse health and environmental impacts and unsafe practices are also an essential part of the monitoring systems. Some of the recommended reporting requirements are mentioned in the Operations Manual for Malaria

²² Exploiting the potential of vector control for disease prevention. Townson.H et al. WHO, Dec. 2005

Action Program (1995), but implementation remains inadequate. Monitoring and supervision is often marred by vacancies and inadequate resources, including transportation. While it is recognized that data and information collection in such a decentralized program is quite difficult, but without effective monitoring of the insecticide chain and environmental and health issues, such a program can not be successfully implemented. NVBDCP will need to invest resources into establishing such a reporting and monitoring system and possibly also review PPP arrangements to support it.

Recommended actions are detailed below:

- i. Records of insecticides dispatched by product name, amount, quality and point of destination must be maintained by insecticide manufacturers and submitted annually to NVBDCP.
- ii. Records of insecticides as received at the District level by product name, amount, quality of delivery, date and condition of receipt should be submitted annually to the Director, Health Services for on-forwarding to NVBDCP. This should also include detailed records of insecticides as distributed by the district and received at the PHC levels.
- iii. Records of insecticides utilized in various applications (IRS, spraying and larviciding), with details of amounts and location should be maintained at PHC levels and submitted annually to NVBDCP through the District office. Supervisors at village levels to monitor application methods should submit their findings to the PHC level for on-forwarding to the NVBDCP.
- iv. Records of ITN procured, distributed and impregnated, amounts of insecticides used for impregnation should be maintained at PHC levels and submitted annually to NVBDCP through the District office.
- v. Monitoring for health impacts of spray workers (blood cholinesterase levels) and others handling insecticides should be done annually at the PHC level and submitted annually to NVBDCP through the District office.
- vi. Records of spray equipment, PPE and other tools related to insecticide use should be maintained at PHC levels. The records should include inspection of spray pumps and equipment maintenance records. Information about distribution of PPE to insecticide handlers should also be included.
- vii. The NVBDCP should review the state reports on conditions of storage and transportation facilities, and allocate funds as mentioned in earlier section.
- viii. The states should report to NVBDCP on implementation of training plans for spray workers and availability of supervisory staff and involvement of NGOs for monitoring of activities.
- ix. Records of accidental poisoning events and availability of antidotes should be maintained at PHC levels.
- x. The opinions and decisions of village health committees, householders, community concerning the management of pesticides and referring any adverse health impacts from insecticide use should be recorded at the PHC levels
- xi. The state level surveillance committee should review the above records on an annual basis and recommend corrective measures where necessary. The National Committee should review the findings and recommendations of the state level committees
- xii. As mentioned in earlier section, NVBDCP should commission a study of impact of vector control activities after 2 years of project implementation.

DDT:

GOI is committed to gradual reduction in use of DDT, as required by the Stockholm Convention. However, to ensure this, an action plan needs to be prepared showing planned/estimated year wise reduction in states and districts. It is recognized that to combat Kala-Azar, GOI is going to undertake an intensive IRS operation using DDT, so the Action Plan may possibly reflect unchanged DDT usage levels for the next 3-4 years. As is the case for insecticides, records of DDT movements from manufacturer to Districts and below by quantity, and location must be maintained. Effective regulatory mechanisms already in place must be implemented to ensure that DDT is not used for purposes other than public health. In this regard, the NVBDCP will need to have close collaboration with the Ministries of Environment and Agriculture, to ensure a coordinated management and monitoring system is in place for DDT usage. This is also recommended by the Stockholm Convention.

Countries that are parties to the Stockholm Convention have to provide the following information to the POPs Secretariat and the WHO:

- information on the amount of DDT used;
- conditions of such use and its relevance to that Party's disease management strategy (including geographic coverage and selection criteria;
- DDT resistance and diseases targeted, population at risk, incidence and mortality;
- cost and effectiveness.

The report also requires information on regulatory framework and management procedures and human and environmental health and safety measures. It should be noted that many of the reporting requirements overlap with information required under Bank's Policies, OP 4.09 and BP 4.01 Annex C.

7.11: Training Plan: Details of training plan for different categories of persons are given in **Table-10**.

7.12: Budget: Cost Estimates should be specified for both the initial investment and recurring expenses for implementing all measures defined in the EMP, integrated into the total project costs and factored into loan negotiations. It is important to capture all costs – including administrative, design and consultancy, and operational and maintenance costs.

7.13 Implementation Schedule:

The timing, frequency and duration of mitigation measures and monitoring is given in **Table-11**

Table-10 Training plan for different levels

Level	Education level	Training contents	Mode of training	Duration of training	Frequency of training
District Malaria Officer/ Entomologist	Medical graduate/ M.Sc./graduate	Storage, Transportation, perceived adverse impact on health and environment, disposal of empty containers	Lectures, demonstration	One day	Every alternate year
Sr. Malaria Inspectors (Health Supervisors)	High school onwards	Toxicity of insecticides, importance of proper transportation, spray methods, sound handling and disposal	Audio visuals in local language and demonstration	Two days	Every year
Junior health Assistant (Health Worker), ANM, Anganwadi worker	8 th class pass or above	Toxic effects of insecticides, proper transportation, adequate dose, spray methods, disposal of empty containers	Printed guidelines, importance of protective gears, and demonstration of spray, disposal of empty containers	One day	Just before Ist round of spray
Spray Workers	Illiterate/Primary level	Toxicity of insecticides, importance of protective gears, correct doses, proper handling, place of making suspension, disposal of empty containers	Verbal with printed guidelines on a pocket size post card*	One day	Just before Ist Round of spray
Community (Village chief, anganwadi worker/ANM, Teacher and shop keepers etc.)	Illiterate to literate	Proper storage, toxic effects, usefulness of IRS and ITMN, how to use ITMN and importance of community participation	Video-films in local language	40 minutes	Before every Round of spray

Table-11 Implementation schedule of Environmental Management Plan

Activities	Year 1				Year 2				Year 3				Year 4				Year 5			
	Q 1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q 1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4
Mitigation Measures	√	√																		
i.Review of legal framework:																				
ii.Occupational Health & Safety measures: Constitution of National, State and District level committees To develop facilities for monitoring of workers for exposure to insecticides, record for accidental poisoning etc and monitoring (item 7.5 of EMP)	√	√			√		√		√		√		√		√		√		√	
Storage and Transport:																				
i. Printing of FAO manual on “Pesticide storage and stock control” to be translated and distributed to states	√	√																		
ii. Survey of existing storage facilities by states and allocation of funds		√																		

<p>for construction and/or up-gradation of appropriate storage areas for district HQ and PHC facilities by NVBDCP.</p> <p>iii. Collection of information on amount of stockpiled insecticides. NVBDCP to develop a plan of action for disposal of these stockpiles, in consultation with the Bank.</p>		√	√																	
<p>Application activities:</p> <p>i. NVBDCP should instruct manufacturers to provide instructions for disposal of pesticide containers as label requirements and to consider disposal of larger containers by manufacturers.</p> <p>ii. States should be asked to allocate resources (time and financial) for maintenance, repair and</p>	√			√			√		√		√		√		√		√			

replacement of old equipment and protective gear.																			
iii. To develop clear pictorial instructions to health and spray workers on use, applications, preparation of suspension and disposal of insecticides, insecticide treated materials, insecticide containers etc.	√	√																	
iv. NVBDCP to discuss with insecticide manufacturers for the possibility of supplying insecticides in the appropriate sized ampoules for impregnation of bed-nets and sachets for IRS.	√																		
iv. NVBDCP to provide specifications for PPE required for the programme and consider supply by manufacturers along with product packages.	√	√																	

vii. Capacity building: viii. Seasonal and part-time spray workers must be trained before the start of the spraying season. ii.DMO should submit report of this activity to Director Health Services Kindly refer to Table 10 for a generic Training plan.	√		√		√		√		√		√		√		√		√		√		
		√		√		√		√		√		√		√		√		√		√	
Intersectoral collabotration	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√
Reporting & Monitoring: Setting up of National surveillance system for reporting & Monitoring of various activities mentioned in EMP				√				√				√				√			√	√	
Impact assessment of vector control activities									√	√											

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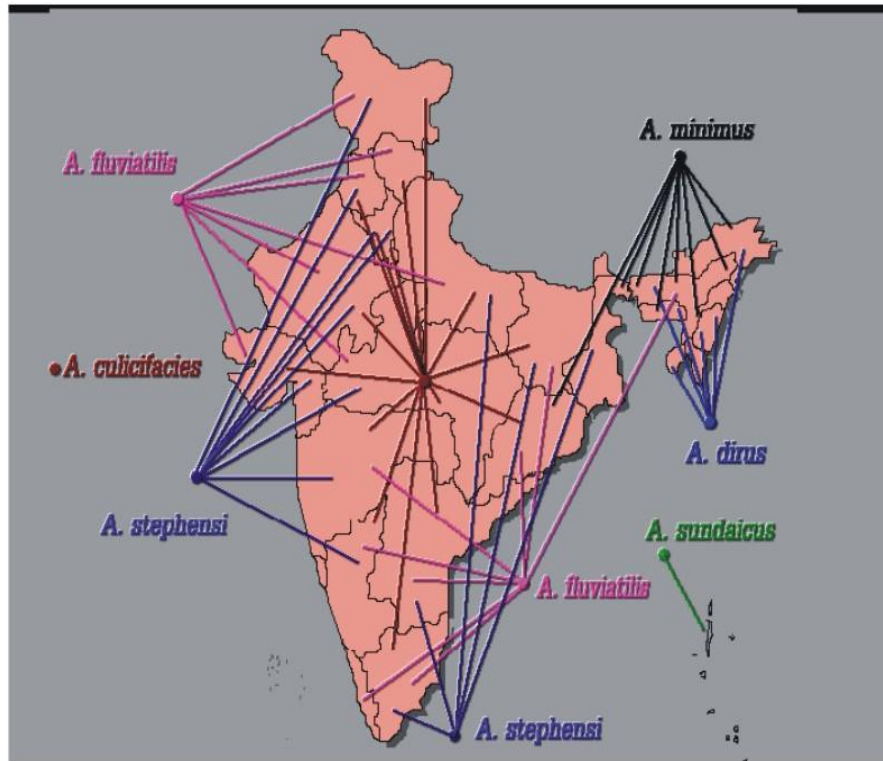


Fig 1 Sphere of malaria vectors in India

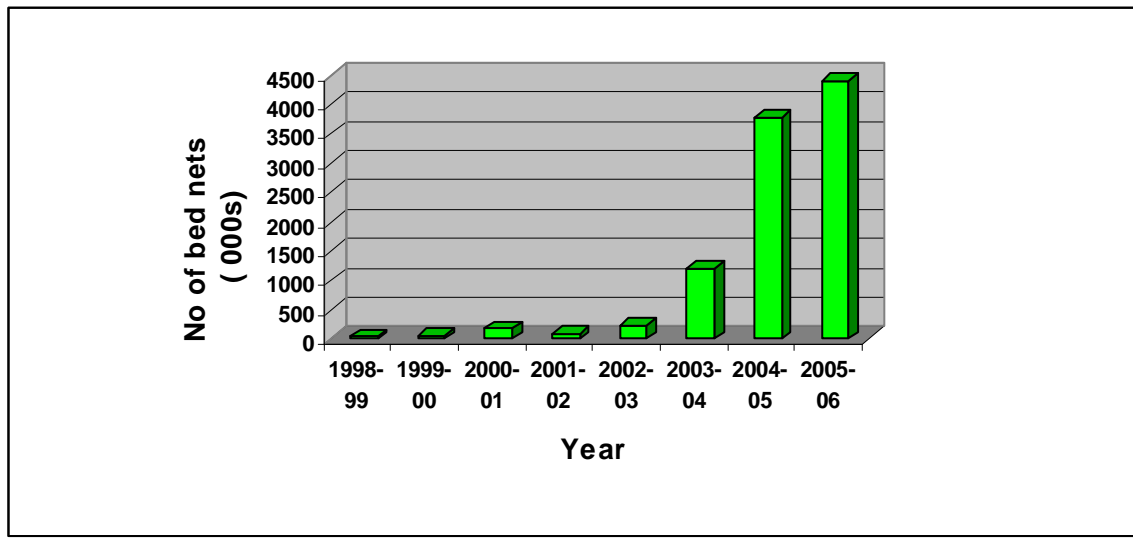


Fig 2 Supply of bed nets under EMCP (in 000s) (Source: NVBDCP)

Insecticide wise population targeted for spray during the past 5 years

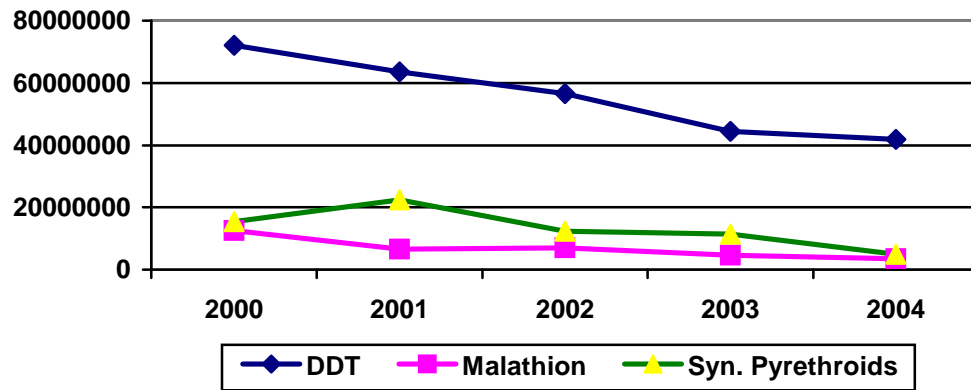


Fig -3 Phase wise reduction in target population for IRS (Source: NVBDCP)

Latest decisions on the use of DDT under the Stockholm Convention

Countries that are parties to the Stockholm Convention have agreed that DDT may be used for indoor spraying for control of malaria, subject to the following requirements

1. Listing in the DDT registry on the Convention website.
2. Notification to Convention Secretariat of present or planned production or use of DDT and disease vector(s) targeted
3. Triennial reporting to the secretariat on
 - Information on DDT stocks, production ,import and export
 - Amounts used
 - Disease targeted, population at risk, incidence and mortality
 - DDT resistance in target species
 - Geographic coverage and selection criteria
 - Regulatory framework and management procedures
 - Cost and effectiveness
 - Biological, chemical and environmental alternatives in use and their efficacy
 - National Vector Management policy and strategy
 - Human and environmental health and safety
 - Targets and programs to strengthen disease vector control

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Questionnaire for eliciting information on Practices for Safe handling and storage of insecticides at District/PHC level

District/ PHC

1. How many times the consignments of insecticides are received by your state

2. Where do you store insecticides:

3. Size of storage place

4. Designation of the Officer responsible for storage of insecticides

5. What is the mode of transportation of insecticides to Districts:

6. What is the annual consumption of insecticides in your state

7. Do you get your supply as per demand Yes/No

8. What are the insecticides used in your state.
a. b. c.

9. Do you have stock of protective clothing and gloves for spraymen. If so, Number?

10. Weight of insecticide packs.

11. Material of insecticide packs

12. Training facilities available for supervisors and spraymen: Yes/No
If Yes
Date of last training organized

13. No. of persons trained.

14. Whether spray workers are same every year or replaced by novice

15. Do you train the spray workers before launching spray operations: Yes/No

16. Who trains the spray workers?

17. Duration of Spraymen's training ½ day/1 day / 2 days/ 1 week / > 1 week

18. The types of containers used for making suspension of insecticides: Plastic/ Tin

19. Number of spray pumps available at State/District HQ

20. Quality of spray pumps: Functional/leakage if any

21. Where do you store unused insecticide after day's operation:

22. Where do you dispose off left out insecticide after completion of spray operations:

23. Do you have printed guidelines for spray supervisors/ spray workers/ inhabitants. Yes/No

24. Do you have printed guidelines for impregnation of mosquito nets. Yes/ No

25. What measures are taken if spray worker reports irritation on skin, eyes etc:

26. Do you have printed guidelines for spray in aquatic habitats. Yes / No

27. What precautions are taken by spray workers for entering aquatic habitats:

28. Is there any environmental legislation in practice for safe disposal of insecticides

29. Date of last insecticide spray:

30. Whether Facilities for estimation of cholinesterase level exists: If so
Date of last cholinesterase estimation:

31.No of spray workers on whom Test was done.
Result thereof:

32.To Verify register records of insecticide dumping stations

33. Labeling of Containers

34. Planning of insecticide dumping stations at PHC

35. Communication facilities during rainy season

36. Where do you destroy empty insecticide containers:

Date of survey

Data generated by

Guidelines from National Vector Borne Disease Control Programme on Safe Handling and Storage of Insecticides

Precautions for Handling of Organophosphorus Compound

- a) While using Organophosphorus (Malathion) compounds, it is necessary to use protective clothing.
- b) While making suspension – use rubber gloves so that skin of hands does not come in direct contact with insecticide.
- c) The cholinesterase level of all spray men employed in spraying of Malathion should be monitored regularly at the recommended intervals and those showing a drop in cholinesterase level should be given rest and suitable medical care. For estimation of cholinesterase level, standard technique recommended by WHO should be used.
- d) Avoid contamination of cooked food or food material.

Precautions for handling of Synthetic Pyrethroids

- a) While spraying Synthetic Pyrethroids, use protective clothing.
- b) The exposed skin, hands, face and eyes should not come in direct contact with insecticide.
- c) In case of accidental contamination, wash liberally with soap and water.
- d) Avoid contamination of cooked food or food material.

Storage of Insecticides

- a) The FTDs or voluntary Link Workers in their headquarter village should be selected they are made responsible for safe storage of insecticide.
- b) Select and earmark insecticide dumping station well in advance in each PHC, keeping in mind the communication facilities during rainy season.
- c) Indicate the quantity of insecticide to be stored in each dumping station.
- d) Fix the date by which the insecticide will be placed in the dumping station.
- e) Ensure proper safety of insecticide at the dumping station and also take steps to prevent any health or environmental hazard due to insecticide while stored at the dumping station.
- f) Make sure that full quantity of insecticide required for all rounds of spray (2 or 3 rounds as the case may be) is transported to the dumping station with adequate safety precaution.

- g) Store the insecticide away from food, foodstuffs, children and animals. Keep the insecticides preferably in enclosed and locked location.
- h) Ensure that the containers are properly labeled.
- i) Empty containers should be destroyed so that they are not used for storing food materials or for other house hold purposes.

Annexure IVa- Examples of Advance action plan for IRS at the level of State Programme Officer

Government of Karnataka
Directorate of Health & Family Welfare Services
 Ananda Rao Circle, Bangalore - 560 009

NAMP / SPR / 59 / 2003-04

Date: 16-02-2004

Circular

Sub:- Indoor residual spraying for the year 2004 according to National Vector Borne Diseases Control Programme (NVBDCP) - reg.

Indoor residual spray is one of the important strategies for interrupting transmission of Malaria.

The District Malaria officers have been advised to prepare micro level planning prioritizing the areas, sub-centres / villages at higher risk, keeping in view of the availability of insecticides and other resources needed for operational purpose.

As per NVBDCP guidelines, sub-centres showing API 2 and above during the last three years has to be taken up for regular rounds of spray operations and also in high risk sub-centres.

While prioritizing the areas for spray, the following criteria is to be considered:

1. To spray on priority basis earmarked areas taking sub-centre / village as a unit with more than 5 API where ABER is 10% or more.
2. To spray on priority basis earmarked areas reporting more than 5% SPR.
3. Due priority be accorded for spray if PF proportion is more than 50%.
4. To accord priority for IRS in areas less than 5 API / SPR, 5% increase of drug resistance foci, project areas with population migration and aggregation and other vulnerable factors.
5. To make provision of insecticidal spraying in epidemic situations.

Spray schedule:

Spray schedule for IRS in the state is as follows:

Rounds	Period	Insecticides
I Round	15 th Feb to 15 th April	DDT, Malathion, Sy. Pyrethroid.
II Round	15 th July to 15 th Sept.	DDT, Malathion, Sy. Pyrethroid.
III Round	1 st Oct to 30 th Nov	Malathion

Spray schedule has to be planned during the above period before the peak malaria transmission depending upon the local situation.

Insecticide requirement to be worked out as follows:

Insecticide	Dosage / Sq. Mt. Active ingredient (A)	Insecticide formulation / HMD / 100 Sq. Mt. / round	Average requirement per 5000 population / round	Total requirement per annum	No. at 10000
DDT 50% WP	1 gm.	300 gm.	375 Kg.	750 Kg.	2
Malathion 25% WP*	2 gm.	1200 gm.	1500 Kg.	4500 Kg.	3
Deltamethrin 2.5 % WP	20 mg.	120 gm.	150 Kg.	300 Kg.	2
Cyfluthrin 10 % WP	25 mg.	37.5 gm.	46.9 Kg.	93.80 Kg.	2
Lambda Cyhalothrin 10 % WP (ICON)	25 mg.	37.5 gm.	46.9 Kg.	93.80 Kg.	2
Alpha Cypermethrin 5% WP (Fendona)	25 mg.	75 gm.	93.80 Kg.	187.60 Kg.	2

* Malathion is sprayed in two coats to obtain 2 gm / mt.

The quantity of insecticide required per 10 lbs. of water is as follows:

Sl. No.	Insecticide	Qty.	Surface to be sprayed
1	DDT 50% WP	1 Kg.	500 Sq. Mts.
2	Malathion 25% WP	2 Kg.	250 Sq. Mts.
3	Deltamethrin 2.5 % WP (K'othrine)	400 gm.	500 Sq. Mts.
4	Cyfluthrin 10 % WP (Solfac)	125 gm.	500 Sq. Mts.
5	Lambda Cynalathrin 10 % WP (ICON)	125 gm.	500 Sq. Mts.
6	Alpha Cypermethrin 5% WP (Fendona)	250 gm.	500 Sq. Mts.

In the revised Malaria control approach, only human dwellings and mixed dwellings to be sprayed. Cattle are not to be sprayed.

The details regarding indoor residual spray operations has to be followed as per MAP-95 guidelines.

The supervisory staff of the District Malaria Office should supervise the spray operations to ensure coverage and maximum coverage.

The advance programme of each round of spray has to be prepared by the District Malaria Officers and has to be scrutinized by the Deputy Directors of respective NAMP zones and further submission to sector (Malaria & Filaria), Directorate of Health & FW Services for approval well in time.

The Deputy Directors of NAMP zones should also monitor the spray operations in their zonal area.

The spray completion report to be submitted as per the proforma along with receipt, consumption and use of insecticides to be submitted to the Joint Director (M & F) immediately after each round of spray.

Joint Director (Malaria & Filaria)

cc:

The District Malaria Officer, _____ District.
 The District Health & FW Officer, _____ District.
 Deputy Director, NAMP Zonal Office, Bangalore / Belgaum / Mysore / Gulbarga.

Copy with compliments to the Sr. Regional Director of Health & FW, 11 floor, "F" wing, Maratha Building, Koramangala, Bangalore - 560 034.

Allotment of DDT 60% from NAMP Delhi (in Metric Tons)

Sl. No.	District	2000-2001		2001-2002	2002-2003	2003-2004		2004-05 Requirement
		DDT	Malathion			Delhi	AP	
1	Kolar	5		10	5	5		9
2	Tumkur	5	10	9	9	9	5	18
3	Chitradurga	5	5	10	9	9	5	10
4	Mandya	10	10		9	9	5	9
5	Davanagere			4				
6	Belgaum	5		9	6			9
7	Bellary	5			9	6	5	9
8	Raichur	10	18	9	9	9	10	18
9	Gulbarga		10	9	8	9		9
10	Mangalero (DK)	5		19	6	9		9
11	Udupi			18	9			
12	Bijapur	10	15	9		9		9
13	Hassan	5	10	9	4	9		9
14	Koppal	5	10	9		9	5	9
15	Bagalkot		7	9	6	8		9
16	Chickmagalur		5					
17	Shimoga			9	6			6
18	Bidar				5			
	Total	70	100	160	100	100	35	150

The following districts have been allotted Melathion 25% WDP and Synthetic Pyrethroids for indoor residual spray, during 1st round of 2005

Sl no	District	Quantity of Melathion supplied	Quantity of Synthetic Pyrethroid supplied
1	Raichur	4 M.T	Cyfluthrin 10%(Sofac) 240 k.g.
2	Tumkur	2 M.T	Lambda Cynalathrin 10% (Icon) 200 k.g + Cyfluthrin 10% (Sofac)-100 kg
3	Chitradurga	1 M.T	
4	Mandya	2 M.T	
5	Gulbarga	2 M.T	
6	Bijapur	2 M.T	Cyfluthrin -200 k.g. (Sofac)
7	Bagalkote	2.5.MT	Cyfluthrin 160 kg
8	Bellary	2 M.T	
9	Koppal		Cyfluthrin- 200 kg(Sofac)

Annexure-IV b Advance action plan for IRS at the level of SPO

DIRECTORATE OF HEALTH AND FAMILY WELFARE SERVICES

No: NAMP/SPR/59/2003-04.

Anandarao Circle, Bangalore - 9,
dated: 12th April 2004.

CIRCULAR

*Subject: NYBDCP (NAMP) - 1st round of Indoor Residual Spray-2004 - regarding.
Reference: This Directorate's circular instructions of even number dated 16.2.2003.*

The following districts have been allotted Malathion 25% wdp and Synthetic Pyrethroids for Indoor Residual Spray, during 1st round of 2004.

Sl No	District	Quantity of Malathion Supplied	Quantity of Synthetic Pyrethroid Supplied
1	Raichur	20 MT	DMT - 2000 Kgs
2	Tumkur	15 MT	ICON - 300 Kgs & SOLFAC - 160 Kgs
3	Chitradurga	5 MT	FENDONA - 460 Kgs
4	Mandya	15 MT	-
5	Hassan	5 MT	DMT - 300 Kgs
6	Udupi	5 MT	-
7	Koppal	5 MT	SOLFAC - 480 Kgs
8	Belgaum	5 MT	-
9	Guburga	10 MT	-
10	Bijapur	5 MT	DMT - 1600 Kgs
11	Bagalkot	5 MT	DMT - 1000 Kgs
12	Bellary	5 MT	-
13	Mysore	-	FENDONA - 460 Kgs

The wages for the above insecticidal spray is already released vide this Directorate's letter no. BGT/25(P)/03-04 dated 27.3.2004 (both for Synthetic Pyrethroid and Malathion separately). The spray has to be taken up considering the basic (eligible) criteria for regular rounds of spray. The above insecticides have to be used in the Primary Health Centres, prioritizing the areas; Subcentre/villages - of high risk & showing high Pf incidence, reported deaths due to Pf deaths and with high Malariogenic conditions. Proper planning has to be done before taking up the spray.

The problematic PHCs earmarked for Malathion 25% wdp and Synthetic Pyrethroids spray is enclosed for necessary action. The spray operations have to be done under proper supervision so as to achieve maximum coverage. The monitoring of the programme should be done by the concerned District Malaria Officers in co-ordination with the Taluk Health Officer and the concerned Medical Officer of Health of the respective Primary Health Centres.

The spray schedule, which was to be completed by 15th April 2004, is further extended to 30th April, 2004. The spray report of 1st round spray to be submitted within 15 days from the date of completion of the spray along with balance of insecticides on hand, for 2nd round.

[Signature]
JOINT DIRECTOR (M&F)

To: District Health & FW Officer/District Malaria Officer, _____ district for immediate action and report.

Copy to Deputy Director, NAMP Zone, Bangalore/Bagaim/Guburga/Mysore for follow-up action and report.
Copy submitted to the Additional Director (CMD), Directorate of Health & FW Services, Bangalore - 9, for kind information and needful.

FN: Spray/Spray instructions 1(04)

List of PHCs earmarked for Malathion 25% wdp and Synthetic Pyrethroid spray during 2004-05

District	Malathion 25% wdp PHCs	Synthetic Pyrethroid PHCs	District	Malathion 25% wdp PHCs	Synthetic Pyrethroid PHCs	
Bichur	Mudgal	Echanala	Koppal	Dohral	Mudhenur	
	Santhakallur	Anehosur		Hinjala	Tavargera	
	Meski	Gurugunta		Anagundi		
	Sajjalagadda	Jalahalli		H V Kunta		
	Medikund			Kukanoor		
	Masarkal			Hannasagar		
	Nagaral		Belgaum	Kanagaon		
	Turuvhal			Betageri		
	Arakera			Kadabi		
	Tumkur	Halkurke	Icon - Hullyar	Bijapur	Kangarur	Konnur
Halepaiva		Icon - C.N. Halli		Carasangi	Nalethwad	
Biligeri		Solfac - Handanakere		Kalagi		
Nonavinakere		Solfac - Mathighatta		Tamadoddi		
Honnasalli			Bagalkot	Pattadakal	Kamathagi	
Bukkapatna				Kerur	Thoguneri	
Sira				Katageri		
Araluguppe			Bellary	Gadiganur		
Chitradurga		Janakal	Dindavara		Kampli	
		Devigere	Yelladakere		Kamlaoura	
	K.K.Pura	V.V.Pura	Guburga	Raankollur		
	Javagondanahalli			Kodekal		
	Akkibebal			Kakkera		
Mandya	Mudaganur			Benebompil		
	Mahadevapura			Ravori		
	Chinakuruli			Jewargi		
	Basaralu		B'lore (Rural)	Harohalli		
	Melikota					
	D.K.halli					
	Pandavapura					
	Hassan	Hallimysore	D.M. Kurke			
		Sravanabelgola	Doddakadanur			
		Banevara	Shashivata			
Hannali						
Kansakatte						
Udupi	Jittinahalli					
	Malce					
	Pernankia					
	Nitte					
	Mudabettu					
Byloor						
Hirgana						

Note: Apart from the above PHCs, the old PHCs which are under Malathion spray previously, may also be continued on selective basis, depending up on the problem of Malaria.

Annexure spray 1(04) PHCs

[Signature]
JOINT DIRECTOR (M & F)

Annexure-IVc Advance action plan for IRS from DMO to SPO

OFFICE OF THE CHIEF DISTRICT MEDICAL OFFICER : SUNDARGARH :
 No. 1915 /Malaria, Sundargarh Dated the 25.11.04.

The Joint Director of Health Services
 (Malaria and Filaria), Orissa,
 BHUBANESWAR.

Sub: Submission of 2nd Round Advance Spray Programme for the year 2004-05.

Ref:- Your letter No.346 dt. 31.3.2004 and this Office memo No.1621(2) Dt.14.10.2004.

Sir,

With reference to the letter no cited above, I am to enclosed herewith One copy of Advance Spray Programme for 2nd Round 2004-05 of 17 PHCs mentioned below duly approved by the undersigned for favour of necessary action at your end.

Sl.No	Name of PHC	No S.C.	No village	No of Hamlets	No of Holding	No of population	No of squad	Name of insecticides
1	Hemgar	7	22	28	4575	23866	80	DDT
		10	59	38	8860	37070	131	SP2.5%
2	Sargipali	2	10	10	1601	10864	37	SP10%
		2	16	3	1260	6032	25	DDT
3	Mangasapur	18	61	130	12443	61637	209	SP2.5%
		1	5	5	879	3875	14	SP10%
4	Majhapara	7	28	34	6084	27060	98	DDT
		8	30	32	5890	29665	98	SP2.5%
5	Kinjirkela	1	4	2	937	4599	15	SP10%
		1	4	2	638	3346	12	DDT
6	Subdega	17	81	-	12680	61284	225	SP2.5%
		7	32	57	5058	20591	78	DDT
7	Bargaon	12	44	130	12279	51143	190	SP2.5%
		1	4	12	1774	6105	35	SP10%
8	Kutra	1	3	21	1112	4203	16	DDT
		15	55	110	11112	57038	225	SP2.5%
9	Laing	1	2	3	482	3014	7	SP10%
		15	60	120	11305	55874	225	SP2.5%
10	Kuarmunda	1	4	21	1254	6240	26	DDT
		3	8	41	1727	10125	26	DDT
11	Hatibari	11	34	114	7600	42701	130	SP2.5%
		3	4	27	1887	10232	32	SP10%

9	Laing	14	58	57	9178	53618	163	DDT
		7	13	33	4127	23003	69	SP2.5%
		2	4	9	1300	7403	20	SP10%
10	Kuarmunda	17	84	193	10479	59191	196	DDT
		6	18	63	4108	24320	75	SP2.5%
11	Hatibari	12	52	84	7869	42468	131	DDT
		10	45	54	6363	36002	112	SP2.5%
		2	9	19	2008	10240	33	SP10%
12	Bisra	4	23	25	3135	14733	51	DDT
		9	35	48	7414	45477	126	SP2.5%
13	Birkeri	17	42	115	12820	64110	214	DDT
		8	23	308	6788	33940	108	SP2.5%
		4	17	58	2179	10893	39	SP10%
14	Kotra	4	19	-	2165	11306	41	DDT
		17	89	-	11638	57665	227	SP2.5%
		1	1	-	1050	5426	18	SP10%
15	Lahunipara	23	170	14	17677	77983	313	DDT
		2	15	1	1168	7740	22	SP2.5%
16	S.Balang	5	35	-	3360	12903	59	DDT
		12	57	3	9539	42599	154	SP2.5%
17	Gurundia	7	57	12	5320	27171	64	DDT
		9	61	0	5917	25911	66	SP2.5%
	TOTAL	336	1527	1841	247124	1231112		
	ABSTRACT							
	DDT50%	131	683	685	92541	459121		
	S.P.2.5%	186	780	990	139232	693069		
	S.P.10%	19	64	166	15351	78922		

Yours faithfully

Chief District Medical Officer
 Sundargarh

Memo No. 1916 / Malaria, Sundargarh Dated the 25.11.04.
 Copy along with a copy of advance spray programme of PHCs forwarded to the Collector cum-Chairman-ZSSI(EMCP), Sundargarh for favour of information and necessary action with reference to this office memo No.1622 dt.14.10.04.

Chief District Medical Officer
 Sundargarh

M.O. to
 Kuarmunda
 PHC.

25/11/04

Annexure-IVd Advance action plan for IRS from DMO to PHCs/sub-centres

OFFICE OF THE CHIEF DISTRICT MEDICAL OFFICER : SUNDARGARH :
 No. 1880 /Malaria, Sundargarh Dated the 20.09.05 /
 To,

The Medical Officer In-Charge
 All PHC/CHC/UPHC in Sundargarh district.

Sub:- Revised I.R.S. Action Plan for 2nd Round 2005-06 of
 Sundargarh district.

Ref:- This Office letter No.851 dt.12.5.2005 and No.1844 dt.14.9.2005.

Sir/Madam,

With reference to the letter no cited above, I am to enclose herewith the revised I.R.S. Action Plan for 2nd Round 2005-06 of your PHC/CHC/UPHC for your needful action. The action plan has been prepared basing the annual malaria incidence report 2004 and also the inaccessible sub-centre.

Therefore, you are requested to instruct your spray In-Charge to prepare 7(Seven) copies of date wise, Sub-Centre wise Village wise advance spray programme for 2nd Round spray work and submit the same to this office by 26th Sept.2005 positively for necessary approval. The spray work should be started by 15th Sept,05 with the available stock of insecticide which was discussed during spray review meeting held on 5.9.2005 and must be completed before 10th December 2005. The further requirement of insecticides will be supplied to your PHC/CHC/UPHC very soon.

This may please be treated as spray urgent.

Yours faithfully,

[Signature]
 Chief District Medical Officer
 Sundargarh

Memo No. 1881 /Malaria, Sundargarh Dated the 20.09.05 /

Copy along with a copy revised projected Sub-Centers of the district submitted to the Joint Directed of Health Services (Malaria and Filaria), Orissa, Bhubaneswar / Project Director EMCP 5-Forest Park, Orissa, Bhubaneswar for favour of information and necessary action.

[Signature]
 Chief District Medical Officer
 Sundargarh

REVISED INDOOR RESIDUAL SPRAY ACTION PLAN (2nd ROUND) 2005-06 OF SUNDARGARH DISTRICT

Sl. NO	Name of PHC	Projected 2 nd Round 2005-06		DDT50%		S.P.5%		Insecticide to be required				Insecticide stock at PHC level			
		Sub-Centre	Popula tion	Sub-Centre	Popula tion	Sub-Centre	Popula tion	DDT 50%	SP 5%	SP 2.5%	SP 10%	DDT 50%	SP 5%	SP 2.5%	SP 10%
1	Hemgir	15	57273	7	28307	8	28966	2123	543	0	0	1607	0	0	0
2	Sargipali	17	55054	9	27647	8	27407	2073	514	0	0	2003	0	0	0
3	Mangasapur	14	51510	6	20926	8	30584	1570	571	0	0	1750	0	0	0
4	Kinjirkela	22	89717	9	31203	13	58514	2340	1100	0	0	2431	0	0	0
5	Majhapara	18	71365	8	29438	10	41927	2200	785	0	0	2186	0	0	0
6	Subdega	16	49870	3	12229	13	33641	915	700	0	0	153	0	0	0
7	Ekma	12	45430	6	20317	6	25113	1525	470	0	0	1145	0	0	0
8	Kutra	13	49986	3	13486	10	36500	1000	685	0	0	979	0	0	0
9	Laing	19	72377	7	29446	12	42931	2200	800	0	0	5235	0	16	19
10	Kuarmunda	20	74350	10	34883	10	39467	2615	740	0	0	3155	0	0	0
11	Haibari	24	87549	14	48333	10	39216	3625	735	0	0	4349	0	462	0
12	Bisra	9	44754	4	18840	5	25914	1413	485	0	0	1023	0	0	0
13	Birkera	22	80973	9	33997	13	46976	2550	880	0	0	1620	0	0	0
14	Koira	17	59953	6	23167	11	36786	1750	690	0	0	2172	0	0	0
15	Lahumipara	24	86544	9	28136	15	58408	2110	1095	0	0	4409	0	0	0
16	S.Balang	12	37360	7	20229	5	17131	1517	325	0	0	1465	0	0	0
17	Gurundia	16	67376	8	35915	8	31461	2690	590	0	0	3724	0	0	0
	TOTAL	290	1081441	125	456499	165	624942	34216	11708	0	0	39407	0	478	19


[Signature]
 Chief District Medical Officer
 Sundargarh

[Signature]
 District Medical Officer
 Sundargarh

SUB-CENTRE WISE REVISED ACTION PLAN FOR THE YEAR 2005-06
(2ND ROUND) KUARMUNDA PHC DISTRICT SUNDARGARH

Sl.No.	Name of Sub-Center	Population	API	Insecticide to be used	Remarks
1	Kuarmunda	5315	102.7	S.P.5%	
2	Teliposh	2736	36.1	-do-	
3	Kalosiria	3171	27.7	-do-	
4	Baniguni	3453	28.09	-do-	
5	Kumjharia	3987	21.5	-do-	
6	Dhangrinacha	3600	23.8	-do-	
7	Raiboga	4094	56.9	-do-	
8	Jhunmur	4040	31.9	-do-	
9	Kadobahal	4450	77.5	-do-	
10	Andali	4621	48.9	-do-	
	Total	39467		740 kg	
11	Padmapur	2988	14.3	DDT50%	
12	Kacharu	3201	20.9	-do-	
13	Rampur	3709	19.6	-do-	
14	Ushra	3807	15.4	-do-	
15	Indrapur	4100	10.0	-do-	
16	Dularpur	3206	8.7	-do-	
17	Simko	3475	11.7	-do-	
18	Majhapara	3364	15.7	-do-	
19	Dalki	3615	17.4	-do-	
20	Salangabaha	3418	42.7	-do-	
	Total	34883		2615 kg	
	G.TOTAL	74350			


District Malari Officer
Sundargarh


Chief District Medical Officer
Sundargarh

Annexure V. Guidelines for Junior Health Assistants/Sr Malaria Inspectors/ Supervisors

1. Storage

- ❖ There should be labeling of stores room as per FAO guidelines
- ❖ To make entry in stock register by date of arrival and issue.
- ❖ Drugs, mosquito nets should not be stored along with insecticides.
- ❖ Incidents of leakage should be recorded.

2. Transportation

- ❖ Do not carry insecticide with food items or medicines.

3. Spray activities

- ❖ Check the quality of spray pumps before one month of spray.
- ❖ Advance information of spray should be given to community before one day.
- ❖ All the equipments required for one spray squad (Stirrup pumps-2, Spare nozzle tip -1, bucket 15 lt-4, bucket 5-10lt-1, asbestos thread-3 metres, pump washers-2, measuring mug-1; straining cloth-one metre, plastic sheet(3x3 mt)-1 and soap-1) should be provided to spray squads.
- ❖ The discharge rate of spray pumps should be checked (740 to 850 cc per minute) before handing over the pumps to spray workers.
- ❖ Should ensure satisfactory coverage of rooms and households.
- ❖ Must educate the community about the significance of insecticidal spray.
- ❖ Community should be advised not to mud plaster or white wash the walls after spray.
- ❖ Should ensure to provide protective gears (apron, gloves, goggle and shoes) to spray workers

4. Disposal of empty containers

- ❖ Empty insecticidal containers should be collected back from spray workers.
- ❖ The empty plastic containers must be punctured/crushed so that they cannot be used for storing water food items.

5. Reporting of adverse health impacts

- ❖ Incidents of adverse health impacts should be reported at PHC.

Annexure-VI Guidelines on pocket size card for spray workers

- ❖ Use gloves for making suspension
- ❖ Wear goggles and mask while spraying
- ❖ Wash buckets and spray pumps away from water source
- ❖ Check the insecticide bags/ tins for any leakage.
- ❖ Use correct dosage of insecticide for making suspension and spray.
- ❖ Do not provide any amount of insecticide to villager
- ❖ Handover empty DDT bags, plastic/tin containers of insecticides to junior health assistant supervisor.

Back side with

Illustrations for illiterate persons

Discussion with state officials and community of Orissa



With DMO , Sundergarh



With supervisors ,DMO office Sundergarh



With spray supervisors



Popularisation of IRS programme by state Govt



With community leaders



Interaction with ANM



Storage practices for insecticides



Insecticides and mosquito nets stored at common place



Insecticides and mosquito nets stored at common place



Insecticides spread on floor



Storage of spray pumps in the houses of supervisor



Central store in Bhubaneswar



Insecticides stored in ward

Spray operations



Spray worker without proper gear



Spray worker without proper gear



Spray operation in a village



Spray worker with goggle and gloves



Spraying without protective gears

Discussion with state officials of Karnataka



With JD (malaria and filaria)



With state entomologist , MO and ROI IFW



With DHO Mandya



With DMO , Entomologist and superior



With DMO Tumkur



With MO , PHC Devalpura



With agriculture officer Mandya

Interaction with official and community



With ANM



with spray workers



With environmental engineer
Tumkur



with spray workers



With teacher in a village



Eliciting opinion of the
community

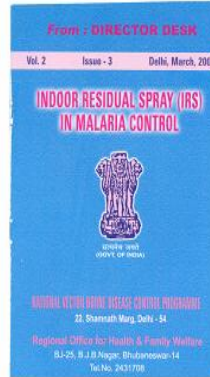
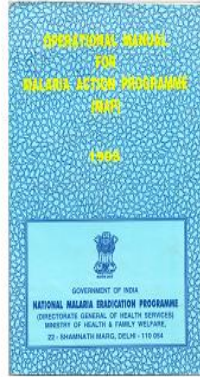


Eliciting opinion of the
community

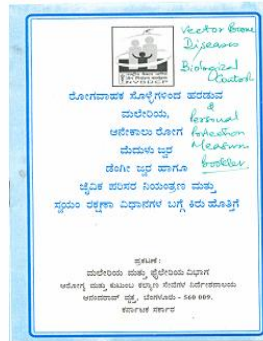
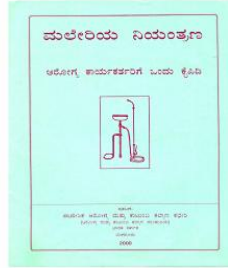


Spray workers of MC, Tumkur

IEC Material on malaria control
(from NVBDCP and ROHFW)



IEC Material on IRS and ITMN
(in regional language)



IEC Material on IRS and ITMN
(in regional language)



IEC Material on IRS and ITMN
(in regional language)

