



Ministry of Health & Family Welfare  
Government of India



# **National Strategic Plan** **Malaria** **Elimination in India**

2017–2022

National Vector Borne Disease Control Programme  
Directorate General of Health Services  
Ministry of Health and Family Welfare  
Government of India

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# **Malaria**

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# ACRONYMS

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|        |                                                                   |
|--------|-------------------------------------------------------------------|
| ABER   | annual blood examination rate                                     |
| ACT    | artemisinin-based combination therapy                             |
| ACT-AL | artemisinin-based combination therapy – artemether lumefantrine   |
| ACT-SP | artemisinin-based combination therapy – sulfadoxine pyrimethamine |
| AIM    | Action and Investment to defeat Malaria 2016–2030                 |
| An     | Anopheles                                                         |
| API    | annual parasite incidence                                         |
| APLMA  | Asia Pacific Leaders Malaria Alliance                             |
| APMEN  | Asia Pacific Malaria Elimination Network                          |
| ASHA   | accredited social health activist                                 |
| BCC    | behaviour change communication                                    |
| CHC    | community health centre                                           |
| CRPF   | Central Reserve Police Force                                      |
| CSR    | corporate social responsibility                                   |
| DDT    | dichlorodiphenyltrichloroethane                                   |
| GTS    | WHO Global Technical Strategy for Malaria 2016–2030               |
| G6PD   | glucose-6-phosphate dehydrogenase                                 |
| HCH    | hexachlorocyclohexane                                             |
| IEC    | information, education and communication                          |
| IPHS   | Indian Public Health Standards                                    |
| IRS    | indoor residual spraying                                          |
| ITN    | insecticide-treated net                                           |
| JMM    | joint monitoring mission                                          |
| LLIN   | long-lasting insecticidal net                                     |
| MDG    | Millennium Development Goals                                      |
| MDR    | multi-drug resistance                                             |
| MIS    | Malaria Information System                                        |
| NGO    | non-governmental organization                                     |
| NHM    | National Health Mission                                           |
| NVBDCP | National Vector Borne Disease Control Programme                   |
| NPSP   | National Polio Surveillance Project                               |
| NSP    | National Strategic Plan                                           |
| Pf     | Plasmodium falciparum                                             |
| PHC    | Primary Health Centre                                             |
| Pv     | Plasmodium vivax                                                  |
| RBM    | Roll Back Malaria Partnership                                     |
| RDT    | Rapid Diagnostic Test                                             |
| SC     | Sub-centre                                                        |
| SP     | Synthetic pyrethroids                                             |
| SPR    | Slide Positivity Rate                                             |
| TMAP   | Tribal Malaria Action Plan                                        |
| UMS    | Urban Malaria Scheme                                              |
| UT     | union territory                                                   |
| WHO    | World Health Organization                                         |

# ACKNOWLEDGEMENT

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The National Strategic Plan for Malaria Elimination in India (2017-22) has been developed by Directorate of National Vector Borne Disease Control Programme (NVBDCP) with the support of World Health Organization (WHO) through an extensive consultative process including several interactive & brainstorming sessions. The purpose of the document is to provide a roadmap for progress towards malaria elimination aligned with the commitment of the Ministry of Health and Family Welfare, Government of India in making India malaria free by 2027.

The National Strategic Plan (NSP) has been developed under the overall guidance of Dr. P. K. Sen, Director, NVBDCP and Dr. A. C. Dhariwal, Director, NCDC (Former Director, NVBDCP). The technical aspects of NSP document have been coordinated by malaria team headed by Dr. Neeraj Dhingra, Addl. Director and Dr. Avdhesh Kumar, Addl. Director, Dr. S.N.Sharma, Joint Director, Dr. Sher Singh Kashyotia, Joint Director and Dr. Suman Wattal, Deputy Director. Contribution made by Dr. P.K. Srivastava, Joint Director and all the officers and consultants of Dte. NVBDCP are sincerely acknowledged.

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## EXECUTIVE SUMMARY

Over the past 15 years, India has made considerable progress in reducing its malaria burden. It has a vision of a malaria-free country by 2027 and elimination by 2030. However, the country still faces daunting challenges as malaria epidemiology exhibits enormous heterogeneity and complexity. The disease is mainly concentrated in tribal and remote areas of the country.

The National Strategic Plan (NSP) for Malaria Elimination (2017–2022) has been developed based on the National Framework for Malaria Elimination (NFME) of the National Vector Borne Disease Control Programme (NVBDCP), Ministry of Health & Family Welfare (MoHFW), Government of India and World Health Organization (WHO) Global Technical Strategy for Malaria Elimination (2016–2030). NSP for Malaria Elimination (2017–22) has been prepared through active participation and extensive consultation processes involving state programme officers, regional directors, international experts from WHO, research and academic institutions such as National Centre for Disease Control (NCDC) and Indian Council of Medical Research, civil society and other stakeholders. NVBDCP acknowledges the support of WHO SEARO and WHO WR in formulation of this document.

Malaria transmission is a local-focal problem and hence district will be the operational unit and all districts/reporting units have accordingly been stratified into four categories based on reported annual parasite incidence (API) for the years 2015:

| Category of districts                            | Definition                                                                                                                                                                                                                      | Number (%) |
|--------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Category 0: Prevention of re-establishment phase | Districts/units historically considered to be without local transmission and reporting no case for last 3 years. Vigilance will be maintained in these districts to prevent reintroduction of malaria in view of climate change | 75 (11.0)  |
| Category 1: Elimination phase                    | Districts/units having API less than 1 per 1000 population                                                                                                                                                                      | 448 (66.1) |
| Category 2: Pre-elimination phase                | Districts/units having API 1 and above, but less than 2 per 1000 population. These are targeted for elimination in the subsequent years                                                                                         | 46 (6.8)   |
| Category 3: Intensified control phase            | Districts/units having API 2 and above per 1000 population. These are positioned for elimination targeting in the subsequent years                                                                                              | 109 (16.1) |

The above classification is more granular than the classification given in the NFME, which was state focused. However, this has been done after extensive discussion with experts to initiate the monitoring of impact indicator at a more peripheral unit in preparation for elimination. It is further clarified that the decision for different interventions including long-lasting insecticidal net (LLIN) distribution and indoor residual spray would continue to be sub-centre based within the districts.

The goals of NSP strategy are phased elimination of malaria in India. National Framework for Malaria Elimination (NFME) in India has set 2030 as eliminating malaria and goals of NSP are in consonance with overall goals

- Eliminate malaria in Category 1 districts (API <1) by 2020 and Category 2 districts (API 1–2) by 2022,
- Reduce transmission in Category 3 districts to stabilize API at <1 by 2022.

### **Specific objectives of NSP are as follows:**

- Achieve universal coverage of case detection and treatment services in endemic districts to ensure 100% parasitological diagnosis of all suspected malaria cases and complete treatment of all confirmed cases.
- Strengthen the surveillance system to detect, notify, investigate, classify and respond to all cases and foci in all districts to move towards malaria elimination.
- Achieve near universal coverage of population at risk of malaria with an appropriate vector control intervention.
- Achieve near universal coverage by appropriate BCC activities to improve knowledge, awareness and responsive behavior regarding effective preventive and curative interventions for malaria elimination.
- Provide effective programme management and coordination at all levels to deliver a combination of targeted interventions for malaria elimination.

In districts where transmission is interrupted, the goal will be to maintain malaria-free status and prevent reintroduction, with particular emphasis on tackling the problem associated with imported malaria. The probability of malaria becoming re-established in a malaria free area varies according to the area's receptivity and vulnerability. When importation of malaria (e.g. migrant workers from a malaria endemic area) coincides with high receptivity (e.g. halting of anti-malaria measures or of socioeconomic changes) re-establishment of malaria transmission can occur. The following activities will be implemented in such areas:

- Establishing reliable malaria case and entomological surveillance system with full coverage of malaria risk areas.
- Maintain epidemiological and entomological capabilities with an effective operational research component to determine risk and underlying causes of transmission resumption.
- Ensure easy access to reliable laboratory diagnosis and effective and radical treatment for every individual.
- Establish a system for early warning of any impending outbreak/epidemic, preparedness and response.
- Ensure participation of at-risk communities and population groups in malaria prevention activities.

Malaria elimination is a dynamic process and there is increasing recognition of the importance of malaria elimination as a long-term goal. However, it remains difficult to facilitate the transition to elimination without the long-term political and financial support that elimination requires. Advocacy is an important tool that the programme and partners should use to support the transition to elimination and sustain gains made in malaria control. Institutional structures created under the National Health Mission at the Central level, i.e. Mission Steering Group (MSG) under the Chairpersonship of Union Health Minister, Govt. of India; State Health Mission (SHM) under the Chairpersonship of state Health Minister at state level; district health mission under the chairpersonship of zila parishad president; block pramukh at block level; and village pradhan at village level for village health sanitation & nutrition committee/gramin kalyan samiti will be leveraged for mounting advocacy campaigns for malaria elimination. MSG will meet annually, while SHM will meet biannually and institutions at district, block and village levels will meet at quarterly intervals to ensure sustained political commitment by the government and other stakeholders at different levels for elimination of malaria. Communities affected by malaria will be engaged as active participants in elimination for identifying priorities and influencing local programming approaches. It is well recognized that community involvement and ownership can be important drivers of programme success and all possibilities will be explored in promoting community mobilization and participation at all levels of implementation.

To ensure continued progress towards the goal and objectives of malaria elimination, the implementation of all intervention areas must be regularly monitored and critically evaluated. The purpose of the Monitoring and Evaluation (M&E) system is to track the execution of the NSP for Malaria Elimination 2017–2022 and measure whether the set of objectives are being met in accordance with the proposed timelines. Monitoring the NSP objectives on a routine basis will allow NVBDCP to identify which activities are successfully implemented and which require additional support (financial or technical). By allowing programme implementers to understand the processes, impact and outcomes of the implemented interventions, the M&E system will promote evidence based decision-making to facilitate corrections during implementation. Through proper interpretation of the collected data, corrective action will be taken to improve ineffective practices, and best practices can be implemented across multiple intervention areas. The programme will develop a M&E plan for each level of implementation, i.e. at national, state, district, block and sub-centre levels, considering the local context.

MoHFW will ensure that the required programme management capacity is available at all levels of the health system. NVBDCP will support programme units at state and district levels to hire and train additional human resources to perform the activities outlined in the NSP framework. An independent national malaria elimination committee/task force would ensure effective and efficient implementation of the NSP and monitoring of the overall goal of elimination. Swacch Bharat Abhiyan and Digital India are proposed to be taken as enablers and catalysts to achieve the goal of malaria elimination.

The Integrated Disease Surveillance Programme would be involved through their network in generating early warning signals and rapid responses thereto to any impending malaria outbreak situation, and would supplement the NVBDCP team in liquidating the foci of malaria infection. Institutions like NCDC, National Institute of Malaria Research, National Institute for Research in Tribal Health, Vector Control Research Center, National Institute of Health and Family Welfare, All India Institute of Medical Sciences and medical colleges are involved in providing support for malaria elimination in terms of capacity building, research input, generating evidences, documentation and developing and testing new innovative tools, and would continue to be so involved.

The National Polio Surveillance Project (NPSP), a collaborative project of the Government of India and WHO would be leveraged to provide additional technical and operational support for malaria elimination in India. They would be involved in strengthening surveillance particularly case-based surveillance and foci investigation, mapping and monitoring of migrant, mobile and other high-risk populations at risk of malaria for focused interventions, capacity building, reorientation of formal and informal private sector health-care providers in malaria case detection and treatment, supervision and monitoring of programme implementation and real-time reporting to the surveillance system.

The role of civil society has been envisioned to be crucial for community engagement in malaria elimination in NSP. Indian Medical Association and other professional bodies including NGOs would have an important role in disseminating and advising its members to adhere to the programme guidelines.

The resource requirement for malaria elimination would be to the tune of ₹10653.16 Crores for a period of 5 years and would be managed from Government sources of different ministries, corporate sector as a part of their corporate social responsibility and the international donors.

Year wise detailed budget break up is given below.

| Sr. No                    | Activity Type                                | Includes                                                                                                                                                                                                                                                                             | 2017-18        | 2018-19        | 2019-20        | 2020-21        | 2021-22        | Total           |
|---------------------------|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|-----------------|
| 1.                        | Prevention                                   | Distribution of LLINs & IRS in high endemic areas                                                                                                                                                                                                                                    | 354.32         | 482.39         | 452.08         | 569.96         | 1016.02        | 2874.78         |
| 2.                        | Case management                              | Diagnosis and Treatment of Malaria cases (p.falciparum, p. vivax, severe & Mix)                                                                                                                                                                                                      | 242.74         | 269.43         | 298.60         | 330.46         | 365.22         | 1506.45         |
| 3.                        | Programme-Specific Human Resources           | Consultants, IT and Administrative staff related to program at National, Regional, State, District level and also provision for CDW against vacant position of MPW in States (This does not include permanent staff positions at state level involved in malaria related activities) | 140.98         | 1092.50        | 1151.72        | 1214.16        | 1279.98        | 4879.34         |
| 4.                        | Training                                     | Training of DMO/SPO, Lab Technician, Medical Officers, ASHA, Consultants, Entomologists, Private provider, Informal provider etc. on various aspects of disease management, financial management, IT, Logistic etc.                                                                  | 69.88          | 97.39          | 27.19          | 28.49          | 27.13          | 250.08          |
| 5.                        | Training Cell at National and Regional Level | Setting up and maintenance of training cell at National and Regional offices for capacity building of HR                                                                                                                                                                             | 2.30           | 1.77           | 1.87           | 1.97           | 2.08           | 9.98            |
| 6.                        | Supervision                                  | Supervision visit of National and Regional director are to state and health facilities respectively.                                                                                                                                                                                 | 5.81           | 6.12           | 6.45           | 6.80           | 7.17           | 32.36           |
| 7.                        | Monitoring and Evaluation                    | Development and maintenance of IT platform for real time monitoring of disease progression, reporting of cases from various sources of information, purchase of IT hardware infrastructure and collection and evaluation of cases reported at various levels.                        | 175.04         | 98.49          | 39.33          | 49.29          | 55.46          | 417.62          |
| 8.                        | Infrastructure and Equipment                 | Purchase of Microscopes at health facilities for replacement of old microscope                                                                                                                                                                                                       | 33.00          | 34.79          | 36.67          | 38.66          | 40.76          | 183.89          |
| 9.                        | Transport                                    | Purchase of vehicles, maintenance, POL etc.                                                                                                                                                                                                                                          | 42.92          | 38.28          | 6.10           | 6.42           | 6.78           | 100.50          |
| 10.                       | Communication, Media & Outreach              | Development of communication strategy, mass media campaign development and implementation through Newspaper, Outdoor (Hoarding, Wall Painting), Radio, Television, Flyers, Posters etc.                                                                                              | 34.62          | 36.24          | 38.20          | 40.27          | 42.46          | 191.79          |
| 11.                       | Advocacy                                     | Planning of advocacy strategy and advocacy meetings at various levels from National to State, District and Village level                                                                                                                                                             | 28.11          | 29.60          | 31.20          | 32.94          | 34.67          | 156.52          |
| 12.                       | General Programme Management                 | Designing and annual review of country strategy, Development of annual work plans, Development of HR Plan and other program coordination meetings                                                                                                                                    | 0.18           | 0.18           | 0.20           | 0.20           | 0.22           | 0.98            |
| 13.                       | Committee / Task Force / Advisory Group      | National level advisory committee to be formed to provide technical inputs on program implementation meeting twice a year                                                                                                                                                            | 0.11           | 0.11           | 0.12           | 0.13           | 0.13           | 0.60            |
| 14.                       | Guidelines and SOPs                          | Development and publishing of various guidelines, manuals, treatment protocols related to Malaria                                                                                                                                                                                    | 0.76           | 0.04           | 0.11           | 0.02           | 0.23           | 1.16            |
| 15.                       | Reports and Policy Briefs                    | Publication of annual reports, fact sheets, policy briefs on regular interval.                                                                                                                                                                                                       | 0.12           | 0.09           | 0.09           | 0.10           | 0.10           | 0.51            |
| 16.                       | Research & Survey                            | Research in the area of behavioural change, efficacy and effectiveness of interventions, Cost-effectiveness analysis, etc. Also includes large scale survey for Mid-term evaluation (2019-20) and end term evaluation (2021-22) of Malaria Elimination Program.                      | 9.66           | 7.23           | 12.018         | 7.10           | 10.45          | 46.61           |
| <b>TOTAL Cost of NMEP</b> |                                              |                                                                                                                                                                                                                                                                                      | <b>1140.56</b> | <b>2194.66</b> | <b>2102.12</b> | <b>2326.96</b> | <b>2888.87</b> | <b>10653.16</b> |

# 1. INTRODUCTION

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Malaria continues to be a public health problem in India with socio-economic implications as the disease is more prevalent in rural, tribal and forested underserved areas. However, during last decade there has been availability of newer tools for effective prevention and control of Malaria, paving the way for elimination. The current package of core interventions – namely, vector control, diagnosis and treatment – has proved to be highly cost-effective and needs to be further expanded in order to bring down the incidence to zero.

Many challenges threaten continued progress. To name a few, emerging parasite resistance to anti-malarial medicines and mosquito resistance to insecticides could, if left unaddressed, render some of the current tools ineffective and trigger a rise in malaria morbidity and mortality. To avert

and delay these challenges, there is an urgency to avail the opportunity to accelerate progress towards elimination. Accordingly, World Health Organization (WHO) has developed the Global Technical Strategy (GTS) for Malaria Elimination 2016-2030 and recently in 2017 released a framework for malaria elimination. This Strategy sets ambitious but attainable goals for 2030, with milestones along the way to track progress. Sustainable Development Goals (SDGs) also talks of accessibility and equity of health services with the targets of end the epidemics of AIDS, TB, malaria and NTDs by 2030.

**The Hon'ble Prime Minister of India was among the 18 Leaders, who endorsed the Asia Pacific Leaders' Malaria Alliance (APLMA) malaria elimination road map at the East Asia Summit held at Kuala Lumpur, Malaysia, in November, 2015 and agreed to the goal of a region free of malaria by 2030.**

In accordance with the Global Technical Strategy (GTS) for malaria elimination 2016–2030 and commitment made to APLMA, the National Vector Borne Disease Control Programme (NVBDCP), Ministry of Health & Family Welfare, Government of India has launched the National Framework for Malaria Elimination (NFME) on 11 February 2016 towards commitment to malaria elimination by 2030. Malaria elimination in India will be carried out in a phased manner because States differ in malaria burden attributed to systemic and technical obstacles, such as the inherent weakness of health systems, including poor disease surveillance and a lack of adequate technical and human resource capacity; the high prevalence of asymptomatic infections, which contribute to disease transmission; the complex biology of the malaria parasites; and the diversity of vectors and their behavior.

In sync with NFME, the National Strategic Plan (NSP) for the period 2017-22 has been developed in which focus is on district based planning, implementation and monitoring. The document includes the vision, goals and objectives, guiding principles, strategies situation analysis and activities to be undertaken in relation to malaria prevention including vector control, case management activities, IEC and social mobilization, human resources development, HMIS, M&E and operational research. Further the document indicates the monitoring, evaluation indicators of the programme, budget implications and schedule for the implementation of the strategic plan.

## 2. GLOBAL SCENARIO AND EXPERIENCES OF MALARIA ELIMINATION IN OTHER COUNTRIES

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- Globally, a total of 32 countries and territories have received official WHO certification of malaria elimination.
- An attempt has been made to study the elimination processes in these countries and lessons learnt are as under:
- A conducive environment, including political, social, financial, operational, and technical factors, is imperative for successful elimination.
- As history has taught us, a universal approach is ineffective, and each country or region pursuing elimination should thoroughly assess their situation and develop a strategy for elimination and prevention of reintroduction.
- Critical activities that a malaria programme must take on to achieve elimination is similar to the activities needed to maintain controlled low-endemic malaria, and should be well established before the launch of a elimination efforts.
- High coverage with appropriate vector control interventions and with diagnostic and case management services should be established and maintained.
- Data collection should be well designed and rigorously undertaken, and a high standard of programme management is essential.
- As elimination approaches, these activities should continue, but will become more focal as the heterogeneity of malaria transmission increases.
- Elimination needs a relentless focus on surveillance and response, and especially on the identification and rapid elimination of foci of all infections, both symptomatic and asymptomatic.
- In addition to the need for sophisticated surveillance and response systems, requirements for active case detection at borders, screening of high risk migrants, and implementation of cross-border and regional initiatives.
- A further elimination-specific intervention is mass drug administration or some form of mass or focused screening and treatment. Although experience of these techniques in some parts of the world has been discouraging, several countries, including China and Vanuatu have successfully used mass drug administration. A comprehensive review of country experience with mass drug administration, screening and treatment is urgently needed, with a particular focus on Asia.
- The research agenda that is especially relevant to countries trying to eliminate malaria consists of a short-term operational research to improve the effectiveness of present anti malarial interventions.
- Each country has willing and competent non-governmental partners whose help should be harnessed through effective collaborations. For example, the mining industries, faith-based organisations, community groups and other groups have been active in malaria programmes but could do much more.
- With immunisation, the maintenance of an expensive public health intervention in the absence of disease is common place and thought to be a cost-effective investment. However, experience in malaria shows that when the disease falls to low rates and is no longer an obvious threat, political leadership, support, and investment diminish and interventions are often discontinued.
- New approaches are needed to maintain the necessary political commitment, community engagement, and investment to eliminate malaria and prevent its reintroduction. Some countries, such as Singapore, have achieved this goal by responding to malaria through a broader capacity for other vector-borne diseases, especially dengue fever.
- Sri Lanka could achieve elimination by deploying malaria mobile clinics besides strengthening surveillance system.

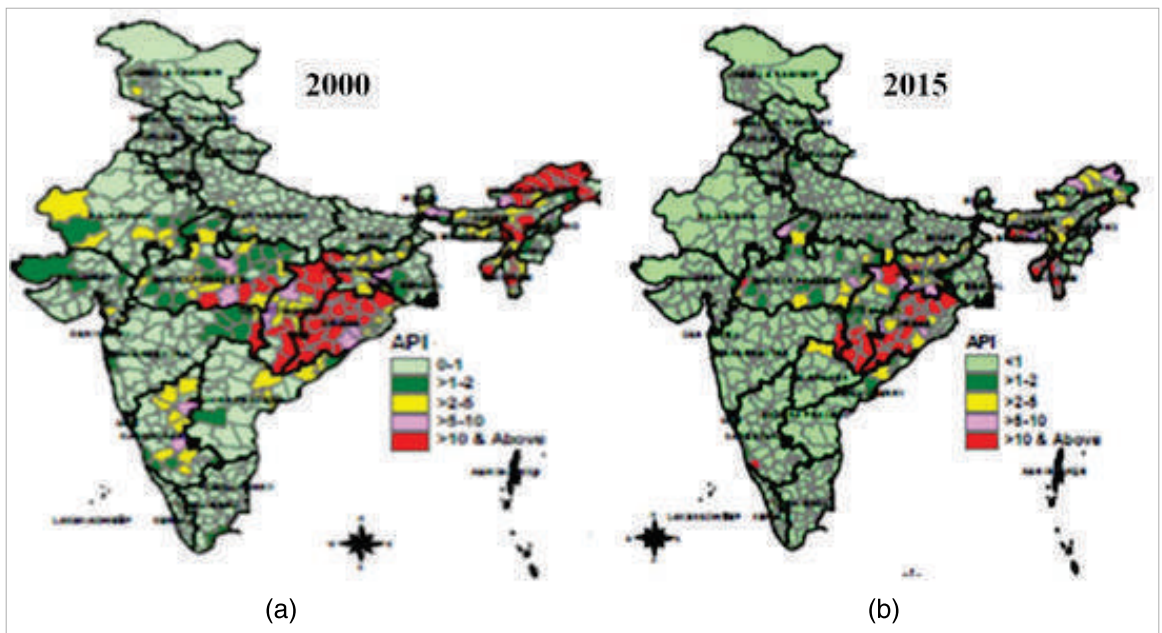
### 3. CURRENT EPIDEMIOLOGICAL PROFILE OF MALARIA

Disease burden due to malaria in India has been reduced significantly over the years with an overall decline in malaria-related morbidity and mortality. This has been made possible by a series of interventions undertaken in the last decade, such as the introduction of artemisinin-based combination therapy (ACT) for *P. falciparum* malaria in 2004–05, introduction of malaria rapid diagnostic tests (RDTs) for detection of *P. falciparum* cases in 2004–05 and bivalent RDT in 2013, imposition of a country-wide ban on oral artemisinin monotherapy in 2009, introduction of long-lasting insecticidal nets (LLINs) in 2009, revision of the National Malaria Drug Policy in 2013, support from Development Partners, Civil Society, additional manpower provided to states, involvement of ASHAs etc.

#### Current Malaria Burden in India

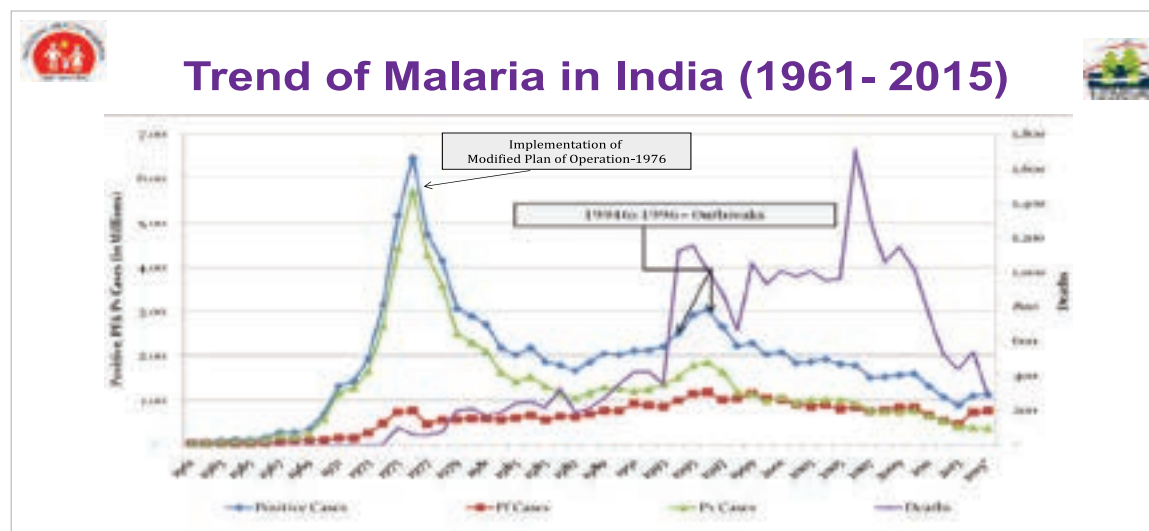
As per the World Malaria Report 2016, India contributes for 89% of the total malaria incidence in the South-East Asia Region. However, reduction in malaria-related morbidity and mortality between 2000 and 2015, the country achieved Goal 6 of the Millennium Development Goals (MDGs). The shrinking map of malaria is shown in Figure 1. There are a total of 660 reporting districts in the country and 18 other reporting units like corporations etc., making a total of 678 reporting units. ABER has risen because of greater involvement of ASHAs in community level diagnosis and treatment of malaria.

Fig 1: Malaria Burden In India And Its Regional Distribution, 2000 & 2015



It shows that malaria map in India is shrinking. High transmission areas have become low transmission areas. Detailed malaria burden for the last 3 years is given at Annex. 1 and in Annex 2 categorization of States.

**Fig 2: Malaria Trends In India**



## HIGH RISK AREAS FOR MALARIA TRANSMISSION

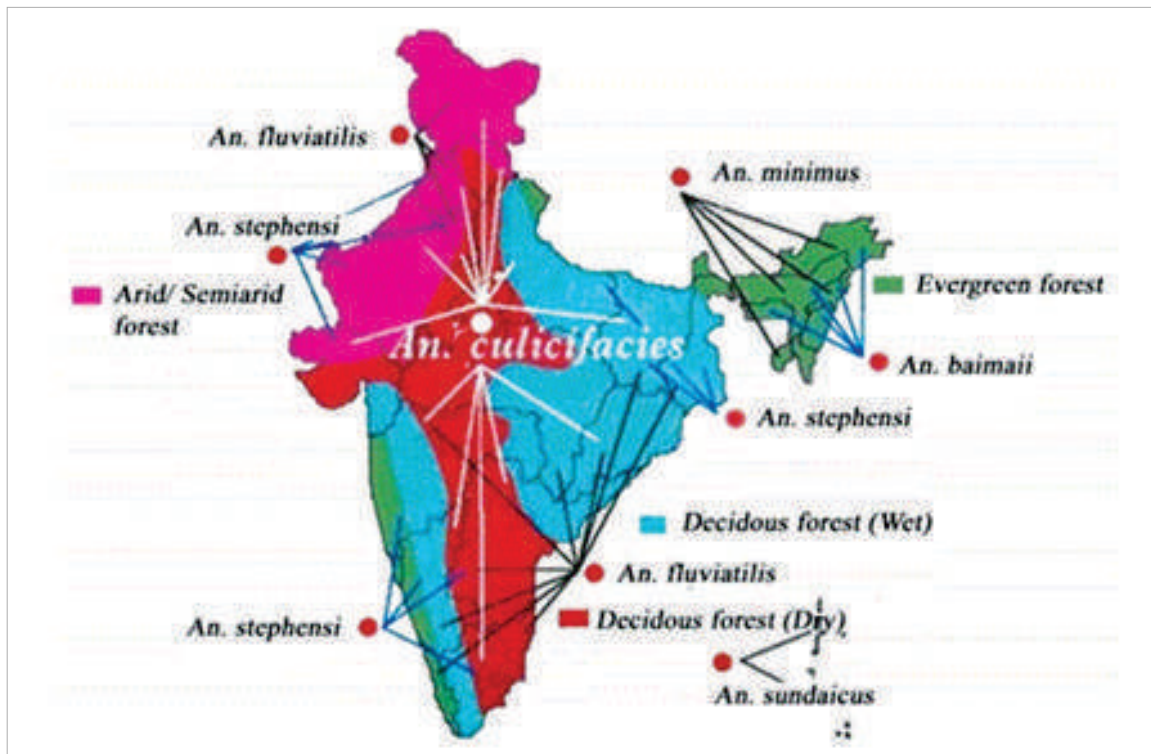
At present, malaria affects all population groups in the country, regardless of gender or age, although children and pregnant women are at higher risk. The majority of malaria in India is reported from the eastern and central part of the country and from states which have large forest, hilly and tribal areas. These states include Odisha, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra and some north-eastern states like Tripura, Meghalaya and Mizoram. These states have more or less perennial transmission of malaria due to a number of factors, such as presence of large conflict-affected, hilly and forest areas with poor access and inadequate health infrastructure. Additionally, there is low community awareness on malaria prevention and control among the tribal population in these areas which makes the task of transmission reduction even more challenging. On the other hand, in states and UTs with low levels of malaria transmission, the majority of the malaria occurs as a result of continuous influx of mobile and migrant populations from neighbouring moderate or high endemic states and bordering countries. During the months from June to September, the country experiences the monsoon season characterised by heavy rains across different states of the country. It is during these months that maximum transmission of malaria takes place. In the immediate post-monsoon period from October to December, collection of rainwater in pits and puddles promotes mosquito breeding and subsequently the transmission of malaria.

## MALARIA VECTORS IN INDIA

Malaria in India is mainly caused by two major malaria parasites namely *Plasmodium falciparum* and *Plasmodium vivax* (though cases of malaria from *Plasmodium ovale* and *Plasmodium malariae* have also been reported from some parts of the country). *P. falciparum* (Pf) and *P. vivax* (Pv) are the most common species causing malaria in the country. While *P. vivax* is more prevalent in the plains, *P. falciparum* predominates in forested and peripheral areas. The disease is transmitted by nine Anopheline species out of which the six primary vectors are *Anopheles culicifacies*, *Anopheles stephensi*, *Anopheles fluviatilis*, *Anopheles dirus*, *Anopheles minimus* and *Anopheles epiroticus* (previously known as *Anopheles sundaicus*).

**Fig 3: Distribution Of Malaria Vectors In India**

**Figure 1: Distribution of main malaria vectors in India**



Source: National Vector Borne Disease Control Programme

### Key characteristics of these vectors are summarised below

- *An. culicifacies* is widespread in peninsular India. It is the main vector of malaria in rural plains areas and peri-urban areas. It is found in a variety of natural and man-made breeding sites. It is highly zoophilic as a result of which the presence of a high density of cattle relative to that of humans limits its vectorial capacity.
- *An. stephensi*, which often shares breeding sites with *An. culicifacies* has developed a strong propensity for artificial containers, and is responsible for malaria in urban and industrial areas.
- *An. fluviatilis* is the main vector of malaria occurring in hilly areas, forests and forest fringe areas in many states, especially in the eastern part of the country
- *An. minimus* is the vector responsible for malaria occurring in foothills of north-eastern states of the country.
- *An. dirus*, an important forest vector in the North-East, is well known for its exophilic behaviour.
- *An. epiroticus*, a brackish-water breeder, is restricted to causing malaria in the UT of Andaman & Nicobar Islands.

In India, DDT and hexachlorocyclohexane (HCH) were introduced for public health use (vector control) during the 1950s, and malathion was brought in for vector control during the 1960s. In 1997, HCH was banned from public health use and this insecticide is not used for vector control any more. Use of DDT and malathion continues in the NVBDCP, primarily for indoor residual spraying (IRS) and space spraying (malation), respectively. Synthetic pyrethroids (SP) have been introduced during the last one and a half decades for IRS and impregnation of mosquito nets. This is the only insecticide group recommended for net treatment. Currently, insecticides of the organochlorine (DDT), organophosphate (malathion) and synthetic pyrethroid (deltamethrin, cyfluthrin, lambdacyhalothrin, alphacypermethrin, permethrin, bifenthrin) groups are used for the control of vectors in India. Carbamates are not used as they are expensive and possess high mammalian toxicity.

## 4. CHALLENGES AND GAP ANALYSIS OF MALARIA CONTROL IN INDIA

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### **Population movements, often uncontrolled across states/UTs, and sharing of large international borders with neighbouring malaria endemic countries**

There are 36 states and union territories in India, most of which share large borders with each other. This often leads to the spread of malaria from one state to another due to movement of populations. With different administrative structures and variable functioning of health systems in each state, management of malaria in such mobile and migrant populations becomes difficult. Additionally, some of the high-endemic states including north-eastern states share their border with neighbouring countries such as Myanmar and Bangladesh where malaria is still prevalent and there is a persistent threat of influx of malaria cases from these countries. There is also a growing threat of the spread of malaria multi-drug resistance including ACT resistance as a result of sharing these international borders.

#### **4.1 Shortage of skilled human resources**

The programme is adversely affected by an insufficient number of sanctioned posts of health workers and other programme staff in different parts of the country. For instance, there are about 40,000 multipurpose health workers (MPWs) against approximately 80,000 sanctioned posts for nearly 150,000 sub-centres (SCs) across the country. Additionally, there is a shortage of qualified entomologists in the country leading to poor vector surveillance and a lack of robust data on entomological aspects of malaria.

#### **4.2 Insecticide resistance**

The extensive use of insecticides, particularly DDT, under the vector control programme controlled malaria to a great extent but exerted high selection pressure on the vector population to develop resistance. Among the six primary vectors of malaria in India, resistance to DDT has been widespread in *An. culicifacies* (district level), but malathion resistance in this species is localized and except for a few reports of reduced susceptibility this species remains largely susceptible to synthetic pyrethroids.

#### **4.3 Others**

- Limited Sub-optimal health system functioning in some States/ UTs impeding progress in malaria prevention and control
- Lack of integration with private sector leading to poor estimation of actual disease burden due to Malaria
- Sustenance of an effective procurement and supply chain
- Lack of robust monitoring and evaluation system including fully functional national MIS or geo-referencing
- Accordance of high priority to Malaria among communicable diseases
- Access to conflict-affected, tribal areas and other hard-to-reach areas with high Malaria endemicity
- Sustained financial and political commitment along with effective partnerships essential for success of Malaria prevention and control effort
- Threat of spread of Artemisinin resistance from neighboring countries

## 5. NATIONAL STRATEGIC PLAN

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### 5.1 Vision

Aligning with the vision of NFME, the NSP 2017-22, focuses strategic policies to provide universal intervention package, paving the way for malaria elimination by 2030.

#### **Definition of Malaria Elimination**

“Interruption of local transmission (reduction to zero incidence of indigenous cases) of specified malaria parasite species in a defined geographical area as a result of deliberate activities. Continued measures to prevent re-establishment of transmission are required.”  
(WHO 2017. *A Framework for Malaria Elimination*)

### 5.2 Goal

- Eliminate malaria (zero indigenous cases) by 2022 in all the districts of 26 States/UTs of existing category-1 and 2 and in districts having API <1 of Category-3 states.
- All remaining districts (having API > 2) to be brought into pre-elimination and elimination phase; and
- Maintain malaria-free status in areas where malaria transmission has been interrupted and prevent re-introduction of malaria by strengthening surveillance.

### 5.3 Objective

The overall objective of the NSP 2017-22 is to consolidate the achievements of the previous National Strategic Plan 2012-17 and sustain its impacts. The overall objective of the strategic plan will be attained through the following specific objectives:

- Achieve universal coverage of case detection and treatment services in endemic districts to ensure 100% parasitological diagnosis of all suspected malaria cases and complete treatment of all confirmed cases.
- Strengthen the surveillance system to detect, notify, investigate, classify and respond to all cases and foci in all districts to move towards malaria elimination.
- Achieve near universal coverage of population at risk of malaria with an appropriate vector control intervention.
- Achieve near universal coverage by appropriate BCC activities to improve knowledge, awareness and responsive behavior regarding effective preventive and curative interventions for malaria elimination.
- Provide effective programme management and coordination at all levels to deliver a combination of targeted interventions for malaria elimination.

### 5.4 Guiding Principles

The following guiding principles will determine the direction and pace of malaria elimination in districts and States:

- Political commitment, leadership and ownership by States/Districts.
- Equitable access to services, especially for the most vulnerable and underserved geographical/populations at risk of malaria.
- Quality healthcare service delivery.
- Community mobilization and participation.
- Inter-sectoral approach involving all stakeholders.
- Promote Innovative tools and newer approaches by having operational research.
- Delegation of responsibility and fixing accountability.

#### **Enabling Environment for Malaria Elimination**

- “**Swacch Bharat**” for Elimination of mosquitogenic condition and upcoming National Mosquito Control Mission,
- “**Digital India**” for Real Time Monitoring, Capacity Building and Communication, and

## **5.5 Strategy**

The Strategies for achieving the goal and objectives of NSP is divided into the following four components based on WHO recommended principles and pillars and adapted to India:

- Diagnosis and Case Management
- Surveillance and Epidemic response
- Prevention –Integrated Vector Management
- Cross-cutting interventions- Advocacy, Communication and Community Mobilisation, Programme management and coordination, Monitoring and Evaluation, Research & Development

## 6. DIAGNOSIS AND CASE MANAGEMENT

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### 6.1 Situation Analysis:

Diagnosis and case-management of malaria are essential components to know whether the Programme is in the control phase or the elimination phase. In both settings, all suspected cases of malaria must be confirmed with a parasitological test and promptly treated for radical cure for the benefit of the individual patient as well as community to ensure that the malaria cases within the population achieve complete cure and do not transmit the disease further.

- Health care services in India are provided by the Government as well as private sector. In tribal and rural areas, some proportion of people seek treatment from traditional faith healers also.
- Under the Government system, malaria case detection at peripheral level is done by ASHAs/ Health Workers at the community level and through about 25000 CHCs/PHCs spread across the country at the institutional level.
- In addition, District level hospitals provide both outpatient as well as inpatient care. In order to ensure that all severe cases of malaria in high malaria endemic areas of the country are treated effectively. The Programme has ensured that two Sentinel Surveillance Hospitals (SSHs) are identified in each of the high endemic districts of 18 States for specialised care and treatment and averting deaths in complicated cases.
- To ensure access to malaria diagnosis and treatment bivalent Pf/Pv antigen detecting RDTs were introduced in 2012-13, with prioritised deployment and use in remote and inaccessible high malaria endemic areas where microscopy facilities are not within reach to ensure diagnosis and treatment within 24 hours of onset of fever.
- This has gone a long way in detecting the Pf and Pv cases in remote areas within a short time through ASHAs at the patients doorstep or as close to the patient's home as possible, with antimalarial drugs being administered through the ASHAs/ Hws.
- The frontline health workers ASHAs/HWs are expected to be well trained for this purpose and have been given strict instructions to refer all severe and complicated cases after administering the first dose of antimalarials to the nearest or identified hospital where s/he has to be managed according to the National guidelines for treatment of severe malaria cases.
- Active case detection (ACD) is also done in high malaria endemic areas during transmission season and outbreaks.
- Developing partnerships with the private sector and traditional faith healers remains a challenge in malaria diagnosis and treatment for which Programme is trying to develop strategies for partnership and data sharing.
- Maintaining skills and quality of diagnostic services is another major challenge for the Programme for which effective quality assurance system and regulatory mechanisms a PQre being put in place. Though many important steps have been initiated in this direction for both quality assurance of RDTs as well as microscopy, strengthening of the National Quality Management System (NQMS) through a National Quality Management Network (NQMN) is envisaged on par with international standards.
- Monitoring and review of the malaria cases has revealed that there is considerable delay in diagnosis since the onset of symptoms despite the availability of diagnostic services which favours transmission.
- A large number of asymptomatic malaria cases in high endemic areas are left untreated as Programme does not have the policy for screening of asymptomatic carriers. These issues should be addressed for clearing the large reservoir of infection in high endemic areas for achieving elimination.

- Implementation of the policy is ensured through regular reporting, advisories, circulation of guidelines, review meetings and regular monitoring for compliance and adherence to guidelines.

## **6.2 Policy/ Guidelines:**

Diagnosis and Treatment Guidelines are available and are expected to be followed by all health care providers in India. They include the following key policies and strategies:

### **6.2.1. Diagnosis:**

- Clinical diagnosis of malaria has poor accuracy and results in inappropriate management of febrile illness and wastage due to indiscriminate use of antimalarial medicines.
- Presumptive treatment is not recommended routinely. Treatment is recommended only after parasitological confirmation of suspected malaria case is done through prompt quality-assured diagnostic testing (quality microscopy or quality-assured RDTs) in all settings.
- Although microscopy remains the 'Gold standard', both Pf/Pv antigen detecting bivalent RDTs as well as microscopy are recommended by NVBDCP for parasitological confirmation of a suspected case of malaria. Microscopy being a skill based technique is recommended at PHC/CHC/Institutional level, while bRDT is specifically recommended for use at the community level or in case of emergency at institution level, if microscopy is not available.
- Malaria is a common illness in endemic areas and should therefore, be routinely suspected in any febrile person residing in such areas of the country.
- In non-endemic areas also any febrile person with a suspicion of malaria should be considered for diagnosis of malaria, particularly if the person has a history of previous travel to an area with known malaria transmission.
- Symptoms of malaria are generally non-specific and most commonly consist of fever, malaise, weakness, gastrointestinal complaints (nausea, vomiting, diarrhoea), headache, back pain, myalgia, chills, and/or cough. Sometimes malaria may also result in severe neurologic complaints like dizziness, confusion, disorientation and coma.
- Use of RDTs for diagnosis is recommended at community level, especially in the hard-to-reach and remote areas of the country where microscopy services are not well within reach and easily accessible to ensure early diagnosis and treatment initiation within 24 hours.
- Microscopic examination of thick and thin blood smears is the 'Gold Standard'. but microscopy being a skill based technique, requiring quality control right from smear preparation to staining and examination is recommended for malaria diagnosis at the institutional level i.e. PHCs/CHCs/District hospitals etc.
- Thick blood smears are more sensitive for malaria parasite detection because the concentration of blood is more, thereby allowing examination of a greater volume of blood, but are also more difficult to read. Thin smears aid in parasite species identification and quantification. In addition, microscopy is needed to quantify the proportion of red blood cells that are infected, which is an important prognostic indicator.
- A quality assured RDT or a blood smear made and examined by an expert and proficient laboratory technician as negative, rules out the diagnosis of malaria. However, due to the fact that non-immune individuals can present with symptoms of malaria at very low parasite density that may initially be undetectable by microscopic examination of blood smears, the examination of blood smears by microscopy should be repeated every 12-24 hours for a total of 3 sets and if all 3 sets of slides are negative, the diagnosis of malaria can essentially be ruled out.
- Positive slides should be read for parasite species, parasite stage and estimation of parasite density.

- All PHC/CHC level laboratories that do not provide quality assured microscopy services are supposed to maintain a stock of malaria RDTs so that they are able to promptly perform the diagnostic test for confirmation of a suspected case of malaria until the time the quality assured microscopy services are made fully functional.
- Many ASHAs/ HWs prepare blood slides and send them to PHCs for malaria microscopy, which fail to provide prompt results within 24 hours due to various reasons. These practices result in long delays in diagnosis and initiation of treatment and should be discouraged. All health care institutions/ PHCs/ CHCs/ hospitals involved in such practices should instead use RDTs for early diagnosis.
- The Pf HRP-2 antigen has been found to persist in the blood after parasite clearance for some time after treatment with antimalarials (at least up to three weeks), and should not be therefore, used for patient follow-up for falciparum malaria. Microscopy is recommended for follow-up after treatment for drug efficacy and parasite clearance in patients with P.falciparum infections.
- Currently, the focus of malaria diagnosis in India is limited to diagnosis of Pf and Pv only. However, it is noted in some areas of the country like Madhya Pradesh and Chattisgarh P.malariae cases have been reported along with isolated reports of P.ovale .Therefore, the laboratory technicians should also be trained in identification of P.malariae and P.ovale, so that such cases are not missed. Research institutions should aim to develop point-of-care diagnostic tests for P.malariae and P.ovale.
- Rapid diagnostic tests (RDTs) are recommended for use at the community level i.e villages/subcentres etc by ASHAs/health workers for passive as well as active case detection and in those PHCs where microscopy facilities don't exist due to lack of infrastructure or a trained laboratory technician or lack of a dedicated Lab. technician to examine the slides by microscopy due to excessive patient load in PHCs located in high malaria endemic areas. The diagnosis with RDTs is envisaged to cover an estimated 70 % of all fever cases.
- Microscopy being the 'Gold Standard' for diagnosis of malaria will continue to be used at institutional level in the community health centres/ Primary Health centres (CHCs/PHCs) and hospitals, covering around 30% of all fever cases.
- Microscopy being more sensitive for elimination settings will be the main stay of diagnosis in these low endemic areas and will be further strengthened for quality assured diagnosis through well trained and certified laboratory technicians

#### **6.2.2. Case Management**

- Early detection and complete treatment is the policy for case management.
- Once the diagnosis has been made, appropriate antimalarial treatment must be initiated immediately to ensure radical cure.
- "Presumptive treatment" is not recommended and should be reserved for extreme circumstances only, when there is a strong clinical suspicion accompanied by severe disease and obtaining prompt parasitological confirmation by microscopy or RDT is not possible.
- Treatment of a malaria case and selection of the appropriate antimalarial drugs should be in accordance to the updated and latest National Malaria Drug Policy. Treatment cards should be maintained for all malaria patients and the treatment should be based on three main factors :
  - 1) The infecting malaria parasite (Plasmodium) species
  - 2) The clinical status of the patient
  - 3) The drug susceptibility of the infecting parasites as determined by the geographic area where the infection was acquired and the previous use of antimalarial medicines.

- *P. falciparum* infections can cause rapidly progressive severe illness or death, therefore, the urgent initiation of appropriate anti-malarial treatment therapy is especially critical.
- In *P. vivax* infections, patients having recovered from the first episode of illness may suffer several additional attacks ("relapses") after months or even years with or without symptoms. Radical treatment to reduce the chance of such relapses should be available at the point of care and administered effectively under supervision for complete compliance after the first attack.
- Patients diagnosed with malaria are generally categorized as having either uncomplicated or severe malaria. Patients diagnosed with uncomplicated malaria can be effectively treated with oral antimalarials. However, patients who have one or more of the complications should be immediately referred to an appropriate hospital and the first dose of anti-malarial should be administered immediately.
- The Artemisinin-based combination therapy (ACT-AL) is the first line drug for treatment of uncomplicated *P. falciparum* malaria as per the revised treatment guidelines in entire country.
- Artesunate/Quinine injection is the drug of choice for treatment of severe malaria, followed by complete oral dose of ACT.
- Quinine remains the treatment of choice for pregnant mothers during the first trimester of pregnancy, children under five kilograms body weight, and for treatment failures.
- Chloroquine remains the drug of choice for treatment of uncomplicated *P. vivax* malaria.
- Treatment of severe *P. vivax* malaria is similar to treatment of *P. falciparum*.
- Mixed infection (Pv and Pf) should be treated as a case of Pf and treated with ACT and 14 days radical treatment as prescribed for Pv cases.
- NVBDCP monitors the therapeutic efficacy of anti-malarial drugs through project based collaborative studies with ICMR institutions like NIMR for anti-malaria drugs used as first line of treatment under the Programme.
- The Drug Administration and Control Authority (DCGI) is mandated as a regulatory body for quality control and registration of drugs and pharmacovigilance of drugs.
- Diagnosis and case management of uncomplicated and severe malaria at public sector health facilities is free of charge.

### **6.3 Objectives:**

Early case detection and prompt treatment by test, treat and track (3Ts) every case of malaria to achieve the following objectives:

- To achieve 100% parasitological diagnosis of malaria cases using RDTs and/ or microscopy within 24 hours of onset of fever.
- To achieve treatment of all malaria cases (100%) in accordance with the National Malaria Drug Policy and treatment guidelines within 24 hours of onset of fever.
- To manage 100% of severe malaria cases according to national guidelines.
- To ensure all private practitioners follow the national policy for diagnosis and treatment of uncomplicated and severe malaria.
- To ensure 100% districts have adequate infrastructure, facilities and capacity to treat severe cases of malaria without any charge, and such facilities are notified both in the public and private sectors.

## **6.4 Mass screening and treatment of asymptomatic cases in targeted population:**

NVBDCP considers the strategy of Mass screening and treatment in active foci with large asymptomatic parasite carriers with an objective to interrupt malaria transmission in low transmission settings and to eliminate the huge reservoir of infection to achieve rapid case detection in moderate to high transmission settings:

Mass screening and treatment will also be considered as part of the immediate response in situations requiring epidemic control while other interventions are put in place. Strategic decision making and operational planning for mass screening and treatment is done keeping in mind the local situation and in consultation with other technical partners and would be based on WHO guidelines and evidence generated for mass screening through ongoing research projects in the country like currently ongoing comprehensive case management (CCM) project being carried out by Medicines for Malaria Venture (MMV) in collaboration with State Vector Borne Disease Control Programme, Government of Odisha and National Institute of Malaria Research (NIMR) in selected blocks of Kandhamal district of Odisha.

## **6.5 Quality Assurance of Malaria Diagnostics**

NVBDCP envisages use of quality assurance of all malaria diagnostics and diagnostic services throughout the country under the National Quality Management system (NQMS). To ensure accurate diagnosis, quality of both malaria microscopy and RDTs must be assured at all levels of the health sector. The NQM guidelines for malaria diagnosis and SOPs for laboratory diagnosis are under revision. The revised guidelines, manuals and SOPs will be disseminated to all states up to the peripheral level.

### **6.5.1 Quality Assurance of Rapid Diagnostic Tests:**

For ensuring procurement of highly sensitive and specific RDTs, NVBDCP has recently revised the technical specifications as per WHO RDT procurement and selection criteria/ guidelines. The RDTs procured as per this criteria will ensure that the limit of parasite detection is met and the RDTs are stable under field conditions at room temperature of 40°C. The procured RDT product should be qualified as per the WHO product evaluation criteria and further only such lots will be procured which pass the Lot testing as per WHO protocol by laboratories certified for this purpose. The requirements of lot testing should be fulfilled and followed as per WHO guidelines from time to time. The pre and post-dispatch Lot testing of RDTs is presently done by NIMR for RDTs procured under the Programme and recently the RDT Lot testing laboratory has been certified by WHO also for this purpose.

At a meeting chaired by DGHS in 2014, NIB, Noida, NIRTH, Jabalpur and NCDC have also been directed to do the quality assurance of RDTs.

### **6.5.2 Quality Assurance (QA) of Malaria Microscopy (MM):**

Malaria microscopy has been the method of malaria diagnosis in India since the inception of a formal malaria control programme in 1953. Quality assurance of malaria microscopy was ensured through a mechanism of cross-checking of all positive slides and 10 % all negative slides on a sharing basis between the State/zonal level central malaria laboratory and Regional Offices of Health & Family Welfare (RoHFWs). The size of cross-checking slides being too large to be handled by the cross-checking labs which resulted in backlogs, the number of slides for cross-checking was subsequently

revised to all positive and 5% negative slides. However, owing to the large number of blood smears examined and proportion of positive and negative slides resulting in millions, non-availability of the lab technicians, this system has also proven to be laborious and without much results in absence of timely receipt of feedback from the cross-checking laboratories.

Recognising the shortcomings in the existing cross-checking system and requirement of an upgraded and internationally recognised quality assurance system based on WHO guidelines (2009 & 2016), Directorate of NVBDCP took a lead in revising the existing system following an evaluation report of the Joint Monitoring Mission (2014). Several consultative meetings and discussions were held before revising the existing quality assurance (QA) system.

Under the revised NQMS, all malaria microscopy services are to become a part of NQMS. This will also include medical colleges, private laboratories and other organised govt. sector.

The revised NQMS for malaria microscopy will be implemented as follows:

1. NVBDCP will be the focal point for implementation of quality assurance of malaria microscopy.
2. A national core group of laboratory Technicians/ microscopists certified as level one microscopists by WHO from the Central, State and RoHFWs will be formed who will be directly monitored by the Dte. of NVBDCP. Preferably every State and Regional Office will have at least one laboratory Level One technician/ microscopist certified by WHO through External Competency assessment (ECA) or a National Competency Assessment (NCA)
3. Having established a core group of about 12 WHO certified Level 1 microscopists, the National Competency Assessment (NCA) Programme will be set up immediately under the Dte. of NVBDCP and all certifications of Lab Technicians/ microscopists will be carried out directly by NVBDCP for which a state -of -art training laboratory with good quality binocular microscopes and modern teaching and training aids will be provisioned. The NCA will also be conducted in collaboration with different Regional and State level laboratories, depending upon the requirements and facilities available in the States and RoHFWs..
4. The Core group will have fixed roles and responsibilities for slide panel preparation and validation for NCA, training and certification of microscopists in each state and RoHFW and participation in all QA related activities as per the NVBDCP guidelines and SOPs.
5. Since preparation of slide panels and establishment of a national slide bank is essential for the quality assurance of malaria microscopy and NCA, having a single Apex or National Reference Laboratory is not feasible for the entire country. Also maintenance of such a reference laboratory and slide bank at the central level would be an extremely difficult and an expensive proposition needing additional cost and dedicated staff, charged services for sending the panels in and out of the slide bank which may not be cost effective and sustainable in the long run. NVBDCP has therefore, worked out an alternative mechanism of preparation of the slide panels in different endemic areas of the states utilising the core group and sending the dried blood spots for PCR characterisation to identified central/regional research institutes/ Medical colleges and other related Institutions/NCDC and/or central level laboratories certified for malaria PCR by WHO. An MoU for this purpose will be done with the networked laboratories for PCR for slide banking. All ICMR Institutes and Medical colleges ready to participate and host the malaria microscopy trainings and certification in collaboration with NVBDCP will work under a MoU with NVBDCP.
6. Until the time a national/regional and state level slide banks and panels are prepared by NVBDCP, slide panels will be borrowed from RITM, Manila for conducting further refresher trainings and national competency assessment certification of LTs/microscopists
7. All states will run their own quality management programme under the supervision of an identified officer and certified Level 1 microscopist from the State level Central Malaria Laboratory and linked RoHFW. The private laboratories and Medical colleges will primarily be a part of the State/Regional Quality management Network (SQMN) and secondarily a part of the NQMN.

8. The RoHFW have the mandate of training on malaria microscopy and cross-checking and will hence be a part of the NQMN and National Competency Assessment (NCA) and implementation of EQAS.
9. Both State and RoHFWs will have training facilities for a batch of about 25 laboratory technicians for which adequate panels will be available with them.
10. All Certified Level 1 Microscopists will run the EQAS, OTSS and cross-checking under the guidance of the concerned State/ regional level QA manager and the National focal Point at NVBDCP. They will participate in the EQAS conducted by the international laboratory designated by WHO for this purpose.
11. In addition to this the L1 microscopists will also pay supervisory visits to facilities and villages to assess the quality of diagnosis through peripheral health workers for performance of RDTs.
12. The revised guidelines and checklists of NVBDCP will be followed for this purpose.
13. Strengthening /establishing NCA at the Dte. of NVBDCP and certify LTs. Establish State level Central malaria laboratories/ training centres with good quality microscopes, slide banks and set up a state level Quality management system
14. Strengthening of RoHFW for partnership in the NQMS and establishment of state-of- art training centres in the RoHFWs to support the linked States in all malaria microscopy & QA related matters as per the revised national guidelines.
15. Certification of Lab Technicians by Dte. of NVBDCP under the NCA Programme.
16. As the targeted districts enter into elimination phase, all malaria cases confirmed by RDT and/or microscopy will be re-confirmed by an expert certified Laboratory Technician certified by WHO or NVBDCP under the NCA Programme. Regular onsite training and supportive supervision (OTSS) visits by the certified Lab technicians and officers on a quarterly basis to monitor the quality of diagnosis and case management services at all public health facilities and community level.

### **6.5.3 Implementation of QA MM:**

Dte of NVBDCP has already completed the situation analysis of PHCs/CHCs providing malaria microscopy services in the country under the NHM.

- As a first step towards up gradation of the quality assurance system, two national level refresher trainings of 10 days each were conducted by NVBDCP under an APW with WHO. This was followed by External competency assessment (ECA) by WHO certified facilitator wherein 12 laboratory Technicians from NVBDCP, NIMR, States and RoHFWs with financial support from WHO in December 2016.
- Another refresher training and ECA is being conducted in April, 2017 with the same facilitators for another batch of LTs mainly from the low endemic states.
- Standard operating procedures (SOPs) and guidelines will be made available at all levels of the system for clarity and easy implementation
- A sustainable cross-checking (validation) system that detects gross inadequacies with good feed-back of results and a system to address inadequate performance will be strengthened.
- Regional Offices of Health & family Welfare (ROHFW), Central Malaria Laboratories of the States wherever functional and identified Medical colleges will be designated as the Training laboratories for State level trainings and State Level certification of LTs for Malaria microscopy.
- Under this revised quality management system (QMS), the Laboratory Technicians will be oriented on the lines of the new guidelines and refresher trainings for all LTs would be ensured every 3-5 years.
- The country has about 25000 PHCs and the posts of LTs are vacant in many health facilities. Such PHCs need to be enlisted and diagnosis by RDTs needs to be put in place until the time microscopy services are made available.

- Microscopy services have to be essentially quality assured to achieve the goal of 100% diagnosis of malaria cases, however, this is a difficult milestone to achieve in view of the fact that there is huge training requirement of LTs at the peripheral (PHC) level. It is therefore critical and important that involvement of various State level laboratories (Central malaria Laboratories), Medical colleges, NCDC branches and ICMR institutes to handle the enormous training load..
- The private labs. in each state/UT also needs to be enlisted and networked under the NQMS
- Defining the roles and responsibilities of the various partners /Institutions involved in the NQMS is of utmost importance.
- Armed Forces, Central Reserve Police Force, Border Security Force and NABL accredited labs providing the malaria diagnostic services in all 36 States /UTs are to be encouraged to be part of the NQMS.
- External Competency Assessment (ECA) and WHO certification of Laboratory Technicians (LTs) to form a core group of WHO certified Level 1 LTs. In view of the huge training and slide panel requirements, it is desirable to have at least one WHO certified Level 1 LT/Microscopist in each State/UT and ROHFW (36 + 19 = 55 Level 1 ). Each WHO certified L1 LT will be utilized to train the LTs in his respective State through the ROHFW and State Training Laboratory i.e Medical Colleges and Central malaria laboratories with technical support from WHO country office
- Use of an annual scoring system for all States for achieving the target of quality assurance of malaria diagnostics i.e. RDTs, Microscopy and other modern diagnostic tools introduced for elimination under NVBDCP.
- Ensuring quality assurance of diagnostics used for screening of populations at international border crossings and training/certification of security personnel at international border crossings on malaria diagnosis.
- Setting up apex reference laboratories in the States/UTs for confirmation of diagnosis e.g Medical colleges/ICMR Institutes/NCDC branches etc under elimination settings for final confirmation of diagnosis after elimination has been achieved. These laboratories will be a part of the NQMN.

## 6.6 Quality Assurance of Anti-Malarial Medicines:

The quality of anti-malarials procured is adequately assessed for quality by the National Drug Quality Control Laboratory. Prior to distribution to health facilities, batch testing of all antimalarial drugs is done by the national drug testing laboratory to ensure quality of antimalarials supplied under the Programme.

# 7. SURVEILLANCE AND EPIDEMIC RESPONSE

## 7.1 Background:

Surveillance is recognised as a core intervention for malaria elimination. sensitivity of surveillance systems needs to be enhanced so that aggregated data is sent from peripheral level to higher level (health facility to district to state to national level), and analysis is done at all levels for appropriate action. Staff at all levels should be trained to examine and evaluate surveillance data, monitor programme progress, target interventions and detect problems that require action. The NPSP project has developed an extensive and efficient AFP surveillance network which can be leveraged to further strengthen the malaria surveillance in the country.

## 7.2 Objective:

Overall objective should be to achieve a quality, broad based malaria infection (both symptomatic infection – cases - and asymptomatic infection; P. falciparum and P. vivax) detection, investigation and response Surveillance System to contain the possible sources and thereby reduce malaria transmission.

In elimination settings, surveillance should comprise of the following specific objectives:

- (i) detection of all malaria infections (symptomatic and asymptomatic) as early as possible;
- (ii) prevention of further transmission from each case through early & complete treatment and vector control measures; and
- (iii) identification, investigation, classification and management of all transmission foci with appropriate response to stop transmission as soon as possible.

## 7.3 Policy and Strategies:

A quality surveillance system embedded in the primary health care system and implemented locally through the existing systems with reach to all communities is essential. Surveillance policies and practices under control and elimination phases are shown in Table 1.

Table-1: Surveillance policies and strategies in different phases of elimination

|         | Intensified Control Phase                                                        | Elimination phase/ pre-elimination                                                                                                                                                                                                                                                                        |
|---------|----------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Purpose | Implement targeted interventions, detect potential outbreaks and track progress. | Discover any evidence of continuation or resumption of transmission;<br><br>Detect indigenous and imported cases as early as possible;<br><br>Investigate and classify each case and focus of malaria;<br><br>Provide a rapid and adequate response; and<br>Monitor progress towards malaria elimination. |

|                                                                |                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                         |
|----------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Data reporting, recording and indicators used                  | <p>Private sector requested to report all cases.</p> <p>Aggregate numbers of outpatient, including uncomplicated P. falciparum malaria.</p> <p>Aggregate numbers of in-patients with severe or complicated malaria, and deaths due to malaria.</p> <p>Conventional malariometric indicators (API, SPR/ TPR, ABER)</p> | <p>Malaria is made a notifiable disease.</p> <p>Private sector must report every case by law.</p> <p>Number of indigenous and imported cases and residual new active and potential foci of malaria.</p>                                                                                                                 |
| Detection method                                               | <p>PCD at all levels of health system</p> <p>ACD in high risk groups, especially migrants.</p>                                                                                                                                                                                                                        | <p>PCD at all levels of health system.</p> <p>ACD to fill gap in PCD system, in order to detect infections as early as possible, with particular focus on high risk groups.</p> <p>Reactive ACD in case investigation and clearing of foci.</p>                                                                         |
| Case and foci identification, investigation and classification | No                                                                                                                                                                                                                                                                                                                    | Yes                                                                                                                                                                                                                                                                                                                     |
| Technology, monitoring & evaluation                            | <p>Consolidate the use of new tools such as web based data transmission, volunteer reporting via SMS.</p> <p>Introduce case based malaria surveillance.</p>                                                                                                                                                           | <p>Adequate case and foci based malaria surveillance fully functional in all states/districts under elimination phase.</p> <p>National computerised malaria elimination data base or register established. Malaria Elimination Monitoring Committees &amp; Task Forces are set up at national and all state levels.</p> |
| Data elements                                                  | Aggregate counts, health facilities or districts, blocks, PHCs or villages.                                                                                                                                                                                                                                           | Case based, foci.                                                                                                                                                                                                                                                                                                       |
| Case definition                                                | Confirmed clinical cases.                                                                                                                                                                                                                                                                                             | Any confirmed infection (symptomatic and asymptomatic).                                                                                                                                                                                                                                                                 |
| Case investigation                                             | Admission death.                                                                                                                                                                                                                                                                                                      | All cases.                                                                                                                                                                                                                                                                                                              |
| Time scale                                                     | Monthly.                                                                                                                                                                                                                                                                                                              | Immediate notification.                                                                                                                                                                                                                                                                                                 |

## 7.4 Activities:

### 7.4.1 Case characterisation, classification, follow-up and response:

Each parasitologically confirmed malaria case should be investigated and evaluated. A case investigation form need to be completed for each confirmed malaria case as per national guidelines so as to undertake the following:

- Characterisation of the case: based on patient demographics, history of the current illness, diagnostic test result and treatment, travel history to assess how and where the infection might have been acquired and the possibility of onward transmission.
- Classification of the case: after a case has been characterised, it should be classified as imported, introduced, indigenous, relapsing, recrudescent or induced, as per the guidelines. Classification should be based on the case characterisation and understanding of the different intervals in the life cycle of malaria parasites. Correct epidemiological classification of malaria case would be the basis for selecting appropriate measures and classifying the foci. Especially for cases detected by ACD, the final classification would depend on previous cases in the same locality and a focus investigation. If, for example, the case history is compatible with both importation and local transmission, the presence or absence of other locally acquired cases may determine the classification. Staff responsible for case classification should be trained in classification and investigation during field exercises and by reviewing case histories.
- Response: the response should be based on the classification, although all cases should be managed according to national treatment guidelines. Additional responses to address transmission for the different classifications are described below.

#### **7.4.2 Focus identification, characterization, classification and follow-up:**

- “Focus” is a defined, circumscribed locality situated in a currently or formerly malaria endemic area with continuous or intermittent epidemiological factors necessary for malaria transmission. It should be noted that a focus may not necessarily have active transmission. A focus investigation is conducted to determine the response measures necessary to eliminate or prevent re-establishment of transmission.
- Standard operating procedures should be used to determine the timing of initiation and completion of focus investigations, including reporting and response. An initial ACD survey, for example, should be completed within seven days of detection of the focus.
- A focus may be identified in several ways: investigation of an individual case leading to the recognition of additional indigenous cases around the case household and further investigation shows that transmission is limited to a geographically defined area; active investigation of areas previously defined as “at risk” may identify a transmission focus.
- Once a focus is identified, an investigation should be undertaken to delimit and characterise the area and the populations at risk using a focus investigation form. The investigation would be more extensive for a new focus, whereas detection of a new case in known active foci will trigger a new focus investigation only if its features (e.g. parasite species or location) differ from those of previously detected cases. The areas to be covered is determined by an initial rapid assessment based on the results of ACD, entomological and community social & behavioural investigations. The focus investigation would be able to identify the main features of the location, populations at risk, location of actual/ potential breeding sites, likely vectors and, possibly, insecticide susceptibility and behaviour.
- A map should be prepared depicting location of case households, geographical features relevant for malaria transmission (e.g. water bodies, forests and altitude), other habitations, health facilities and roads, as well as coverage of all interventions.
- SMOs of NPSP may build capacity and coordinate with government for case based surveillance followed by active foci investigation.
- The local officials responsible for malaria, in consultation with experts, will prepare a response plan according to the results of the investigation.
- Focus investigation forms and the line-list records of all cases identified in the focus should be sent to the State HQ and Dte. NVBDCP. The DVBD Officer would be responsible for ensuring that a register of foci is maintained, all foci are investigated and reports on all foci are available and kept up to date as all these records would be required at time of international certification.

**Classification of foci:**

- Once investigated, the focus may be classified into one of the three types as in Table- 2.

**Table-2 : Types of malaria foci with operational criteria**

| Type of Focus         | Definition                                               | Operational criteria                                                                                                                                                                   |
|-----------------------|----------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Active                | A focus with continuing transmission                     | Locally acquired case(s) have been detected within the current calendar year.                                                                                                          |
| Residual (non-active) | Transmission interrupted recently (1-3 years ago)        | Last locally acquired case was detected in previous calendar year or up to 3 years earlier                                                                                             |
| Cleared               | A focus with no local transmission for more than 3 years | There has been no locally acquired case for more than 3 years, and only imported or/and relapsing or/and recrudescent or/and induced cases may occur during the current calendar year. |

- Regular follow-up of foci should be undertaken and reclassification should be updated usually at the end of the calendar year or of the transmission season in the foci register to be maintained at district, state and national levels. Residual non-active foci would have to remain non-active (no indigenous cases) for three consecutive years before malaria elimination certification can be applied.

**Response measures:**

- Response measures to active, residual non-active and cleared foci would depend on several principles. Vector control measures need to be assessed for their appropriateness, coverage and use and should be applied according to the characteristics of malaria in the area, with particular attention to its receptivity. PCD services, with supervision, should be accessible to the community throughout the year.
- For active foci, various options exist: high coverage of appropriate vector control should be maintained; ACD (with screening and testing or with testing alone) can be considered at appropriate intervals, especially just before or during the transmission season. If testing is chosen and no cases have been found after several rounds of ACD, the frequency of testing may be reduced or the strategy changed to active surveillance for suspected clinical cases that can be tested and managed as per guidelines. In some circumstances, mass drug administration may be appropriate.
- For residual non-active foci, ACD may be considered at critical times (e.g. the mid and late transmission season), and high risk people likely to have malaria (e.g. those with fever, migrant labourers, those not using prevention) are screened to identify local cases, indicative of ongoing transmission. If several rounds of ACD reveal no cases, the frequency may be reduced. If newly introduced or indigenous cases are identified, further evaluation would be required to determine if there is local transmission, which would require additional action.
- For cleared foci, the programme should rely on the surveillance system to rapidly identify any cases of suspected malaria and determine if local transmission has resumed.

**7.5 Upgraded Malaria Information System (MIS):**

NVBDCP, in consultation with relevant WHO and other stakeholders and based also on the best practices for malaria programme from other countries, would upgrade the existing or develop a new MIS to strengthen the following surveillance activities:

### **7.5.1 Passive case detection and routine reporting by all health care providers:**

Revised forms reflecting necessary malaria data from PCD system would be developed and distributed to service providers for real time case reporting in all endemic districts targeted for elimination. All the service providers through mobile phone would report case details, including geo-location data, to MIS on a real time basis. MIS will trigger immediate alert to concerned officials at central, state, district and block PHCs.

Routine monthly surveillance will be strengthened across the country to ensure complete and timely reporting from public health facilities, ASHAs, private sector, military, paramilitary and police forces, and other stakeholders like Railway, ESIC etc. NVBDCP will collaborate with the National Health Mission (NHM) for integration of health information system and MIS. Efforts would be made so that other relevant data from case detection, case investigation, vector control intervention, entomological surveillance, therapeutic drug efficacy studies, and logistics procurement, distribution and utilisation as well as human resource is integrated into MIS to improve rapid response.

### **7.5.2 Active case detection, case investigation and reporting for all malaria infections:**

Active surveillance activities will be carried out in low endemic areas targeted for elimination. All confirmed cases from health facilities/ hospitals will be investigated, classified (indigenous, imported, introduced and induced) considering the patient household location, travel history, and reported in MIS. Cases diagnosed by ASHAs and private sector will be notified through MIS which would alert the respective block PHC to carry out investigation within 48 hours.

A network of private hospitals and quacks are already under the purview of the polio network of NPSP across the country. It is proposed to involve this network by orientating the network to ensure the reporting of malaria cases and deaths. NPSP can be leveraged to further strengthen the malaria surveillance in the country. WHO will initiate this in one state-Punjab as a pilot to start with and then multiply in other Category 1 states.

### **7.5.3 Management and usage of data at all health levels:**

All data from passive & active case detection, and foci investigation will be integrated along with entomological surveillance data and intervention coverage within the MIS for detailed analysis by the State & Dte. NVBDCP. Regular feedback will be provided to all levels through an epidemiological report. Regular Malaria Elimination Bulletins will be generated and disseminated.

## **7.6. Outbreak preparedness and response:**

In elimination targeted districts, local cases need to be responded immediately. NVBDCP, in collaboration with NCDC and other stakeholders would develop 'outbreak preparedness and response (OPR) standard operating procedures' for outbreak identification, alert mechanism and response activities. NVBDCP will collaborate with RRTs (IDSP) working at district and state level for quick investigation and response.

## 8. VECTOR CONTROL AND PERSONAL PROTECTION

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### 8.1 Background:

Elimination of malaria in an area does not require elimination of all *Anopheles* mosquitoes but to reduce the human-vector contact by personal protection, reducing longevity of vectors by use of anti-adult or anti-larval measures. Implementation of vector control measures are undertaken within the framework of Integrated Vector Management (IVM). A combination of interventions are recommended in NFME. In urban areas, anti-larval measures are generally the main intervention. However, inter-sectoral collaboration and legislative measures are to support for improved performance. The vector management strategy will guide implementation and will be updated based on transmission dynamics. NVBDCP in collaboration with VCRC, NIMR, NCDC and other research institution has developed an insecticide monitoring plan based on WHO guidelines and vector management strategy of NVBDCP that takes into account potential intervention packages for reducing human-vector contact in targeted areas. National level training is being organised at NCDC/ICMR Institutes supported by NVBDCP/WHO. Under the programme the following components are included:

#### 8.1.1 Larval source management (LSM)

Larval source management is the management of aquatic habitats (water bodies) that are potential breeding sites for mosquitoes, in order to prevent the completion of development of the immature stages as under:

##### 8.1.1.1 Environmental modification & manipulation (by community participation)

Environmental modification and manipulation is permanent alteration to the environment, including land-scaping, surface water drainage, filling and land reclamation, coverage of water storage containers with mosquito-proof lids or permanent slabs. This is a recurrent activity including water level manipulation (e.g. stream flushing, keeping drains clear of vegetation so that water can flow very fast and not support mosquitoes).

##### 8.1.1.2 Larviciding

Larviciding is the regular application of biological or chemical insecticides to water bodies. Larviciding measures should normally be used only as a supplement to the core interventions (LLINs or IRS) and not as a substitute. Use of chemical larvicides like temephos EC and Bti are recommended for non-polluted and polluted breeding sites mainly in urban areas. Insect Growth Regulators (IGR) are chemical compounds that inhibit the physiology of the insect.

#### 8.1.2 Long lasting insecticidal nets (LLINs):

- LLINs have proven to be a practical and cost-effective intervention against malaria, and are highly effective against vector mosquitoes that bite at night. They provide not only a physical barrier against the mosquito bites but also kill the mosquitoes or shorten their life-span so that they cannot transmit malaria infection. However, for the best effectiveness in the community, coverage of population at risk with LLINs must be as close to 100% with high utilisation rate (> 80%). LLINs are usually effective in field conditions for a period of 3 years but their effective life

can vary depending on conditions of usage, washing and maintenance. They are more sustainable than conventional ITNs which require repeated impregnation. Additional LLINs should be given to jhum cultivators, pregnant women on priority in high-risk areas and to children in tribal schools/ hostels.

- Usually each person should sleep under LLIN, however, for procurement purposes the calculation of 1 LLIN for every 1.8 persons is done to cover the targeted population. Under the programme, three sizes of LLINs are supplied. The size 1 is 1 net per person, the size 2 is 1 net for 1.8 persons and the size 3 is 1 net for 2.5 persons. However, for proper distribution, household surveys in advance has to be done so that distribution is done accordingly. The number of LLINs that a household can receive is increased where household size is higher, for example, families of 6 persons will receive at least 3 nets, those with 8 persons 4. WHO recommends universal coverage with LLINs for all people at risk of malaria. Therefore, the community owned bed nets should also be impregnated in case of any gap in supply of LLINs.

## **8.2 Objectives:**

- 100% of households in malarious areas own in general at least one LLIN/ per 1.8 person.
- At least 80% of people at risk of malaria use LLINs.

## **8.3 Activities:**

### **8.3.1 Geographical targeting and distribution of LLINs:**

- Quantification of LLIN with an average of 1 LLIN per 1.8 persons will be estimated as per national guidelines. LLIN will be procured by NVBDCP/state governments and adequate arrangements will be made for safe storage at central/state and district level.
- All sub-center with API >1 per 1000 identified in a district will be targeted. Sub-centre-level micro-planning will be carried out to develop distribution, transport, human resource plans and budgets to deliver LLINs to households.
- Procurement and supply agency (PSA) at central/state level will coordinate and manage the procurement of LLINs. It will be shipped directly to the identified state/districts/blocks by the procurement agency as per the list provided to them by the programme. Micro-planning will also be used to further refine targeting, procurement, customs clearance, storage and distribution of LLINs.
- LLINs will be transported to sub-centres as per micro-plans developed by district/block PHC and, for distribution by HWs to households in front of community representative.
- Most distribution campaigns will be carried out at village level and led by the trained staff from the respective blocks/districts to increase utilisation rates of LLIN.
- The primary delivery point for malaria IEC/BCC activities related to LLIN usage and benefits will be carried out by ASHAs and health workers (including LLIN fortnight once every six months).

### **8.3.2 Monitoring and recording of LLIN distributions**

- Monitoring of LLINs distribution will be done through LLIN registers available with each ASHA and sub-centre and block level PHC.

### **8.3.3 Distribution strategies/channels**

- LLINs can be distributed through more than one method tailored to the situation in each block/sub-centre. Three major methods are outlined, although health staff at all levels can make final decisions, based on local circumstances.

- Campaign Mode: In malaria endemic areas where LLINs are being distributed for the first time, Intensive IEC activities will be undertaken to create awareness among targeted populations before distribution of LLINs.
- Replacing Old LLINs (Keep-up): The LLIN replacement will be made to ensure continuous supply of LLINs at block level. Systems will be developed, primarily through the primary health care system, to ensure that all households in elimination targeted subcentres have access to and use LLINs at all times. HWs will consolidate their village wise registers for identifying families who need new LLINs.
- Emergencies: LLINs/ITNs are delivered rapidly in emergencies such as epidemics, floods, and in disturbed areas.

## **8.4 Indoor Residual Spraying (IRS)**

### **Background:**

- Currently, IRS, as a main component of selective vector control, is targeted to cover epidemic prone areas and malaria-affected communities with low access to the health care system. Procedures for safe handling & disposal of public health insecticides including insecticide treated nets should be institutionalised in accordance with the recommendations of WHO global regulations and NVBDCP Guidelines. Operational research is needed to determine the extent to which combining IRS and LLIN interventions would maximise the public health impact of malaria vector control and offer opportunities for management of insecticide resistance. Regular monitoring of insecticide resistance need to be conducted in selected sites of districts/zone throughout the country to develop mechanisms for insecticide resistance monitoring.

### **Objectives:**

- Increase and maintain IRS coverage to 90% of households in IRS-targeted areas.

### **Activities:**

#### **Annual planning and coordination for IRS ;**

- National IRS plans for every year need to be developed, based on information from States. National plans will be used to improve supply distribution, fund allocation to cover operational costs and schedule the timing of IRS campaigns according to malaria epidemiology of the different areas.

#### **Procurement, distribution and storage of Insecticide/spray materials:**

- Each targeted subcentre will receive all logistics in time and district authorities will ensure it.
- Appropriate insecticides, pumps, spare parts, personal protective equipment will be procured through standard procurement procedure as per NVBDCP policy.
- Store at Blocks/PHCs will be identified for storage of insecticides and spraying materials.
- The district malaria team will also have some insecticides and equipment as a contingency for epidemic control.

### **Implementation of IRS through Primary Health Care System:**

- IRS planning is done by the district malaria team and executed under the leadership of Block/PHC medical Officer to ensure sustainability of IRS and also without separate vertical staff.
- The HWs will be trained to oversee and coordinate the spraying operation in their respective villages; spray operators will be trained for two days to undertake spraying operations for 4-5 months.
- Spray operation activities are reported to the respective block PHC as per NVBDCP guidelines.

### **Environmental compliance:**

- The NVBDCP, MoH&FW has developed 6 volumes on Environmental Codes of Practice (ECoP) which elaborates safe storage, transport, use of PPE and application of insecticides. All efforts will be made to ensure that these practices are followed in field.

### **Quality of IRS operations**

- The timing of spray operations using different insecticides will be determined according to the local epidemiological situation.
- The spray equipment will be checked for functionality and new spray pumps and spare parts will be procured by respective states to replace the old nonfunctional spray pumps.
- Much emphasis will be given to close supervision during spraying operations by trained supervisors from the general health services.

### **Public acceptance, practice, and participation in IRS programmes**

- IRS will be supported by IEC/BCC to make it acceptable to 100% of the households in the targeted villages. Subcentres failing to spray more than 85% of units (households) will review the strategy and approach of their operations and take corrective measures immediately. Intensive IEC and social mobilisation campaigns will be carried out through various channels to ensure messages on IRS.

### **Quality assurance of vector control:**

- Pre dispatch sample and field samples of insecticide/larvicides will be tested from accredited labs to ensure that quality product is supplied.
- Quality of spraying (IRS and anti-larval) will be checked by performance of spray team in delivering proper dose. Quality of spray equipments and its parts will be checked before commencement of spray programme. The environmental code of Practices will be followed in field and adequate sensitization will be undertaken.

## **8.5 Space spray**

Indoor space spray with pyrethrum/cyphenothrin is recommended to contain epidemic/outbreak. Space spray in each house should be continued for 7 to 10 consecutive days, preferably in early morning or evening hours and until IRS in all houses in the locality is completed.

## **8.6 Reducing Human-Vector Contact through Personal Protection:**

Human-mosquito contact can be reduced by use of mosquito nets while sleeping or by use of repellents. Full sleeve shirts and trousers offer better protection from mosquito bites

## 8.7 Prioritisation of Vector control:

The malaria vectors, transmission potential and endemicity levels differ from area to area and therefore the intervention measures are also tailored for implementation. The prioritisation for implementation of vector control measures in India is broadly based on the API of the area. Stratification for IVM activities is required to be done up to subcentre level which is the unit for IVM. The category-wise vector control measures recommended are given in Table 3.

**Table 3: Category-wise Vector Control Measures (should It Be In Sync District-wise??)**

| Category                                                                                        | Vector control measures                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
|-------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Category 0<br>(No case)                                                                         | <ul style="list-style-type: none"> <li>➤ Mapping of potential vector breeding sites</li> <li>➤ Regular adult vector monitoring (prevalence and density).</li> <li>➤ Environmental management and modification in <ul style="list-style-type: none"> <li>- Rural areas through Village Health Nutrition &amp; Sanitation &amp; Committee (VHSNC), MNREGA &amp; Swachh Bharat Abhiyan and</li> <li>- Urban areas by de-silting, de-weeding, channelising, larviciding, through Urban VBD scheme.</li> </ul> </li> <li>➤ Biological control- Larvivorous fish</li> <li>➤ Foci based adult vector control interventions – in and around 50 houses of positive case- Space spray followed by IRS</li> </ul> |
| <b>Category 1, 2 and 3 States</b>                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Subcentres with API < 1                                                                         | <ul style="list-style-type: none"> <li>➤ Same as in category 0 above</li> </ul>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |
| Subcentres with API > 1                                                                         | <ul style="list-style-type: none"> <li>Universal coverage with LLINs of all subcentres with API &gt; 1</li> <li>➤ In sub-centres with API &gt; 1, if not covered with LLIN, two regular rounds of supervised IRS (sub centre as unit)</li> <li>➤ In LLIN covered sub-centre, if there is upsurge of cases, efforts to be made to increase the compliance rate of LLIN usage.</li> <li>➤ In outbreak situations - additional round of IRS</li> <li>➤ Anti larval measures in urban areas with main focus in slum clusters. In outbreak situation Slum clusters can also be covered with IRS.</li> <li>➤ Larval control through source reduction and biological and environmental measures</li> </ul>    |
| Low endemic sub centres i.e. with 0 or <1 API should be treated as under Category 1 activities. |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        |

## 8.8 Strengthening of Entomological surveillance:

For Entomological surveillance 72 entomological zones were provisioned under state infrastructure. Similarly 16 central entomological set-up at Regional Offices for overall monitoring were established. However, considering the 50% functional status of this setup, support is taken from ICMR, NCDC institutes, Entomological division of Universities but it requires expansion and adequate support so that each zone is able to cover maximum 3-4 districts and generate data. It is proposed to increase number of zones accordingly for which provision of funds is made in Annual Plan and states are advised to reflect. The district entomological units established by some states will also be strengthened. Each zonal team will have a provision an entomologist and known as zonal entomologist substituting all earlier nomenclature and two insect collectors. They should be recruited, trained and provided with laboratory facilities, necessary equipment / mobility support.

The medical colleges and entomological division of Universities need to be encouraged to take up entomological activities in nearby areas with the coordination of respective state/ zonal entomologists to generate data related to operational research and program.

The country is in the process of establishing National Mosquito Control Mission to be linked with “Swachh Bharat Abhiyan” which requires strengthening entomological set up at district level. This would ensure impact on other mosquito borne diseases.

In addition entomological surveillance unit at Regional Offices for Health and Family Welfare are to be strengthened as such offices mostly have no replacement for the retired staff. The programme should ensure that all the 19 such offices should have entomologist with two insect collectors along with provision to set up entomological laboratory and mobility support so that they can carry out monitoring and supervision of entomological surveillance in their respective areas. Also insecticides susceptibility test and bio-assay should be conducted by them. Mosquito colonies should be maintained by all zones and entomology lab.

#### **8.8.1 Identification of sites for entomological surveillance:**

- Entomological surveillance are to be carried out in sentinel and random sites
- Sentinel entomological laboratory should be identified by each state for maintenance of mosquito colonies and to generate data for insecticides susceptibility status of malaria vector of the respective areas and data for bio-assay as per WHO guidelines. A sentinel site should usually be an area where malaria transmission risk is present over a period of time or where increased potential for vector breeding is well established. High risk area may also be a previously malaria risk area or an epidemic prone area. Sentinel sites will be monitored at regular intervals to determine seasonal changes in vector densities, changes in vector bionomics and other characteristics.
- Spot checks should also be identified for areas where environmental changes in favour of vector breeding (e.g. climatic changes, disasters, development projects and human activities such as coal or ore mining, timber felling, quarry pits etc.) is reported and migratory populations from malarious areas are present.

#### **8.8.2 Activities**

- Entomological investigation will be undertaken in areas of new or persistent active foci to determine why the transmission is being continued and for planning of vector control.
- The data is to be generated for all four quarter/ seasons of the year.
- The following indicators will be calculated for interpretation of entomological data; indoor resting collection (Per man hour density), mosquito abdominal condition, Night landing collections(ethical clearance mandatory), Feeding habits, human blood index (HBI), sporozoite rate, insecticide susceptibility (5 mortality), density of immature (larval density and pupal density) along with mapping of permanent breeding sites.
- Insecticides resistance management: Mapping of insecticides resistance status of malaria vectors of the respective areas is to be also done by entomological unit at district, zone and state level. One apex laboratory need to be identified to coordinate the activities and preparation of mapping of resistance status and planning for insecticides resistance management in the country with the support of WHO. Quality assurance of sentinel entomology laboratory at state level will be monitored by apex lab.
- Efficacy of LLINs should also to be carried out on a regular basis as per WHO guidelines.

#### **8.8.2 Human resources and infrastructure:**

- Establishing and maintaining such surveillance system requires human and infrastructural capacity – entomologists and insect collectors, and facilities such as insectaries and laboratories appropriately placed to support vector sampling, identification and characterisation at sites selected based on eco-epidemiological representativeness.
- Programme will identify a core group of entomologists and research institutions working on vector biology across the country and support them to carry out monitoring, make recommendations about any necessary changes in interventions or delivery strategies and to address any elimination specific challenges.
- National level training is being organised at NCDC/ICMR institutes supported by NVBDCP/WHO.
- In the context of NSP for elimination of malaria, national level training for entomologists (regular or contractual) of NVBDCP/IDSP should be organised at NVBDCP/NCDC/ICMR Institutes with the support of WHO (ToT) then the down training at district level by state team should be undertaken ( Cascade training)
- District consultants (entomology) functioning under IDSP and interested entomologist of Universities/ Medical colleges will also be trained and deployed for carrying out entomological work with close collaboration of respective states/zones.
- NVBDCP will work out with NCDC, relevant ICMR institutions and academic institutions like Universities for insecticide resistance monitoring (IRM) and efficacy testing for vector control intervention with the support of WHO. These identified institutions will routinely monitor the efficacy of LLINs, insecticides among colonised and field mosquitoes. The data generated will be shared immediately with NVBDCP and respective district/state programme officers. One apex laboratory need to be identified to coordinate the activities and preparation of mapping of resistance status in the country. Directorate of NVBDCP, Delhi will periodically review quality assurance for vector control products using standard protocols in consonance with World Health Organization; Pesticide Evaluation Scheme (WHOPES).
- NVBDCP will make an assessment of human resources needed for carrying out entomological activities and accordingly hire and train additional staff for entomological division/units at central, provincial and district levels in order to build necessary capacity for carrying out entomological surveillance. Entomological surveillance will be strengthened in the country with the technical support of WHO.

## 9. ADVOCACY, COMMUNICATION AND COMMUNITY MOBILISATION

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### 9.1 Background:

Community empowerment and mobilisation are central to malaria prevention and control. It is arguably even more important in the phase of malaria elimination effort as the country moves from intensified control to zero transmission and elimination. The Behaviour Change Communication (BCC) mobilises and engages the community in all aspects and stages of malaria control, and elimination and leads to increased ownership of the programme. The overall goal of the BCC strategy is to increase community awareness and participation. This is done through a variety of media and channels. Significant challenges remain in convergence between “supply” (health services and products/interventions) and “demand” side.

### 9.2 Objectives:

- To promote political and community support for malaria elimination services through educating and influencing planners, policy makers, managers and potential collaborators.
- To create an enabling environment for stakeholders to synergise their BCC activities and as a result, avoid duplication of efforts.
- To develop and improve the capacity for advocacy, BCC and community mobilisation at all levels
- To enhance finance resource support to ensure optimal reach to all sections of target audiences

### 9.3 Activities:

#### 9.3.1 Advocacy:

Malaria elimination is a dynamic process. There is increasing recognition of the importance of malaria elimination as a long-term goal. However, it remains difficult to facilitate the transition to elimination without the long-term political and financial support that is required for malaria elimination. Advocacy is an important tool that the programme and partners should use to support the transition to elimination, and sustain gains made in malaria control. Through coordinated campaigns, advocacy can sustain commitment from both donor and government; strengthen national ownership and partnerships, and position elimination as a driver of development goals. Communication through key elimination messages is an important component of advocacy, sustaining necessary financial, political and community support. These messages will be developed to target donors/partners to garner resource support at various levels.

Communities affected by malaria must be supported as active participants in elimination, identifying priorities and influencing local programming approaches. It is well recognised that community involvement and ownership can be important drivers of programme success.

**9.3.1.1 Institutional structures** established under the National Health Mission (NHM), at central level i.e. Mission Steering Group (MSG) under the chairpersonship of Union Health Minister, Govt. of India, State Health Mission (SHM) under the Chairpersonship of State Health Minister at State level, District Health Mission (DHM) under the chairpersonship of Zilaa Parishad president at district level, Rogi Kalyan Samiti at block level, headed by block pramukh and Village Health Sanitation & Nutrition Committee/Gramin Kalyan Samiti (VHNSC/GKS) at village level chaired by village pradhan, will be leveraged for mounting advocacy campaign for malaria elimination. An IEC Cell at MoH&FW

coordinates all IEC/BCC activities at central level in addition to DAVP. At state level, Department of Field Publicity provides required support. MSG will meet annually, while SHM will meet biannually and institution at district, block and village levels will meet at quarterly intervals to ensure sustained political commitment by government and other stakeholders at different levels for elimination of malaria.

#### **9.3.1.2 Intersectoral Coordination**

Inter-sectoral advocacy with non-health sectors will be fostered with Ministries/Departments of Tribal Welfare, HRD, Rural Development, Urban Development, Panchayati Raj, Drinking Water, Sanitation, and also with private sector for CSR activities.

#### **9.3.1.3 World Malaria Day:**

The World Malaria Day is commemorated on 25th April every year with a specific theme. The current theme is "End Malaria for Good," reflecting the increased interest in and commitment to breaking the transmission cycle of malaria and eliminating it once and for all. The day gives an opportunity to reaffirm political commitment by countries for sustained financial support and community ownership through series of campaigns at all levels.

#### **9.3.1.4 Anti-Malaria Month**

Anti-Malaria Month is observed in the month of June every year. Month long campaigns will be organised for stakeholder participation including the community. Inter-personal communication (IPC), locale - & context-specific BCC will be undertaken to sensitise the community, school children and other stakeholders towards ownership of the malaria elimination agenda. Wide dissemination of messages through utilisation of effective channels like community radio, where possible. Special efforts will be made to collaborate with corporate sector to garner their support through Corporate Social Responsibility.

### **9.3.2 Behaviour Change Communication**

In the context of malaria elimination framework, NVBDCP will revise the current BCC strategy and messages in collaboration with states and partners to align with and support the implementation strategies in case management, vector control and surveillance for malaria elimination. Specifically, state specific need based community mobilisation and mass-media strategies will be developed and incorporated. KABP surveys, communication need assessment and field testing of BCC tools & materials will be inherent components to the strategy implementation.

To promote behaviour change related to health seeking and personal protection, the NVBDCP will develop and distribute malaria BCC material prototypes to states/UTs for translation in local language and produce for distribution BCC material to members of public to reinforce key malaria elimination messages. NVBDCP will also utilise a multi-media strategy to display messages through radio, television newspaper, cell phone networks, web sites and billboards. The messages and medium will be targeted towards the most at risk and underserved populations. Messages for mass media will be developed each year during workshop organised for development of BCC guidelines.

The NVBDCP will map IEC/ BCC programme of the MoH &FW and partner to develop a joint work plan on an annual basis for the implementation of malaria BCC activities in the country. NVBDCP would develop and harmonise the different BCC messages and materials across the partners, suited for different regions, including tribal, mobile and migrant populations. Periodic consultations/meetings with the experts and partners would be held to share progress on BCC

activities, identify best practices and challenges in implementation, update key messages and develop new BCC materials in the context of malaria elimination. BCC Cell at the central, state & district levels will be strengthened gearing towards elimination.

The NVBDCP will conduct monitoring and supervision of BCC activities in selected targeted districts every quarter. NVBDCP will also conduct annual knowledge, attitude, practices and beliefs (KAPB) survey to evaluate the impact of BCC messages. Inform the customisation of strategies and approaches that are compatible with the practices, customs and beliefs of various communities. Based on results, BCC strategies and related materials for future campaign will be updated.

### **9.3.3 Strengthen Community Empowerment and Mobilisation:**

NVBDCP will work with community leaders at district and village level to mobilise community and increase awareness about malaria prevention and access to quality diagnosis and treatment. As part of community mobilisation efforts, community consultations will be organised at different levels like, district, block, subcentre and village levels. These consultations will help in understanding community perspective about malaria control as well as an opportunity for sensitising key stakeholders. Community sensitisation and training workshops will be organised in cooperation with targeted districts and health centres involving important community actors including community health care workers (ASHAs/AWWs), private sector providers, religious leaders, village pradhans, gramin kalyan samitis (GKS)/Village Health Nutrition and Sanitation Committees (VHNSC), teachers, mahila mandals, self-help group and other stakeholders to strengthen the linkages between the key actors and quality malaria service providers. GKS that have already been constituted and functional under the National Health Mission (NHM) in most of the villages in the country and provided financial support by MoH & FW for community empowerment will be made the centre of activity at the village level. The health education officer (HEO) at district and block PHC level will be made accountable for implementation of community mobilisation activities to deliver BCC messages effectively, specifically to marginalised, migrant and mobile populations to fully participate in the malaria control activities and improve the utilisation of malaria interventions.

### **9.3.4 Strengthen capacity of service providers including ASHAs, Health Workers, volunteers, SHGs**

The primary channel for the delivery of malaria BCC is through the primary health care workers, as part of the integrated health & social communication package provided by the HWs and community volunteers. A comprehensive BCC training manual will be developed and integrated in service providers and programme managers training curriculum and even. Service providers will be provided with malaria communication materials and job aids.

### **9.3.5 Involvement of school children as change agents for malaria free village:**

School children as Change Agents will be involved for dissemination of information related to malaria elimination. A state & district wise time table will be prepared for visit of health worker (male), health worker (female) and health assistant. The team will impart sensitisation to students in collaboration with the local ASHAs/AWWs and teacher/head master. The team will also identify “a leader for the change” in consultation with the head master and class teacher who will keep the topic of malaria alive on a day to day discussion amongst his/her classmates and family. Each school will be provided a set appropriate health education material for sensitisation of the students and display. It is expected that the Change Agents will mobilise their families and community to utilise services provided under the programme to ultimately realise the goal of “malaria free village” concept. Class leaders will be recognised for their participation in the programme by awarding them a certificate, etc. from Officials in the district. They will actively participate in WMD and AMM campaigns.

## 10. PROGRAMME MANAGEMENT AND COORDINATION

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### 10.1 Background/Situation analysis:

Successful implementation of malaria elimination interventions depends on the availability of skilled, motivated and well supported staff and service providers. Programme needs to have VBD workforce, in full strength at the primary health care and other levels and trained on periodic basis to follow recommended practices and complete accurate and timely reporting and quality supervision. Inadequacies were observed in the numbers, skill mix, responsibilities and prioritisation of tasks by health staff at all levels of health care services (JMM 2014). These include front line facility based service providers as well as supervisors and managers at the mid and senior levels. Human resources (HR) development remains pre-requisite through rapid scale-up of HR; prioritising primary and mid-level training; and ensuring the quality of training.

**NVBDCP is seeking to address this challenge through the following activities:**

1. Strengthen primary health care service delivery system by deploying health work force as per IPHS norms, especially male health workers and supervisors through NHM.
2. Improving capacity of service providers and programme management staff: strengthening pre-service training and Integrated Refresher Training (IRT).
3. Provision of support for supervision: training and mobility support to ensure continuous and timely supervision.

In order to leverage primary health care system towards moving from sustained control towards elimination of malaria in some areas by 2020 and 2022, and country wide by 2030, there must be both increases in technically trained malaria professionals and improved training for the existing workforce.

### 10.2 Policy / Guidelines:

India's health sector reforms reflect the government's commitment to a decentralized, sustainable health system with the objective of providing a sustainable supply of highly competent, qualified health workers at all levels. This will be largely achieved through several innovative initiatives including: the primary health care systems; investment in building effective supervisory infra-structures; an ambitious national training strategy that incorporates up-to-date malaria training curricula and a "cascade" training model that ensures sustainable training at decentralized level; and, several other initiatives to improve staffing mix and efficiencies such as task shifting.

### 10.3 Objectives:

To strengthen the existing human resource capacity at all levels:

- Management level at central, State, regional/zonal/ district and primary health care levels, and
- Health workers at hospitals, health centres and subcentres and volunteers at community level.

## **10.4 Activities:**

### **10.4.1 Improve capacity of health workers:**

- Health Workers will be trained in diagnosis and case management of malaria, case referral, IRS and distribution of LLINs. The training also includes BCC, monitoring and evaluation, surveillance and epidemic preparedness and response.
- Furthermore HWs/volunteers will be trained in integrated community case management (ICCM) to effectively manage febrile cases at community level. Integration with IMNCI modules will also be carried out.
- Updated guidelines, diagnosis & treatment algorithms and job aides will be provided to reinforce training.

### **10.4.2 Improve capacity of State level functionaries, District Health Office, hospital and health centre staff:**

- Training in improved diagnosis, treatment, vector control, M&E and overall planning will be provided to regional and district level health staff. Training will then cascade down to HW supervisors.
- State/ regional “resource trainers” will be created. They will also train sentinel surveillance site medical officers and laboratory technicians.
- Equipment such as computers and other office infrastructure will be procured to enhance performance of staff in management, stock control and monitoring. Additionally, mobility support will be provided to field staff.

### **10.4.3 Improving evidence-based HR planning**

- The NVBDCP will be carrying out three key initiatives: Firstly, the NVBDCP will carry out a comprehensive HR workload analysis to determine levels of current and required HR level and skills at all levels. This will provide evidence-based information for programme managers to advocate for improvements in HR staffing levels, training and other HR initiatives. Secondly, HR planning including succession planning will be done. Thirdly, for current staff, the NVBDCP will be strengthening malaria elimination specific training through the National Center for Disease Control and ICMR Institutes such as National Institute for Malaria Research, Vector Control Research Center and Center for Research in Medical Entomology, Madurai.
- A set of IPHS norms, which have already been developed for each level of health care under the National Health Mission, will be adopted for malaria elimination HR planning by NVBDCP to ensure sustainability of the programme.

### **10.4.4 Strengthen programme management and coordination:**

The NVBDCP will develop and update a human resource development plan and advocate for high level commitment for implementation of the NSP. NVBDCP leadership will support programme units at State/ district health offices to hire additional human resources to perform activities as detailed in National Framework for Elimination of Malaria. NVBDCP will carry out Mid Term Review of NSP in 2018/2019 and Malaria programme review in 2020. Outcome of these reviews will inform revision of NSP.

Standard operating procedures for all activities managed at state and district level will be developed to improve management and accountability of malaria elimination operations. NVBDCP will carry out quarterly Regional Review Meetings in five regions in the country. The State vector bone disease

control programme will meet with district health staff to carry out an monthly and annual review to chart progress against the national monitoring and evaluation plan and develop state operational plans in quarter four of coming year. Likewise, the District VBDCPs will hold monthly with sub district level staff. Already, monthly meeting of ASHAs are held, which will continue to be leveraged for reinforcing guidelines/skills relating to malaria elimination.

#### **10.4.5 Advocacy and Coordination for high level commitment to Malaria Elimination:**

The Prime Minister of India has committed to elimination by 2030 at the East Asia Summit in November 2014, when 18 Heads of State from the Asia-Pacific region including India committed to the goal of malaria elimination in the entire region by 2030. The Ministry of Health & Family Welfare, WHO, NVBDCP and partners, including the Asia Pacific Malaria Leaders Alliance (APLMA), will continue to advocate for commitment to malaria elimination at the highest levels to secure effective multi-sectoral engagement, address human resource requirements for malaria, ensure effective national leadership and governance, expand health services to provide full access for people in remote areas, and determine appropriate approaches to sustain community level services beyond malaria specific services.

#### **10.4.6 Expand and maintain functional partnerships**

Engagement with partners including governmental sector, national and international non-governmental organisations, the private sector, media, bilateral and multilateral agencies and funding institutions will be harnessed for achievement of the malaria elimination goal. A National Multi-Sectoral Malaria Elimination Committee, consisting of all relevant health and non-health stakeholders, will meet bi-annually to discuss current progress and challenges related to malaria elimination. State elimination committee, consisting of key health staff and other inter-sectoral partners will be constituted to support interventions specific to the local context.

#### **10.4.7 Strengthen cross border collaboration:**

NVBDCP in close collaboration with WHO and implementing partners will strengthen existing cross border activities and establish new ones including conducting biannual planning and review meeting, and harmonisation and synchronisation of interventions of border areas with neighbouring countries. Coordination between border districts of India and neighbouring countries will be strengthened through data sharing agreement and formal action planning sessions. Coordination with SAARC countries will be strengthened for the purpose. Appropriate information/BCC materials will be developed in relevant languages for areas across the border to ensure that key messages are understood by targeted audiences.

#### **10.4.8 Mobilise resources to support programme implementation**

Resource mobilization efforts to ensure successful implementation will be led by NVBDCP, MoH&FW to support programme implementation. A full costing of this Action Framework will be carried out and updated as necessary. This will include financial analysis of costs associated with malaria elimination, a gap analysis, and the development of sustainability plan. For any financial gaps, a business plan will be developed and disseminated to guide financial partners for investment in malaria elimination programme. Following annual review and planning meeting, NVBDCP will meet with financial partners to align resources with elimination action framework. A sustainability plan will be developed in 2020 to ensure that all essential activities are continued in Districts that will achieve elimination to prevent re-introduction of malaria infection. Specific private sector entities may be engaged in malaria elimination depending on the area targeted and the private sector's stake in that region.

#### **10.4.9 Introduce and scale up an appropriate interventions for Mobile and Migrant Populations (MMPs) at risk of malaria infection**

Due to high risk of infection among mobile and migrant populations, specific efforts will be made to reach these populations with strategic interventions. NVBDCP will Identify focal persons to engage with and coordinate with partners and activities directed towards mobile and migrant populations (MMPs). Mobility analysis will be carried out on a regular basis to inform population movement and areas to be targeted for appropriate interventions. Mapping and census of MMPs will be conducted every year at regular intervals in identified specific areas of risk to target bed net distribution and other interventions. This mapping and any ongoing operational research among underserved populations will be utilised to regularly update strategy to address MMPs for malaria elimination. Industries supporting employment of mobile and migrant populations such as forestry, plantation and farming, construction and tourism, at risk of malaria will be engaged in malaria prevention strategies. Cross border activities will take into consideration interventions specific to MMPs.

Indian army deployed as peace keeping force to endemic areas outside the country will be screened pre and post deployment to reduce risk of infection and importation of malaria. NVBDCP will work with armed forces and other security forces to ensure that all prevention, case management and surveillance activities are aligned with the country's malaria elimination action framework.

Surveillance Medical Officers of NPSP have experience in working with mobile, migrant, and other underserved populations (MMPs) at risk of malaria infection, programme may consider to take help from this existing human resources available under the NPSP. The team can also facilitate mapping of migrant, mobile and other high-risk populations at risk of malaria for focused interventions

#### **10.4.10 Strengthen Procurement and Supply Management System (PSM):**

NVBDCP will work along with Central Medical Store (CMS) at MoH&FW and agencies procuring on behalf of NVBDCP or donor agencies to select and register appropriate products, issue tenders and secure procurement items and ensure timely delivery and proper storage. NVBDCP will establish a PSM working group to share regular updates regarding procurement and distribution, share stock levels of different commodities, coordinate with different partners and resolve any related matters.

NVBDCP will strengthen mechanisms of forecasting and quantification at central level to include all malaria commodities to be distributed by CMS and partner in the country. NVBDCP will work with CMS, State government and Districts/Units to improve distribution of medicines, insecticides, LLINs and other essential commodities as per need of the peripheral health facilities across the country.

A PSM plan will be developed for all malaria commodities and shared with CMS for in-country distribution. NVBDCP will appoint a PSM focal point to oversee the implementation and monitoring of PSM plan and NVBDCP staff will receive training and capacity building on PSM system.

NVBDCP will also develop or expand the existing system developed by SAMS and implement a software based stock management system across the country to develop transparency to stock availability, monitor supplies and ensure no commodity stock outs occur at any point of time at lower health facility levels. Health staff will be trained on the stock management system and Standard operating procedures (SOPs) will be established to take appropriate response when needed. Stock levels at central level via drug inventory system at CMS will be closely monitored at NVBDCP and supply plan will be updated as needed.

# 11. RESEARCH AND DEVELOPMENT FOR MALARIA ELIMINATION

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## 11.1 Situation Analysis:

Research and Development is an important and ongoing activity for guiding policy change and improving performance at the district level towards malaria elimination. NVBDCP has been actively engaged with ICMR for operational research (OR) for guidance of TES, QA of RDTs, Insecticide resistance studies, GIS mapping etc. The additional research questions would mainly address the specific Programmatic needs for disease prevention, diagnosis, case management, Plasmodium vivax elimination and G-6-PD deficiency, treatment seeking behaviour and compliance to antimalarial medicines in remote and hard-to-reach areas and ethnic groups and tribal populations, monitoring and evaluation, surveillance, health systems and the private sector

## 11.2 Policy and Guidelines:

As India continues its fight against malaria, towards pre-elimination/elimination, additional needs for Operational Research (OR) will be identified throughout the implementation of this National Strategic Plan, in collaboration with SVBDCP, NCDC, ICMR research Institutes, medical colleges and Universities. Operational studies that are relevant to the context of the States/ districts will also be supported, to ensure states apply interventions which are well suited to the local circumstances.

## 11.3 Objectives:

To conduct studies to refine approaches to applying existing interventions most effectively and efficiently in the local context.

## 11.4 Activities:

- It is vital that options are urgently explored to ensure timely and affordable access to improved vector control tools, including those to mitigate insecticide resistance and residual transmission. Research studies are urgently needed to identify and validate markers of insecticide resistance, assess the extent and drivers of residual transmission, and evaluate new tools for vector control.
- Research on outdoor transmission of malaria vector.
- Research is required to develop and evaluate existing tools that can more readily detect low-level parasitaemia in asymptomatic carriers, in order to appropriately target interventions.
- Evaluation of newer innovations and diagnostic tools for malaria diagnosis under laboratory and field conditions.
- Better species-specific point-of-care rapid diagnostic tests are needed for all non-falciparum malaria parasites, and diagnosis of hypnozoites of *P. vivax* is needed.
- Simple, point-of-care rapid diagnostic tests are needed to establish the glucose-6-phosphate dehydrogenase status of individuals in order to expand access to treatment of vivax malaria with 8-aminoquinoline antimalarials with confidence as well as in *P. falciparum* cases to interrupt transmission.
- A robust pipeline of new candidate therapeutic agents is required in view of the threat of the emergence and spread of resistance. The ideal combination would be a safe, effective and affordable single-dose treatment that can produce radical cure, reduce transmissibility of gametocytes, with prophylactic effect for both *P. falciparum* and *P. vivax* infections, and can

be used during pregnancy and in people with glucose-6-phosphate dehydrogenase deficiency.

- New regimens of medicines that are safe, well-tolerated, affordable, avoid promoting resistance and demonstrate broad spectrum of activity need to be developed for treatment of confirmed clinical cases and for potential mass use against the parasite reservoir, including the sexual stages of both *P. falciparum* and *P. vivax*.
- Develop novel chemoprophylactic agents as well as clear research strategies for developing antimalarial medicines for preventive treatment.
- Operationalise Insecticide susceptibility studies. Effectiveness of IRS depends on the continued susceptibility of *Anopheles* mosquitoes to insecticides used in IRS. Data collected between 2001 to date shows that susceptibility of *Anopheles culicifacies* to major classes of insecticides is variable depending on geographical region. Insecticide efficacy studies according to standard WHO protocols need to be done in collaboration with NCDC and ICMR Institutes and other interested partners at selected sites to represent the entire country once every two years. Technical assistance from WHO will be sought to develop a plan for Insecticides Resistance Management as per WHO guidelines in the country.
- Mapping and stratification of districts to identify major and permanent vector breeding sources for management through IVM methods
- Mapping and identification of the highly receptive and vulnerable areas in malaria districts achieving Zero indigenous transmission and continued entomological monitoring and vector control
- Operationalisation of early warning system for detection of malaria outbreaks in low endemic areas.
- Bionomics of malaria vector, vector succession and research on outdoor transmission of malaria vectors.
- Monitoring the efficacy of antimalarial drugs in India for policy decisions regarding continuation or change in the National drug Policy based on standard WHO protocols, preferably as a multicentric research project covering sentinel sites from different parts of the country.
- Monitoring use, longevity and efficacy of LLINs under field conditions for guiding Programme for LLIN procurement and replacement.
- KAP studies on treatment seeking behaviour, and implementation of key interventions in specific ethnic groups and tribal areas with continuing transmission in order to increase demand for treatment, testing and recommended therapy. Innovative methods to ensure that both public and private providers, and those outside the formal health system, adhere to standard guidelines for detecting, treating and recording all malaria cases.
- Quality assurance of existing and new vector control products and equipment. It is crucial for sustained efficacy and safety of vector control products and equipment. As national capacity to conduct quality control assessments of existing and new vector control products and equipment is currently limited, programme must invest in building sufficient expertise and necessary facilities.
- Quality assurance of RDTs, microscopy and anti-malaria drugs are crucial for the success of malaria elimination programme. As national capacity to conduct quality control of anti-malarial drugs and RDTs, programme must invest in building state and regional level expertise and necessary facilities should be established to attain high standard quality services.
- Annual review of research conducted. A Technical Working Group (TWG) will be formed including WHO country office representatives who will conduct annual technical reviews of research findings. Programme strategies and research priorities will be updated accordingly. Regular meetings between NVBDCP representatives and research partners will ensure a coordinated national approach.

A committee will be established within MoHFW to place special emphasis on translating proven new interventions and approaches quickly to operational adoption. An open access research website will be established by technical partners to allow institutions and researchers to access topics of interest, including research proposal submission procedures, ethical regulations, potential funding sources, informal results, publications and a 'Questions & Answers' forum.

# 12. IMPLEMENTATION OF NATIONAL STRATEGIC PLAN

## 12.1 Stratification of Districts:

The malaria situation in India is heterogeneous due to variance in malaria burden by geographical area, programme capacity and mobility of the risk populations. The identification of specific malaria strata based on these characteristics is essential for determining the most feasible, impactful and cost effective strategies, approaches and interventions. It is not only critical to choose what intervention packages to use in each stratum, but also when to take up these activities. The phasing of malaria elimination will be based on the stratification and the operational capacity of the national programme transition to elimination.

At present, the strata have been identified utilising quantitative characteristics of malaria transmission by taking annual parasite incidence (API) into consideration as the primary value for the year 2014-2016 as reported by public health facilities.

Combining the defined characteristic as above, specific districts were placed into four strata for operationalisation and targeting of the strategy.

Table: 4 Category Of Districts

| Category of Districts                            | Definition                                                                                                                                                                                                                           | Number (%) |
|--------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------|
| Category 0: Prevention of re-establishment phase | Districts/Units historically considered to be without local transmission and reporting no case for last three years. Vigilance will be maintained in these districts to prevent reintroduction of malaria in view of climate change. | 75 (11.0)  |
| Category 1: Elimination Phase                    | Districts/Units having API less than 1 per 1000 population.                                                                                                                                                                          | 448 (66.1) |
| Category 2: Pre-elimination Phase                | Districts/Units having API 1 and above, but less than 2 per 1000 population. These are positioned for elimination targeting in the subsequent years.                                                                                 | 48 (7.1)   |
| Category 3: Intensified Control Phase            | Districts/Units having API 2 and above per 1000 population. These are positioned for elimination targeting in the subsequent years.                                                                                                  | 107 (15.8) |

## 12.2 Year-wise activities:

In 2017, the elimination activities will be concentrated in 448 category-1 districts where surveillance activities will be intensified to guide a targeted response to interrupt transmission. In this elimination targeted stratum, all confirmed cases detected at the health facility, ASHAs/AWWs and PPM network will be subject to an epidemiological investigation. All cases will be classified to identify the likely source and reason for infection. Case investigation, along with reactive case detection and foci investigation, will inform the response to each specific focus. Proactive surveillance will be carried out in targeted areas with mobile, migrant and poorly served populations.

In the category 2 and 3 districts, where there are still many cases of malaria and it is not possible to investigate each malaria case individually, efforts will be made to aggressively scale up and improve the quality of preventive interventions as well as access to diagnosis and treatment.

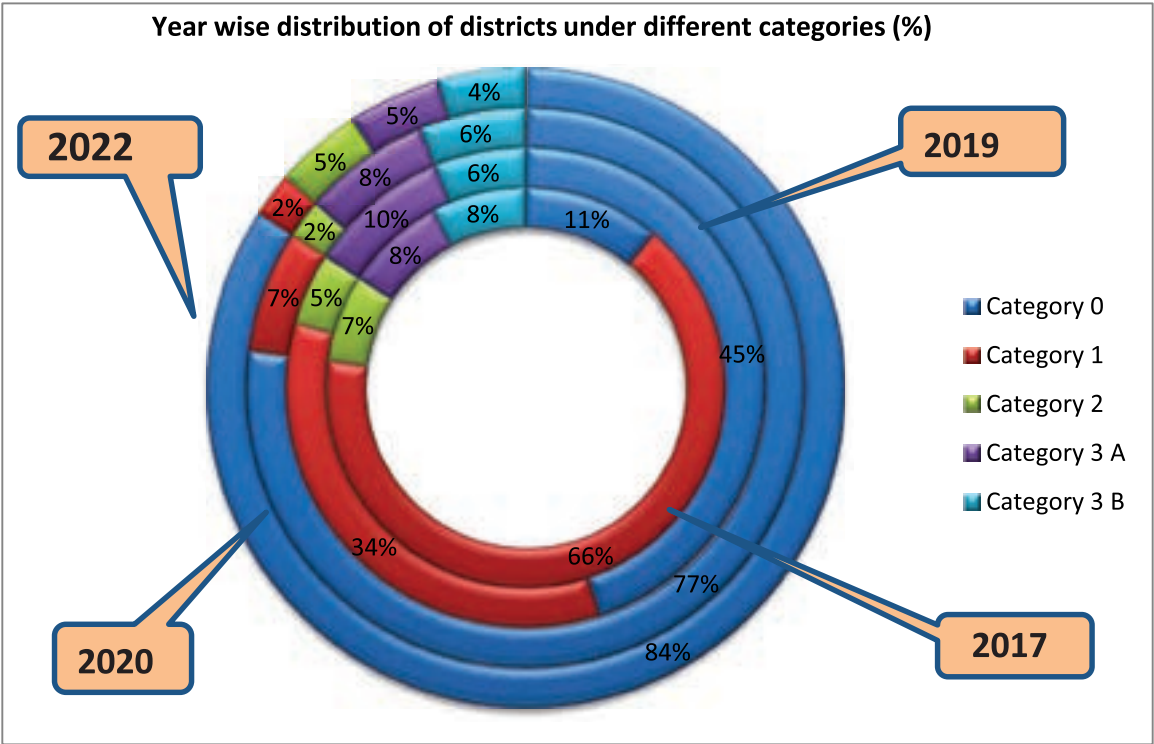
In year 2019, 230 districts in Category 1 will achieve zero indigenous transmissions while 15 districts in Category 2 will transit to Category 1 districts and few districts from category 3 would reduce the incidence of malaria.

In year 2020, all 448 districts that were in Category–1 in 2017 will transit to category 0, while 33 districts in Category – 2 will transit to Category - 1. Besides, 15 districts from category 3 will transit to category –2.

In 2022, 48 districts that were in category 2 in 2017 will achieve 0 indigenous transmissions and 15 districts would move to elimination stratum, while 30 districts from category 3 from to category 2. Year-wise approach to elimination is depicted in the following table and diagram:

**Table - 5: Year-wise distribution of districts in different categories**

| Year | Category 0 | Category 1 | Category 2 | Category 3 | Total |
|------|------------|------------|------------|------------|-------|
| 2017 | 75         | 448        | 48         | 107        | 678   |
| 2019 | 305        | 233        | 33         | 107        | 678   |
| 2020 | 523        | 48         | 15         | 92         | 678   |
| 2022 | 571        | 15         | 30         | 62         | 678   |



## 12.3 Intervention Strategies by CATEGOREIS:

The revision of surveillance system and other approaches to address the new elimination challenges will be initiated before areas enter into the elimination phase. As the parasite reservoir is decreased and became possible to track every case, it is rational to phase/ initiate case and foci based surveillance and other elimination activities. The transition of District/Unit from burden reduction to elimination targeted stratum requires changes of responsibilities according to the revised job definition of programme personnel, revising surveillance and information system including relevant practical guidelines, reorienting cross-border collaboration with neighbouring countries, strengthening inter-sectoral cooperation and adopting monitoring and evaluating procedures to malaria elimination. The unique intervention strategies by stratum are presented in table below:

**Table 6 - : Interventions Strategies by Strata**

| Operational Strata                      | Objective – 1<br>Diagnosis & Treatment                                                                                                                                                                                                                                                                                                                                                                                             | Objective – 2<br>Prevention (Vector Control)                                                                                                                                                                                                                                  | Objective – 3<br>(Surveillance)                                                                                                                                                                                                                                                                                                                                                                                                                                                          | Objective – 4<br>IEC/ BCC                                                                                                                                                                                                                                                             |
|-----------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Elimination Operational Districts (448) | <ul style="list-style-type: none"> <li>• Quality services through public health facilities, ASHAs/AWWs and PPM providers</li> <li>• Quality assured diagnosis with RDT and microscopy.</li> <li>• Treatment with effective ACT+Primaquine(pf)/CQ+PQ(pv)</li> <li>• Training &amp; supervision of all health care staff&amp; ASHAs/AWWs</li> <li>• Training of PPM network</li> <li>• Treatment follow up to ensure cure</li> </ul> | <ul style="list-style-type: none"> <li>• Mass &amp; continuous LLIN distribution in transmission hot spots.</li> <li>• IRS in identified foci where appropriate</li> <li>• Environmental management of vector breeding sites</li> <li>• Entomological surveillance</li> </ul> | <ul style="list-style-type: none"> <li>• Immediate case reporting via cell phone from public health facilities, ASHAs/ AWWs, PPM network</li> <li>• Case investigation and immediate reporting via internet at PHC</li> <li>• Reactive case detection around confirmed cases in transmission areas.</li> <li>• Foci investigation and response</li> <li>• Continual analysis to identify and mitigate drivers of transmission.</li> <li>• All data entered and managed in MIS</li> </ul> | <ul style="list-style-type: none"> <li>• Health education via ASHA/AWWs,</li> <li>• Health workers, health supervisors and PPM network.</li> <li>• Community mobilisation through GKS</li> <li>• School leadership programme for promotion of malaria free village concept</li> </ul> |

|                     |                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |                                                                                                                                                                                                                                                                  |                                                                                                                                                                                                                                                                                                                                       |                                                                                                                                                                                                                                                                                                                                                         |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Transitional Ds(48) | <ul style="list-style-type: none"> <li>• Quality services through public health facilities, ASHAs/AWWs and PPM providers</li> <li>• Quality assured diagnosis with RDT and microscopy.</li> <li>• Treatment with effective ACT+Primaquin (pf)/CQ+PQ (pv)</li> <li>• Training &amp; supervision of all health care staff &amp; ASHAs/AWWs</li> <li>• Training of PPM network</li> <li>• Treatment follow-up to ensure care</li> <li>• Therapeutic efficacy studies.</li> </ul> | <ul style="list-style-type: none"> <li>• Mass &amp; continuous LLIN distribution in transmission hot spots.</li> <li>• IRS in identified hot spots</li> <li>• Environmental management of vector breeding sites</li> <li>• Entomological surveillance</li> </ul> | <ul style="list-style-type: none"> <li>• Case based reporting via internet at block PHC on monthly basis.</li> <li>• Proactive case detection</li> <li>• Continual analysis to identify and mitigate drivers of transmission.</li> <li>• All data entered and managed in MIS</li> <li>• Outbreak preparedness and response</li> </ul> | <ul style="list-style-type: none"> <li>• Health education through ASHAs/ AWWs</li> <li>• Community mobilisation through GKS</li> <li>• MMP focused health education campaign</li> <li>• Multi-media campaign on malaria prevention and case management</li> <li>• School leadership programme for promotion of malaria free village concept.</li> </ul> |
|---------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

## 12.4 Special Area Strategy and Plan

In India, the transmission dynamics, vulnerability and receptivity varies in different eco-epidemiological settings. Tribal areas, urban area, mobile and migrant population and development project areas have different strategy and plan. The same may be seen at Annexures 3, 4 and 5.

*“Receptivity” is defined as the ability of an ecosystem to allow transmission of malaria, while “vulnerability” refers to the probability that malaria parasites will be imported into an area*

## 13. MONITORING AND EVALUATION

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Regular monitoring and critical evaluation is crucial in ensuring sustained and steady progress towards achieving the ultimate goal of malaria elimination. The objective of the monitoring & evaluation system is to track the execution of the National Strategic Plan for Malaria Elimination, 2017-22 and to measure if the set of targets is being met according to the proposed timelines and to identify the activities requiring additional support. The M&E system allows the programme managers at all levels to identify the gaps in inputs, processes & coverage and facilitates evidence based decision making to obtain desirable outcomes and impacts through best practices across multiple intervention areas.

Monitoring of the inputs, processes and coverage and evaluation of the outcomes and impacts under the programme log-frame would be based on assessment of progress against predefined evidence-based indicators.

Completeness, timeliness and reliability of the data collected by NVBDCP would be important for monitoring & evaluation of epidemiological trends, impact of intervention, and improving management and decisionmaking. To support strengthening monitoring & evaluation, NVBDCP will update national monitoring & evaluation plan and review as necessary with the support of WHO country office Update the TORs and SOPs/checklist for M&E teams at central, state, district and CHC levels to ensure quality monitoring of case management, vector control and surveillance activities.

Reporting under the M & E plan will be the joint responsibility of District, State NVBDCP and other implementing partners. The main source of data for indicators will be routine data collection systems and real-time case-based & entomological surveillance systems to be managed under the upgraded MIS. Monitoring visits would be conducted at district & sub-district level facilities and in the households as well as in priority urban settings (e.g. urban slums, construction sites etc.) by state and national M&E team periodically. The purpose of the visits would be to identify the gaps with respect to programmatic, managerial, administrative, financial & logistics related gaps and to validate the field level data. Iterative monitoring & follow-up along with supportive supervision for capacity building of staffs in the PMU & field would be undertaken with focus on non-reporting facilities and areas with high endemicity. At least one representative visit for M&E per month would be done by the National team for oversight. The human resource at various levels would also be monitored on a regular monthly basis.

Granular data points for each village would be collated & maintained and state office with appropriate disaggregation. Granular data points up to SC level would be collated, analysed, interpreted and disseminated at the national office with appropriate disaggregation. Data cleaning & validation would be conducted at each PMU level and any ambiguity or missing data would be resolved through visit to the particular facility level by district level staffs.

Programmatic epidemiological data would be analysed in comparison with the utilisation of stocks and stocks for all logistics including diagnostic supplies as well as antimalarials would be validated comparing with the stock register, facility-wise consumption and physical verification of stocks. All training and reporting related data up to ASHA level would be monitored and cross-checked against the expenditures incurred in the same budget period and any discrepancy would be immediately resolved in monthly meetings at the district office.

A mid-term evaluation of the strategic plan will be conducted in 2018/2019 and end line evaluation in 2020 for category- I and in 2022 for category – II & category – III districts with the support of WHO country office. Mid-term corrections as well as modification in the resource allocation plan would be tailored with the findings of mid-term evaluations. The end-line evaluation would be carried out

preferably by independent agencies in order to ensure unbiased estimation of the progress of the programme against the objectives and would inform the policy about the necessary corrections for the next strategic plan period.

The reporting system provides the basis for the flow of information, which is vital for the implementation of activities and programme administration. Key data from the implementing partners for indicators in the M&E framework will be collected through the MIS which would be linked with surveillance system of implementing partners. Based on the indicators, data collection and reporting will occur on daily, monthly, quarterly, half yearly and annual basis.

The M&E indicators are described in the Annexure 6.

### **13.1 National Polio Surveillance Project**

The polio eradication programme is a “model of excellence” for other public health initiatives in India and global health interventions as a whole. WHO in collaboration with Government of India established National Polio Surveillance Project (NPSP) in October 1997 with deployment of Surveillance Medical Officers (SMO) throughout the country. All health care service providers viz government and private, allopathic and Indian systems of Medicine including traditional healers at village level are included in the network surveillance. The NPSP project has developed an extensive and efficient AFP surveillance network which can be leveraged to further strengthen the malaria surveillance in the country which is the core intervention in the NSP 2020/2022. In pre elimination and elimination States/ districts, focus is on reporting active malaria cases and foci, and their investigation leading to reactive and proactive surveillance for liquidation of active foci, particularly in districts targeted for elimination of malaria by 2020/2022. As the programme moves closer to elimination, SMOs may build capacity and coordinate with government for case based surveillance followed by active foci investigation and reporting.

Actual case burden of malaria in the country is not known and available malaria case data is unreliable, in part, because of the difficulty in reporting from the private sector. Under reporting of malaria cases makes it challenging to accurately estimate the true burden, plan for financing to adequately address the disease, and deploy appropriate control and elimination strategies.

A network of private hospitals and quacks are already under the polio network of NPSP across the country. It is proposed to involve this network by orientating the network to ensure the reporting of malaria cases and deaths. The orientation training would be organized by NPSP surveillance officers in identified districts and cities on case diagnosis, treatment as per drug policy, case base surveillance and foci investigation. Distribution of RDT kits will be explored to incentivise the system to report. The role of NPSP will focus on increasing the number of private sectors/ quacks in reporting system for malaria.

Since NPSP has extensive experience working across multiple sectors as well as in supervision and monitoring of programme implementation this will be leveraged in selected districts for additional technical and operational resources to achieve malaria elimination in the country. Supervision and monitoring of implementation of interventions under malaria elimination strategic plan would be undertaken in category 1 states, during first phase till 2020. In second phase, monitoring and supervision may be carried out in states/UTs of Category 2 States till 2022. In high burden states, their role may be to supervise and support the malaria programme to achieve target coverage of LLIN/IRS and evaluation of these interventions and in monitoring and supportive supervision of the performance of private practitioners.

## 14. COORDINATION MECHANISM

Coordination is an administrative process which seeks to bring about unity of purpose in order to achieve common objectives. Coordination implies a cooperative situation where two or more participants have a common goal and where each has sufficient information as to what others are going to do to enable him to make correct decision. NSP for Malaria Elimination is to be implemented jointly by NVBDCP and other implementation partners including donors with the support of MoH &FW, Government of India. NVBDCP will play a leading role in the coordination of activities essential for malaria elimination with the partners. NVBDCP will work with other ministries and health departments (AYUSH, DHR) and national programmes to ensure that a multisectoral effort is in place to achieve malaria elimination in the country in next decade. New structure for collaboration with international experts will be formed to regularly review the progress on malaria elimination. For achieving cooperation from various Ministries/ departments, NVBDCP will constitute a National Multisectoral Malaria Elimination Committee under the Chairpersonship of Union Health Minister with members from Ministries/Departments of Home Affairs, Defense, Urban Development, Rural Development, Environment and Forest, Water Resource development/Irrigation, Agriculture, Education, Information and Broadcasting, Industry, National High Ways and Transport, Railways and Central Public Works department etc. The committee should also be represented by WHO, NGOs, CBOs and FBOs, The aim of the Committee is to seek active collaboration from the respective departments in implementation of anti-malaria activities related to their respective departments. NVBDCP will prepare a list of activities related to each of these departments and would be communicated to them. Table – below briefly describes potential roles of various departments/ organisations. The committee will meet bi-annually to monitor the progress towards malaria elimination and collaboration with the respective departments.

The NVBDCP will also constitute Malaria Sub – technical Working Group (SWG) to align with the objectives of and drive forward the strategies of malaria elimination. The SWG chaired by NVBDCP will hold meetings with implementing and other partners to share and evaluate programme results, facilitate technical discussion, discuss matters related to policy making and ensure activities are coordinated. Meeting will be convened as needed for different thematic areas including case management, surveillance, vector control, IEC/BCC and procurement and supply management. All the domestic partners with a stake in malaria elimination will be requested to be part of the relevant working group. .

NVBDCP will also establish a National Malaria Elimination Task Force comprising of WHO and other partners providing strategic and technical support to the national programme on day to day basis for oversight of implementation, facilitate communication with external stakeholders, help resolve any bottlenecks needing quick action and participate in discussion.

**Table 7: Potential roles of various sectors and agencies**

| Departments/Agencies       | Potential roles                                                                                                                                                                                                             |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Department of Agriculture  | Pesticide management and judicious use of pesticides<br>Farmer field schools to implement integrated pest and vector management<br>Popularising the concept of dry-wet irrigation through extension education               |
| Water resource Development | Maintenance of canal system to prevent seepage of water<br>Intermittent irrigation<br>Design modifications and improvement of lining of canals<br>De-weeding of canals for proper flow of water<br>Creating small check dam |

|                          |                                                                                                                                                                                                                                                                                                                                                                |
|--------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Drinking Water supply    | <p>“Swachh Bharat” Mission</p> <p>Repair of leakages in supply pipes to prevent water pools</p> <p>Restoration of leaking taps</p> <p>Diversion of wastewater to ponds / pits</p> <p>Staggering of water supply</p> <p>Mosquito proofing of water harvesting devices</p> <p>Repair of sluice valves</p> <p>Improved designing to avoid undue water logging</p> |
| Urban development        | <p>“Swachh Bharat” Mission</p> <p>Issue of building use permission after clearance from health department</p> <p>Safe rainwater harvesting</p> <p>Mosquito proof design of dwellings</p>                                                                                                                                                                       |
| Industry/ mining         | <p>Improving drainage and sewerage systems</p> <p>Safe disposal of used containers / solid wastes</p> <p>Mosquito proofing of dwellings</p> <p>Safe water storage and disposal</p> <p>Use of LLINs</p>                                                                                                                                                         |
| Railways                 | <p>Proper excavations</p> <p>Maintenance of yards and dumps and antilarval activities in areas within their jurisdiction</p> <p>Housing for health safeguards</p> <p>Promotion of use of LLINs amongst the railway employees</p>                                                                                                                               |
| Environment&forest       | <p>Pesticide management policy</p> <p>Environment management policy</p> <p>Reclamation of swampy areas</p> <p>Social forestry</p>                                                                                                                                                                                                                              |
| Fisheries                | <p>Institutional help</p> <p>Training in mass production of larvivorous fish</p> <p>Promotion of composite fish farming schemes at community level</p>                                                                                                                                                                                                         |
| Road and building sector | <p>Proper planning</p> <p>Merging pits by breaking margins</p> <p>Excavations in line with natural slope / gradient</p> <p>Making way for water to flow into natural depressions / pond / river</p> <p>Follow up action after excavations</p>                                                                                                                  |
| Remote sensing           | <p>Technical help and training in GIS mapping environmental changes and malaria risk using GIS</p>                                                                                                                                                                                                                                                             |

|                                                                               |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |
|-------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Education                                                                     | <p>Vector control teaching in educational curriculum</p> <p>Issuing directions for monthly drive on cleaning of school premises,</p> <p>Cleanliness of surroundings and checking water containers for mosquito breeding</p> <p>Incorporation of vector control activities in the training curriculum of ICDS functionaries under the department of women &amp; child development as well as their involvement in vector control activities</p>                                                                                                                                                                                                                                                                                                              |
| Mass media                                                                    | <p>IEC activities</p> <p>Advocacy</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       |
| Tribal Affairs                                                                | <p>Training of teachers in screening of school children for malaria parasite and referral of confirmed malaria cases/ infection for radical treatment to nearest health facility/ ASHA</p> <p>Sensitisation of Ashram school children on prevention and control of malaria.</p> <p>Inclusion of malaria in the curriculum of training programmes undertaken by tribal research and training institute, department of welfare.</p> <p>Identification of priority for research in malaria in tribal population.</p> <p>Mainstreaming of malaria related messages in awareness programme run by tribal affairs department.</p> <p>Community mobilisation for acceptance of vector control measures and case management services from ASHA/health facility.</p> |
| Local self-government/<br>Panchayati Raj<br>Institutions/<br>village councils | <p>Overall cooperation in implementation of ongoing malaria programme activities like IRS, ITN</p> <p>Facilitating community participation in implementation of programme activities.</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Corporations/<br>Municipalities                                               | Coordinated action for vector control in urban/town areas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| Corporations/<br>Municipalities                                               | Coordinated action for vector control in urban/town areas                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   |
| NGOs /FBOs / CBOs                                                             | <p>Community mobilisation</p> <p>Promotion of programme activities</p>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |

## 15. RISK MITIGATION PLAN

| Challenge                                                                                                                                                                                                                                                                | Suggested Mitigation Plan                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                    |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Financial sustainability of the project might be a challenge, successful implementation by maintaining continuous supply of diagnostics kits, IRS, drugs and LLINs. Apart from supply, hiring of human resource and training is also a costly and time consuming affair. | <ul style="list-style-type: none"> <li>• Technology should be used as vital tool either alone or jointly with in person trainings, depending on course and curriculum need to be completed. Use of technology will not only reduce the cost of capacity building but also will maintain uniformity in the delivery of course and curriculum.</li> <li>• Technology should also be used as a powerful and cheaper resource to empower personnel working in different districts. Learning-sharing platform or groups can be created for regular discussions, updates, learning sharing and monitoring purpose.</li> <li>• Launch of special certificate and diploma courses on non-clinical roles for malaria prevention should be initiated for youth and employ them in focus districts to engage them in public health work.</li> </ul>                                                                                                                                                                                                                                                                                                                                                     |
| Developmental activities undertaken by different sectors leading to proliferation of mosquito breeding sites and thereby result in increase in malaria incidence. Absence of a comprehensive and agreed upon accountability framework.                                   | <ul style="list-style-type: none"> <li>• Apart from public-private and not for profit partnerships for various purposes, comprehensive framework of partnership and collaboration is needed between various ministries and government departments. Agriculture, urban and rural development, water supply, water resource development, railways, environment, fisheries, road and building etc are a few to name here and to be involved in framework. Framework should have clear definitions and accountability guidelines and principles for various partners to take timely and proactive actions.</li> <li>• A centralised database of all construction and development activities, conducted by various departments, need to be maintained for yearly updation of preventive action needed for a particular location. Such actions should be supported by technology tools and advance research like GIS for building prediction models and for forecasting and undertaking situational analysis of existing breeding beds and newly formed potential breeding sites for advanced planning and optimisation of resource allocation for maximum returns on investments made.</li> </ul> |
| Political commitment is a major concern for continuity of the programme.                                                                                                                                                                                                 | There is a strong need felt for continuous awareness and motivational sessions for politicians for realisation of problem, interest building and knowledge driven decision taking for successful implementations. Various institutions established under national Health Mission like Mission Steering Group at central, State Health Mission (SHM) at State, District health mission at district, Rogi Kalyan Samiti (RKS) at block and Village Health Nutrition and Sanitation Committee (VH&SC) or Gramin Kalya Samiti at village levels which are headed and represented by politicians, NGOS and other public representatives should be continuously engaged to ensure political commitment towards malaria elimination                                                                                                                                                                                                                                                                                                                                                                                                                                                                 |

|                                                                                                                                                                              |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                      |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Resistance is one of the biggest challenges in success of the program. This includes resistance to drugs, IRS and LLINs, hence require a fresh pipeline of new developments. | There is strong need to expedite the pace of research and development for new pharmaceutical products and insecticides to overcome the challenges. It is proposed to support and encourage research initiatives by organisations independently, in public-private collaborations to expedite the research activities.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                |
| Community Partnership                                                                                                                                                        | <p>Successful programme require ownership and willing actions of community which is a challenge for government to achieve.</p> <ul style="list-style-type: none"> <li>• Not -for -profit sector is known for its expertise for accessibility to mobile, migrant, vulnerable and remote communities, independency, selfless initiatives, community counselling and awareness raising, required for community mobilisation and participation. Hence, there is a need to invite NGOs &amp; FBOs participation in community access and mobilisation.</li> <li>• India with close to one billion mobile phone connections is witnessing now easier penetration to earlier hard-to-reach communities directly. Technology uses should be explored for involving community in monitoring and surveillance activities by conducting periodic surveys, providing easy to use tools for feedback, grievance addressal, case reporting as well as management issues.</li> </ul> |
| Real time reporting                                                                                                                                                          | Being an epidemic prone disease, real time reporting of malaria outbreak from remote and poorly served areas is a challenge for the programme to respond. Technology should be used as a vital tool for real time information like use of SMS or app bases platform built in Malaria Information system.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                             |

## 16. GUIDELINES FOR CERTIFICATION AND VERIFICATION OF MALARIA ELIMINATION

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### Malaria Elimination

WHO certification of malaria elimination is an official recognition of the elimination for all the human malaria parasite species (*P. vivax*, *P. falciparum*, *P. malaria* and *P. ovale*) in the country as a whole. This achievement is of great importance for the international community and even more for the country concerned, as the political, social and economic impacts on sectors such as tourism and business are considerable. It is nevertheless the prerogative of national governments to decide to request certification of malaria elimination.

#### 16.1 Procedure

The burden of proof of malaria-free status falls on the national authorities that are requesting WHO certification through their minister of health. The steps in certification of malaria elimination, managed by the WHO GMP applying standard operating procedures, are summarised as below:

- 1.1 The country, after reporting zero indigenous malaria cases for at least the past three years through a sensitive and robust national surveillance system, can submit an official request for certification to WHO (Regional Director or GMP). The country should contact WHO about certification only when it believes it has eliminated mosquito transmission of all human malaria parasites within its borders.
- 1.2 The country, in consultation with the corresponding WHO regional office and the GMP, formulates a plan of action and timeline for the certification process. This takes place during an initial WHO assessment mission.
- 1.3 The country finalises the required national elimination report and submits it to WHO.
- 1.4 A team of the independent CEP, established by WHO, i) reviews the national elimination report and other key documents, ii) conducts field visits to verify its findings, and iii) develops a final evaluation report.

#### 16.2 Key Documents Required:

Documents for the Certification Elimination Panel to be prepared from the elimination database by the national government:

- national malaria elimination strategic and operational plan;
- annual malaria programme report;
- plan of action for the prevention of re-establishment of malaria;
- organizational structure of the malaria department and malaria activities in general health services, with detailed budget and staff information; description of health facilities and their functions and activities in malaria surveillance; plans for continued staff education; and guidelines and standard operating procedures for malaria surveillance;
- all available annual malaria surveillance reports for at least 10 years, three years of which show zero indigenous cases;

- full information about malaria foci in the five years before the last indigenous case, with supporting maps (database of malaria focus investigations; focus register and analytical tables and maps);
- national malaria case register with case investigation forms for at least the previous five years;
- for laboratory support, reports of quality-assurance activities for diagnosis; designation of a national reference laboratory; participation in an external quality assurance scheme; standard operating procedures for malaria diagnostics; participation in WHO assessment of malaria microscopy competence; annual reports on performance of laboratory services for malaria diagnostics;
- national anti-malarial treatment policy;
- annual report of entomological and vector control activities;
- reports of independent committees on malaria (such as the national malaria elimination advisory committee), the surveillance system and entomological and vector control activities;
- recent published and unpublished reports of studies on malaria epidemiology and malaria vectors;
- legislation or regulations related to malaria and vector control;
- reports of inter-sectoral collaboration;
- reports of border coordination activities, if relevant; and
- documentation of health education and community awareness-raising.

The final evaluation report is reviewed and finalised by the CEP and submitted to the WHO MPAC with a recommendation to certify malaria elimination or to postpone certification with details on the extra evidence required to demonstrate that malaria elimination has been achieved.

The WHO MPAC makes a final recommendation on granting malaria-free status and provides a summary of the final evaluation report to the WHO GMP for subsequent submission to the WHO Director-General.

The WHO Director-General makes the final decision and officially informs the national government. When granted, WHO publishes the certification in the Weekly epidemiological record, International travel and health and the World malaria report and the country is listed in the official WHO Register of areas where malaria elimination has been achieved.

The country continues its efforts to prevent the re-establishment of malaria transmission and reports annually to WHO in order to maintain its malaria free status.

### **16.3 National Elimination Report**

The country requesting certification provides proof of the absence of mosquito-borne malaria transmission and its ability to detect and respond to any malaria case in a national report. The report is a comprehensive summary of national documentation including the existence of an adequate surveillance system and a complete history of national malaria epidemiology and of the programme. It provides evidence that human malaria transmission has been interrupted in the country, indicates that the country has met the prerequisites for certification and includes a description of how the country plans to maintain its malaria-free status. The national report should be provided to WHO preferably in English. The country also submits the database for the national elimination report, which includes:

- a national malaria case register, with individual case and focus investigation forms and for at least the previous five years, showing that no indigenous malaria infections were detected in the country during at least the past three years;
- annual malaria surveillance reports covering the previous 10 years;

- full information about active malaria foci in the five years before the last indigenous case;
- reports of quality assurance of diagnoses; and
- the existence of a central repository of information on entomological surveillance and application of selected vector control interventions in the five years.

#### **Activities of the malaria Certification Elimination Panel:**

WHO arranges for members of the malaria Certification Elimination Panel (CEP) to review the national report and other relevant documentation and then to visit the country (the number of people is determined by the size of country) to gather any additional information required. Members of the panel evaluate whether the following prerequisites have been satisfactorily fulfilled:

- a malaria surveillance system of high quality covering all the geographical areas of the country;
- evidence of no indigenous malaria cases for the past three years (based on comprehensive case investigation forms);
- an adequate system for early detection and effective treatment of malaria cases and for subsequent clinical and epidemiological monitoring, supported by continuing education on malaria for health workers, including in the private sector;
- laboratory services that provide prompt, quality-assured parasitological diagnosis of malaria throughout the country, including the most remote and inaccessible areas;
- prompt, thorough epidemiological investigation and classification of every malaria case and focus; • immediate mandatory notification of all malaria cases by public and private health services;
- a central computerised database of malaria cases and foci, with a geographical information system for mapping, and a national register of cases; and
- a comprehensive national plan of action with continuing political and financial support for activities to prevent re-establishment of local transmission. Special studies (for instance, molecular epidemiological studies by polymerase chain reaction techniques to map the distribution of sub-microscopic infections) may provide additional proof that malaria transmission has been interrupted.

#### **The prerequisites for preventing re-establishment of malaria transmission are:**

- an adequate system for early recognition and rapid response to malaria epidemics;
- inter-country information-sharing and functional border coordination, where relevant;
- an efficient malaria surveillance system (which may be integrated into systems for other communicable diseases);
- effective mechanisms for cooperation among all ministries and agencies involved in malaria prevention;
- a high-quality system for entomological surveillance, including monitoring of resistance of malaria vectors to insecticides, especially in areas with high receptivity; and
- services to raise awareness and provide practical advice on prevention and early detection of imported malaria (for nationals travelling to or returning from malaria-endemic countries)
- During the field visit, CEP members review the quality and completeness of the database. The data are cross-checked against the information provided in the national elimination report. Attention is paid to the classification of individual cases and foci.

#### **CEP members pay particular attention to:**

- coverage of populations by health services that provide access to malaria diagnosis and treatment, especially in former transmission foci and other entomologically receptive areas;

- the possible presence, in areas at risk for malaria, of treatment sites that do not always report cases to the surveillance system, including private pharmacies, private medical practitioners, drug vendors, public and private hospitals that were not included in the malaria surveillance system, military health services and services in neighbouring countries;
- documentation of surveillance at intermediate and primary levels, including case and focus registers, entomological surveillance reports and mapping of breeding sites in receptive foci;
- validation of surveillance reports against health facility records and anti-malarial drug supply figures;
- surveillance of populations at risk for malaria in time and space, based on a matrix showing the sizes of the smallest population units and the number of diagnostic tests (blood slides and/or RDTs) conducted in each of the units by month during the transmission season;
- the existence and performance of or requirement for special measures to ensure coverage of mobile populations, including temporary workers, illegal immigrants and refugees, whose presence and distribution in an administrative unit is variable or uncertain and who may not habitually use established health services;
- standard operating procedures for quality-assured diagnostic methods (RDTs and microscopy); an internationally certified, designated national central reference laboratory; and a national quality assurance system for malaria diagnosis reports;
- the timeliness of diagnosis and treatment specifically for malaria; and
- the timeliness of notification, epidemiological investigation of cases and foci and reporting.

CEP members also assess whether the systems and activities of the national programme can be considered adequate to monitor the potential for reintroduction of malaria into the country, to identify the areas that are receptive to resumption of transmission, to identify areas that are likely to become receptive, to identify areas vulnerable to parasitic importation and capture changes in vulnerability, and to take adequate measures to prevent reintroduction of transmission.

## 16.4 CEP Report

CEP members prepare a comprehensive report of their findings and recommendations, to answer two fundamental questions.

- Is it proven beyond reasonable doubt that mosquito-borne local malaria transmission has been fully interrupted in the country, resulting in zero incidence of indigenous cases for at least the past three consecutive years, and, if so, on what evidence is this based?
- Can it be stated with full confidence that the national health system, as it is, will be able to prevent re-establishment of malaria transmission in the country, and, if so, on what evidence is this claim based?

## 16.5 Granting Malaria-Free Status

The report is reviewed by all CEP members. The country will be asked to clarify any technical issues or respond to questions. After any further clarification or supplementary information, the CEP submits its final evaluation report to the WHO MPAC with a recommendation to certify malaria elimination or to postpone.

A minimum indication of possible transmission re-establishment would be the occurrence of three or more indigenous malaria infections of the same species per year in the same focus for three consecutive years. Because certification represents recognition of a considerable operational achievement, a careful national investigation and consultation with WHO will be conducted before a country's malaria-free certification status is lost. As of November 2016, no certification had been withdrawn.

## **16.6 Subnational Verification of Malaria Elimination**

Subnational verification of malaria elimination is an option for large countries that have achieved interruption of local transmission in certain parts of their territory (states, regions or provinces). This option may be useful for countries that have geographically isolated territories, such as islands. The documentation of elimination of local malaria transmission at subnational level should be as rigorous as that at national level but is managed only by the national health authorities of the country concerned. The outline of the subnational elimination report should be aligned with that of the national elimination report reviewed by WHO during certification.

## **16.7 Follow Up of WHO Certification**

Certification confirms to the international community that an entire country has an adequate system for preventing re-establishment of local malaria transmission. It also demonstrates an accomplishment made possible by the necessary political will and vision, the required legislative and regulatory framework, adequate financial and administrative resources, personnel and technological capacity. Reliable information on the global distribution of malaria is necessary to assess the risk of international travellers for exposure to malaria and the epidemiological risk of importation of malaria parasites into malaria-free areas that are receptive to transmission. Therefore, certified countries should continue to report to WHO annually on maintenance of their malaria-free status, providing information on reported malaria cases and their classification.

A minimum indication of possible transmission re-establishment would be the occurrence of three or more indigenous malaria infections of the same species

per year in the same focus for three consecutive years. Because certification represents recognition of a considerable operational achievement, a careful national investigation and consultation with WHO will be conducted before a country's malaria-free certification status is lost.

## 17. RESOURCES REQUIREMENT AND PLANNING

National Strategic Plan for Elimination of Malaria (2017–22) will be implemented under the flagship of National Health Mission (NHM) as a part of National Vector Borne Disease Control Program (NVBDCP). A detailed assessment of resources required for implementation of such an ambitious project is of utmost important.

Union government spent ₹505.65 Crore on National Vector Borne Disease Control Programme in 2015-16 which is increased from ₹237.44 Cr in 2012-13.

Estimation of resources for a dynamic disease like Malaria involves high level of complexity and is of high importance for public health programme addressing management of communicable diseases. Considering the implementation of National Strategic Plan, the exercise has been undertaken to assess the annual requirement of financial resources for successful implementation of the programme using the scientific method (Annexure-7) and tools like One Health Tool v.4.55 developed by World Health Organization for resource estimation and financial planning for public sector programmes. Given the complexity of the disease and limited availability of information on actual disease burden from private sector it becomes more challenging to provide accurate estimate for treatment / diagnostic cost and the estimations provided here are dynamic in nature. Expenditure on various strategies will be reviewed on annual basis using various scientific tools of economic evaluation like Health Technology Assessment (HTA) to optimally utilize the available resources to attain highest coverage in the most cost-effective manner.

India will require ₹10653.16 Crore during 2017 – 2022 for implementation of NSP for Malaria Elimination in India. The resource requirement is front loaded as the initial years require huge investment in Human Resource Development (HRD), infrastructure up-gradation and sensitization of community to for successful behavioral change in the country. Year wise summary of expenditure is presented in Table 15.1 Total estimation of resources for implementation of NSP for Malaria in India.

Intervention cost includes estimated expenditure on drugs and supplies for treatment, diagnostics and preventive interventions like distribution of LLINs, IRS etc. This cost also includes cost of incentives for ASHA to be provided on diagnosis and treatment as per NVBDCP policy. Programme cost includes programme related direct costs like Human Resource, Training, M&E, Surveillance, Communication, Advocacy etc. Governance & other costs include cost on development of guidelines, manuals, SOPs, Research and Development, Large scale surveys etc.

The summary of the expected resources required is given below in Table 8 below:  
₹ in Crore

**Table 8: Total estimation of resources for implementation of NSP for Malaria in India**

| Type of Expenditure | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 2021-22 | Total    |
|---------------------|---------|---------|---------|---------|---------|----------|
| Intervention costs  | 597.06  | 751.83  | 750.68  | 900.42  | 1381.25 | 4381.23  |
| Programme costs     | 532.85  | 1435.36 | 1338.94 | 1419.20 | 1496.71 | 6223.05  |
| Governance & Others | 10.65   | 7.47    | 12.50   | 7.35    | 10.91   | 48.88    |
| Total costs         | 1140.56 | 2194.66 | 2102.12 | 2326.96 | 2888.87 | 10653.16 |

Note: The figures indicated above are provisional figures and may be revised on further refinement of the estimate using detailed analytical techniques.

**Fig 4 Distribution of resources by major category**

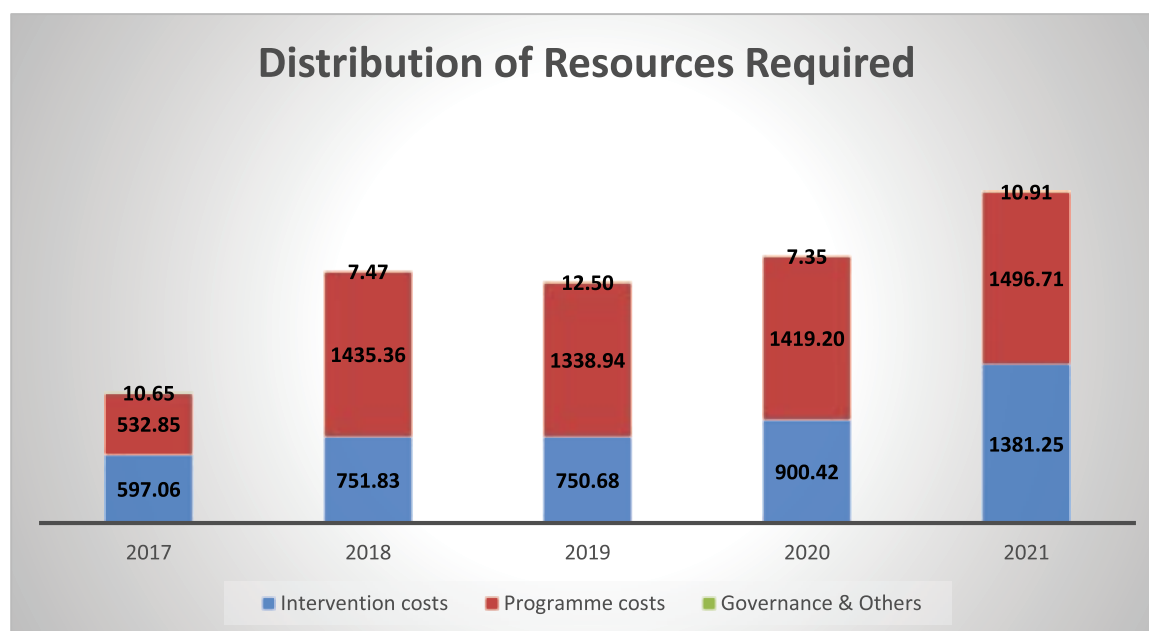


Figure 4 provides information on year wise distribution of total spending on implementation of national strategic plan for malaria elimination. 2nd year onwards significant investment in program specific activities like extended surveillance and monitoring mechanism, additional human resources at State, District and Sub-Centre level for effective case detection and treatment is required resulted in increased resource allocation in this segment.

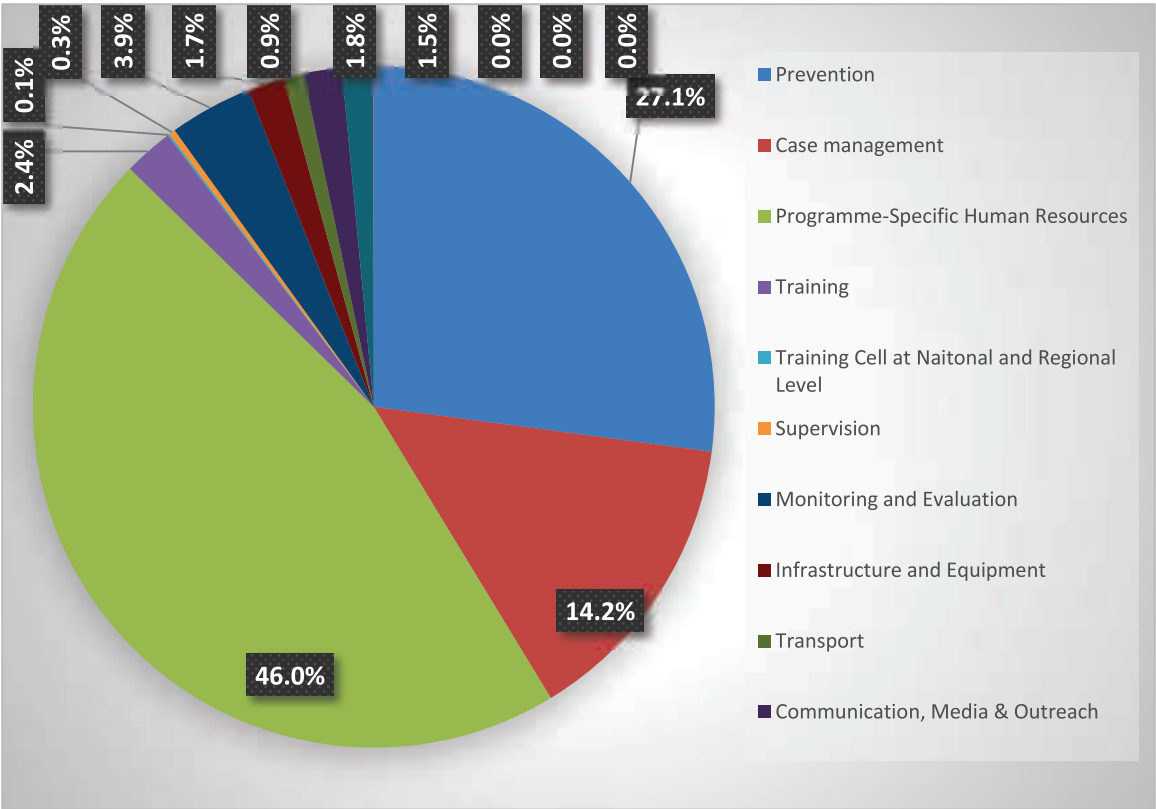
This estimate does not include routine infrastructure maintenance cost at state level to operationalize any health facility which is assumed to be a part of broader NHM umbrella and will be fulfilled through mission flexi pool.

Distribution of the expenditure observe a progressive increase in investment in interventions like procurement of drugs, diagnostics, preventive equipment etc. to improve treatment coverage. The provision for inter-sectoral co-ordination and private sector engagement in passive surveillance as well as treatment of cases through private practitioners' network. There was also increased investment proposed in the area of research and development through large scale research programs on community behavior, technical efficacy of medicines, cost-effectiveness studies etc. through institutes of repute. Monitoring and Surveillance is one of the important components of this strategic pla, however, creating awareness about the program in community through effective communication strategy is also reflected as one of the major program management activity over a period of five year. The details of budgetary breakup is given below:

Figure 5 provides information on distribution of total spending on national strategic plan for malaria elimination. Around 46 per cent of funds are required for programme specific human resources at national to health sub-centre level. 27% of expenditure is expected in implementing various preventive strategies including distribution of LLINs in priority districts and Indoor Residual Spraying (IRS) in districts in need. Treatment and diagnosis contribute to more than 14% of total expenditure. Monitoring and evaluation including surveillance activities also account for 3.9% of total spending during the NSP period. Communication, media and outreach activities absorb more than 1.8% of total planned expenditure.

This estimate does not include routine infrastructure maintenance cost at state level to operationalize any health facility which is assumed to be a part of broader NHM umbrella and will be fulfilled through mission flexi pool.

Figure 5 Resource Distribution for NSP for Malaria Elimination (2017-22)



This estimate is based on reported cases of malaria by public sector facilities through active and passive surveillance hence doesn't include cases directly visiting private sector and never been reported by public sector surveillance activity.

**Table 8.1 Summary of major head of expenditures**

| Sr. | Activity Type                                | Includes                                                                                                                                                                                                                                                                             | 2017-18 | 2018-19 | 2019-20 | 2020-21 | 2021-22 | Total   |
|-----|----------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------|---------|---------|---------|---------|---------|
| 1.  | Prevention                                   | Distribution of LLINs & IRS in high endemic areas                                                                                                                                                                                                                                    | 354.32  | 482.39  | 452.08  | 569.96  | 1016.02 | 2874.78 |
| 2.  | Case management                              | Diagnosis and Treatment of Malaria cases (p.falciperum, p.vivax, severe & Mix)                                                                                                                                                                                                       | 242.74  | 269.43  | 298.60  | 330.46  | 365.22  | 1506.45 |
| 3.  | Programme-Specific Human Resources           | Consultants, IT and Administrative staff related to program at National, Regional, State, District level and also provision for CDW against vacant position of MPW in States (This does not include permanent staff positions at state level involved in malaria related activities) | 140.98  | 1092.50 | 1151.72 | 1214.16 | 1279.98 | 4879.34 |
| 4.  | Training                                     | Training of DMO/SPO, Lab Technician, Medical Officers, ASHA, Consultants, Entomologists, Private provider, Informal provider etc. on various aspects of disease management, financial management, IT, Logistic etc.                                                                  | 69.88   | 97.39   | 27.19   | 28.49   | 27.13   | 250.08  |
| 5.  | Training Cell at National and Regional Level | Setting up and maintenance of training cell at National and Regional offices for capacity building of HR                                                                                                                                                                             | 2.30    | 1.77    | 1.87    | 1.97    | 2.08    | 9.98    |
| 6.  | Supervision                                  | Supervision visit of National and Regional director are to state and health facilities respectively.                                                                                                                                                                                 | 5.81    | 6.12    | 6.45    | 6.80    | 7.17    | 32.36   |
| 7.  | Monitoring and Evaluation                    | Development and maintenance of IT platform for real time monitoring of disease progression, reporting of cases from various sources of information, purchase of IT hardware infrastructure and collection and evaluation of cases reported at various levels.                        | 175.04  | 98.49   | 39.33   | 49.29   | 55.46   | 417.62  |
| 8.  | Infrastructure and Equipment                 | Purchase of Microscopes at health facilities for replacement of old microscope                                                                                                                                                                                                       | 33.00   | 34.79   | 36.67   | 38.66   | 40.76   | 183.89  |
| 9.  | Transport                                    | Purchase of vehicles, maintenance, POL etc.                                                                                                                                                                                                                                          | 42.92   | 38.28   | 6.10    | 6.42    | 6.78    | 100.50  |
| 10. | Communication, Media & Outreach              | Development of communication strategy, mass media campaign development and implementation through Newspaper, Outdoor (Hoarding, Wall Painting), Radio, Television, Flyers, Posters etc.                                                                                              | 34.62   | 36.24   | 38.20   | 40.27   | 42.46   | 191.79  |

|                           |                                         |                                                                                                                                                                                                                                                                 |                |                |                |                |                |                 |
|---------------------------|-----------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|----------------|----------------|----------------|----------------|-----------------|
| 11.                       | Advocacy                                | Planning of advocacy strategy and advocacy meetings at various levels from National to State, District and Village level                                                                                                                                        | 28.11          | 29.60          | 31.20          | 32.94          | 34.67          | 156.52          |
| 12.                       | General Programme Management            | Designing and annual review of country strategy, Development of annual work plans, Development of HR Plan and other program coordination meetings                                                                                                               | 0.18           | 0.18           | 0.20           | 0.20           | 0.22           | 0.98            |
| 13.                       | Committee / Task Force / Advisory Group | National level advisory committee to be formed to provide technical inputs on program implementation meeting twice a year                                                                                                                                       | 0.11           | 0.11           | 0.12           | 0.13           | 0.13           | 0.60            |
| 14.                       | Guidelines and SOPs                     | Development and publishing of various guidelines, manuals, treatment protocols related to Malaria                                                                                                                                                               | 0.76           | 0.04           | 0.11           | 0.02           | 0.23           | 1.16            |
| 15.                       | Reports and Policy Briefs               | Publication of annual reports, fact sheets, policy briefs on regular interval.                                                                                                                                                                                  | 0.12           | 0.09           | 0.09           | 0.10           | 0.10           | 0.51            |
| 16.                       | Research & Survey                       | Research in the area of behavioural change, efficacy and effectiveness of interventions, Cost-effectiveness analysis, etc. Also includes large scale survey for Mid-term evaluation (2019-20) and end term evaluation (2021-22) of Malaria Elimination Program. | 9.66           | 7.23           | 12.18          | 7.10           | 10.45          | 46.61           |
| <b>TOTAL Cost of NMEP</b> |                                         |                                                                                                                                                                                                                                                                 | <b>1140.56</b> | <b>2194.66</b> | <b>2102.12</b> | <b>2326.96</b> | <b>2888.87</b> | <b>10653.16</b> |

Note:\* All the cost for subsequent years are adjusted to annual average inflation @ 5.7%

\* Annual increment for program specific HR is estimated at 5%.

\* LLIN and IRS is estimated based on available district level population figures and adjusted to sub-centre level figures based on expert's opinion.

\* Disease burden for malaria cases is taken as average of NVBDCP reported figures for 2014, 2015 and 2016 (Provisional) and estimated 10% annual decline in number of cases.

\* Drugs and Supplies (Excluding LLIN) are calculated based on published treatment protocol & 20% buffer and 5% wastage factor is applied.

## 17.1 Financing of National Strategic Plan for Elimination

A coordinated effort from various financing agents (Source of Funds) is expected to attain the desired goal of Malaria Elimination in India. Union government will take a lead in putting up more funds by increasing financial allocation through budgetary provisions and will be supported by the similar efforts at the state level and local government (Municipalities / Municipal Corporations) level to increase overall public spending on malaria treatment and diagnosis and attain universal coverage of case detection and management by 2018. The potential funds required for malaria elimination can be financed through various sources at national and sub-national levels with coordinated efforts. The following figures will provide an overview of mapping expenditure with potential sources of financing in India.



In addition to public funds by Union and State Governments, additional resources will also be explored from domestic investment through Corporate Social Responsibility (CSR) activities as well as international sources like Global Fund, Asian Development Bank, World Bank etc. to support the NSP achieve its desired goal.

Historical data on the utilisation of available resources for malaria is low which require improvement in spending capacity of state governments in the area of Malaria related activities. Last four year data on utilisation of funds at the state level observes negative trend and effort will be made to build capacities at state and regional level for proper utilisation of available resources. Continuous review of the programme related activity will improve the utilisation rate.

The following measures will be taken to improve efficiency, transparency and accountability in resource management...

- Financial management information system to be implemented for real-time tracking of financial resources and effective financial planning.
- Logistic and Supply chain management system to be upgraded for real-time tracking of medicines, diagnostics, LLINs and IRS at regional and sub-regional level.
- Regular review of the programme by the team of technical professionals like clinicians, administrators, programme manager and health economists to ensure requisite funds made available at different level of service provisioning.
- Economic evaluation of the programme on regular interval to evaluate efficacy of the treatment and cost-effectiveness analysis of the impact of various preventive, promotional and case management interventions.

# ANNEXURE – 1

## Malaria epidemiological data

| Annual Report of Malaria Epidemiological Situation for 2014 |                   |                |        |         |       |       |       |      |       |      |       |
|-------------------------------------------------------------|-------------------|----------------|--------|---------|-------|-------|-------|------|-------|------|-------|
| SN                                                          | States/Uts        | POSITIVE CASES |        |         | Pf%   | ABER  | API   | SPR  | AFI   | SFR  | DEATH |
|                                                             |                   | P.V.           | P.F.   | Total   |       |       |       |      |       |      |       |
| 1                                                           | Andhra Pradesh    | 5566           | 15511  | 21077   | 73.59 | 19.26 | 0.41  | 0.21 | 0.30  | 0.16 | 0     |
| 2                                                           | Arunachal Pradesh | 3744           | 2338   | 6082    | 38.44 | 8.73  | 4.30  | 4.92 | 1.65  | 1.89 | 9     |
| 3                                                           | Assam             | 3330           | 11210  | 14540   | 77.10 | 11.09 | 0.44  | 0.39 | 0.34  | 0.30 | 11    |
| 4                                                           | Bihar             | 1344           | 699    | 2043    | 34.21 | 0.17  | 0.02  | 1.11 | 0.01  | 0.38 | 0     |
| 5                                                           | Chhattisgarh      | 20119          | 108874 | 128993  | 84.40 | 14.42 | 4.72  | 3.27 | 3.98  | 2.76 | 53    |
| 6                                                           | Goa               | 782            | 42     | 824     | 5.10  | 28.67 | 0.55  | 0.19 | 0.03  | 0.01 | 0     |
| 7                                                           | Gujarat           | 35355          | 6253   | 41608   | 15.03 | 21.38 | 0.66  | 0.31 | 0.10  | 0.05 | 16    |
| 8                                                           | Haryana           | 4440           | 45     | 4485    | 1.00  | 9.46  | 0.17  | 0.18 | 0.00  | 0.00 | 1     |
| 9                                                           | Himachal Pradesh  | 101            | 1      | 102     | 0.98  | 8.60  | 0.02  | 0.02 | 0.00  | 0.00 | 0     |
| 10                                                          | Jammu & Kashmir   | 270            | 21     | 291     | 7.22  | 8.04  | 0.05  | 0.06 | 0.00  | 0.00 | 0     |
| 11                                                          | Jharkhand         | 57287          | 46448  | 103735  | 44.78 | 9.63  | 2.94  | 3.06 | 1.32  | 1.37 | 8     |
| 12                                                          | Karnataka         | 13465          | 1329   | 14794   | 8.98  | 17.93 | 0.27  | 0.15 | 0.02  | 0.01 | 2     |
| 13                                                          | Kerala            | 1446           | 305    | 1751    | 17.42 | 7.89  | 0.05  | 0.07 | 0.01  | 0.01 | 6     |
| 14                                                          | Madhya Pradesh    | 55241          | 41638  | 96879   | 42.98 | 13.35 | 1.26  | 0.94 | 0.54  | 0.40 | 26    |
| 15                                                          | Maharashtra       | 27615          | 25770  | 53385   | 48.27 | 15.31 | 0.46  | 0.30 | 0.22  | 0.15 | 68    |
| 16                                                          | Manipur           | 73             | 72     | 145     | 49.66 | 2.32  | 0.05  | 0.22 | 0.03  | 0.11 | 0     |
| 17                                                          | Meghalaya         | 2019           | 37149  | 39168   | 94.85 | 13.99 | 12.52 | 8.95 | 11.88 | 8.49 | 73    |
| 18                                                          | Mizoram           | 2062           | 21083  | 23145   | 91.09 | 29.65 | 20.74 | 6.99 | 18.89 | 6.37 | 31    |
| 19                                                          | Nagaland          | 1289           | 647    | 1936    | 33.42 | 11.69 | 0.96  | 0.83 | 0.32  | 0.28 | 2     |
| 20                                                          | Orissa            | 52755          | 342280 | 395035  | 86.65 | 14.60 | 9.08  | 6.22 | 7.87  | 5.39 | 89    |
| 21                                                          | Punjab            | 1022           | 14     | 1036    | 1.35  | 10.78 | 0.04  | 0.03 | 0.00  | 0.00 | 0     |
| 22                                                          | Rajasthan         | 14515          | 603    | 15118   | 3.99  | 11.43 | 0.20  | 0.17 | 0.01  | 0.01 | 4     |
| 23                                                          | Sikkim            | 17             | 18     | 35      | 51.43 | 3.93  | 0.17  | 0.44 | 0.09  | 0.23 | 0     |
| 24                                                          | Tamilnadu         | 8390           | 339    | 8729    | 3.88  | 12.31 | 0.12  | 0.10 | 0.00  | 0.00 | 0     |
| 25                                                          | Telangana         | 587            | 4602   | 5189    | 88.69 | 10.49 | 0.15  | 0.14 | 0.13  | 0.13 | 0     |
| 26                                                          | Tripura           | 1587           | 49653  | 51240   | 96.90 | 15.71 | 13.27 | 8.44 | 12.86 | 8.18 | 96    |
| 27                                                          | Uttarakhand       | 1082           | 89     | 1171    | 7.60  | 3.84  | 0.12  | 0.30 | 0.01  | 0.02 | 0     |
| 28                                                          | Uttar Pradesh     | 41286          | 326    | 41612   | 0.78  | 2.37  | 0.20  | 0.86 | 0.00  | 0.01 | 0     |
| 29                                                          | West Bengal       | 21503          | 4981   | 26484   | 18.81 | 7.28  | 0.28  | 0.39 | 0.05  | 0.07 | 66    |
| 30                                                          | A & N Islands     | 448            | 109    | 557     | 19.57 | 16.07 | 1.20  | 0.74 | 0.23  | 0.15 | 0     |
| 31                                                          | Chandigarh        | 114            | 0      | 114     | 0.00  | 4.17  | 0.11  | 0.25 | 0.00  | 0.00 | 0     |
| 32                                                          | D & N Haveli      | 579            | 90     | 669     | 13.45 | 17.54 | 1.64  | 0.93 | 0.22  | 0.13 | 1     |
| 33                                                          | Daman & Diu       | 52             | 4      | 56      | 7.14  | 12.51 | 0.20  | 0.16 | 0.01  | 0.01 | 0     |
| 34                                                          | Delhi             | 98             | 0      | 98      | 0.00  | 1.07  | 0.01  | 0.05 | 0.00  | 0.00 | 0     |
| 35                                                          | Lakshdweep        | 0              | 0      | 0       | 0.00  | 0.20  | 0.00  | 0.00 | 0.00  | 0.00 | 0     |
| 36                                                          | Puducherry        | 76             | 3      | 79      | 3.80  | 14.53 | 0.06  | 0.04 | 0.00  | 0.00 | 0     |
|                                                             | All India         | 379659         | 722546 | 1102205 | 65.55 | 10.05 | 0.89  | 0.89 | 0.59  | 0.58 | 562   |

| Annual Report of Malaria Epidemiological Situation for 2015 |                   |                |               |                |              |             |             |             |             |             |            |
|-------------------------------------------------------------|-------------------|----------------|---------------|----------------|--------------|-------------|-------------|-------------|-------------|-------------|------------|
| SN                                                          | States/Uts        | POSITIVE CASES |               |                | Pf%          | ABER        | API         | SPR         | AFI         | SFR         | DEATH      |
|                                                             |                   | P.V.           | P.F.          | Total          |              |             |             |             |             |             |            |
| 1                                                           | Andhra Pradesh    | 6333           | 18709         | 25042          | 74.71        | 13.32       | 0.49        | 0.37        | 0.37        | 0.27        | 0          |
| 2                                                           | Arunachal Pradesh | 3374           | 1714          | 5088           | 33.69        | 10.13       | 3.52        | 3.48        | 1.19        | 1.17        | 7          |
| 3                                                           | Assam             | 3882           | 11675         | 15557          | 75.05        | 10.37       | 0.46        | 0.45        | 0.35        | 0.33        | 4          |
| 4                                                           | Bihar             | 2720           | 1286          | 4006           | 32.10        | 0.19        | 0.04        | 1.84        | 0.01        | 0.59        | 1          |
| 5                                                           | Chhattisgarh      | 21047          | 123839        | 144886         | 85.47        | 13.98       | 5.21        | 3.73        | 4.46        | 3.19        | 21         |
| 6                                                           | Goa               | 576            | 75            | 651            | 11.52        | 28.67       | 0.44        | 0.15        | 0.05        | 0.02        | 1          |
| 7                                                           | Gujarat           | 34334          | 7232          | 41566          | 17.40        | 21.39       | 0.65        | 0.30        | 0.11        | 0.05        | 7          |
| 8                                                           | Haryana           | 8582           | 726           | 9308           | 7.80         | 9.98        | 0.34        | 0.34        | 0.03        | 0.03        | 3          |
| 9                                                           | Himachal Pradesh  | 59             | 1             | 60             | 1.67         | 8.12        | 0.01        | 0.01        | 0.00        | 0.00        | 0          |
| 10                                                          | Jammu & Kashmir   | 208            | 8             | 216            | 3.70         | 8.03        | 0.04        | 0.05        | 0.00        | 0.00        | 0          |
| 11                                                          | Jharkhand         | 49807          | 54993         | 104800         | 52.47        | 5.83        | 2.91        | 4.99        | 1.52        | 2.62        | 6          |
| 12                                                          | Karnataka         | 10847          | 1598          | 12445          | 12.84        | 16.04       | 0.21        | 0.13        | 0.03        | 0.02        | 0          |
| 13                                                          | Kerala            | 1149           | 400           | 1549           | 25.82        | 7.80        | 0.05        | 0.06        | 0.01        | 0.02        | 4          |
| 14                                                          | Madhya Pradesh    | 61472          | 39125         | 100597         | 38.89        | 12.65       | 1.28        | 1.01        | 0.50        | 0.39        | 24         |
| 15                                                          | Maharashtra       | 25464          | 31139         | 56603          | 55.01        | 15.12       | 0.47        | 0.31        | 0.26        | 0.17        | 59         |
| 16                                                          | Manipur           | 97             | 119           | 216            | 55.09        | 2.74        | 0.07        | 0.27        | 0.04        | 0.15        | 0          |
| 17                                                          | Meghalaya         | 4775           | 43828         | 48603          | 90.18        | 18.61       | 15.10       | 8.11        | 13.62       | 7.32        | 79         |
| 18                                                          | Mizoram           | 3991           | 24602         | 28593          | 86.04        | 26.84       | 24.71       | 9.21        | 21.26       | 7.92        | 21         |
| 19                                                          | Nagaland          | 995            | 532           | 1527           | 34.84        | 11.68       | 0.76        | 0.65        | 0.26        | 0.23        | 3          |
| 20                                                          | Orissa            | 67317          | 369533        | 436850         | 84.59        | 15.08       | 9.97        | 6.61        | 8.43        | 5.59        | 80         |
| 21                                                          | Punjab            | 583            | 13            | 596            | 2.18         | 10.43       | 0.02        | 0.02        | 0.00        | 0.00        | 0          |
| 22                                                          | Rajasthan         | 11134          | 662           | 11796          | 5.61         | 11.30       | 0.15        | 0.13        | 0.01        | 0.01        | 3          |
| 23                                                          | Sikkim            | 16             | 11            | 27             | 40.74        | 4.24        | 0.13        | 0.31        | 0.05        | 0.12        | 0          |
| 24                                                          | Tamilnadu         | 5232           | 355           | 5587           | 6.35         | 11.65       | 0.07        | 0.06        | 0.00        | 0.00        | 0          |
| 25                                                          | Telangana         | 745            | 10206         | 10951          | 93.20        | 9.47        | 0.30        | 0.32        | 0.28        | 0.29        | 4          |
| 26                                                          | Tripura           | 2451           | 30074         | 32525          | 92.46        | 11.66       | 8.37        | 7.18        | 7.74        | 6.63        | 21         |
| 27                                                          | Uttarakhand       | 1393           | 73            | 1466           | 4.98         | 3.61        | 0.14        | 0.40        | 0.01        | 0.02        | 0          |
| 28                                                          | Uttar Pradesh     | 42396          | 371           | 42767          | 0.87         | 2.49        | 0.21        | 0.86        | 0.00        | 0.01        | 0          |
| 29                                                          | West Bengal       | 18433          | 5775          | 24208          | 23.86        | 8.18        | 0.26        | 0.31        | 0.06        | 0.07        | 34         |
| 30                                                          | A & N Islands     | 332            | 77            | 409            | 18.83        | 12.05       | 0.88        | 0.73        | 0.17        | 0.14        | 0          |
| 31                                                          | Chandigarh        | 151            | 1             | 152            | 0.66         | 6.32        | 0.14        | 0.22        | 0.00        | 0.00        | 1          |
| 32                                                          | D & N Haveli      | 372            | 46            | 418            | 11.00        | 13.65       | 0.97        | 0.71        | 0.11        | 0.08        | 0          |
| 33                                                          | Daman & Diu       | 66             | 18            | 84             | 21.43        | 11.79       | 0.29        | 0.25        | 0.06        | 0.05        | 0          |
| 34                                                          | Delhi             | 54             | 0             | 54             | 0.00         | 1.04        | 0.00        | 0.03        | 0.00        | 0.00        | 0          |
| 35                                                          | Lakshdweep        | 4              | 0             | 4              | 0.00         | 0.50        | 0.06        | 1.23        | 0.00        | 0.00        | 0          |
| 36                                                          | Puducherry        | 49             | 5             | 54             | 9.26         | 12.76       | 0.04        | 0.03        | 0.00        | 0.00        | 1          |
|                                                             | <b>All India</b>  | <b>390440</b>  | <b>778821</b> | <b>1169261</b> | <b>66.61</b> | <b>9.58</b> | <b>0.92</b> | <b>0.97</b> | <b>0.62</b> | <b>0.64</b> | <b>384</b> |

| Epidemiological Situation Report 2016 (provisional) |                   |                |               |                |              |             |             |             |             |             |            |
|-----------------------------------------------------|-------------------|----------------|---------------|----------------|--------------|-------------|-------------|-------------|-------------|-------------|------------|
| SN                                                  | States/Uts        | POSITIVE CASES |               |                | Pf%          | ABER        | API         | SPR         | AFI         | SFR         | DEATH      |
|                                                     |                   | P.V.           | P.F.          | Total          |              |             |             |             |             |             |            |
| 1                                                   | Andhra Pradesh    | 6170           | 17443         | 23613          | 73.87        | 13.79       | 0.48        | 0.35        | 0.36        | 0.26        | 0          |
| 2                                                   | Arunachal Pradesh | 2233           | 911           | 3144           | 28.98        | 9.81        | 2.03        | 2.07        | 0.59        | 0.60        | 2          |
| 3                                                   | Assam             | 2140           | 5686          | 7826           | 72.66        | 9.15        | 0.24        | 0.26        | 0.17        | 0.19        | 6          |
| 4                                                   | Bihar             | 4310           | 895           | 5205           | 17.20        | 0.16        | 0.05        | 2.80        | 0.01        | 0.48        | 0          |
| 5                                                   | Chhattisgarh      | 26717          | 121503        | 148220         | 81.97        | 17.29       | 5.31        | 3.07        | 4.35        | 2.52        | 61         |
| 6                                                   | Goa               | 612            | 130           | 742            | 17.52        | 27.03       | 0.48        | 0.18        | 0.08        | 0.03        | 0          |
| 7                                                   | Gujarat           | 38485          | 6298          | 44783          | 14.06        | 22.81       | 0.69        | 0.30        | 0.10        | 0.04        | 6          |
| 8                                                   | Haryana           | 7314           | 552           | 7866           | 7.02         | 10.72       | 0.29        | 0.27        | 0.02        | 0.02        | 0          |
| 9                                                   | Himachal Pradesh  | 102            | 19            | 121            | 15.70        | 7.55        | 0.02        | 0.03        | 0.00        | 0.00        | 0          |
| 10                                                  | Jammu & Kashmir   | 231            | 11            | 242            | 4.55         | 8.52        | 0.04        | 0.05        | 0.00        | 0.00        | 0          |
| 11                                                  | Jharkhand         | 58182          | 83232         | 141414         | 58.86        | 8.02        | 3.83        | 4.78        | 2.26        | 2.81        | 15         |
| 12                                                  | Karnataka         | 9332           | 1746          | 11078          | 15.76        | 14.29       | 0.16        | 0.11        | 0.03        | 0.02        | 0          |
| 13                                                  | Kerala            | 1128           | 419           | 1547           | 27.08        | 8.01        | 0.05        | 0.06        | 0.01        | 0.02        | 2          |
| 14                                                  | Madhya Pradesh    | 46802          | 22304         | 69106          | 32.28        | 12.02       | 0.86        | 0.72        | 0.28        | 0.23        | 3          |
| 15                                                  | Maharashtra       | 16168          | 7815          | 23983          | 32.59        | 14.91       | 0.20        | 0.13        | 0.07        | 0.04        | 26         |
| 16                                                  | Manipur           | 64             | 58            | 122            | 47.54        | 3.21        | 0.04        | 0.13        | 0.02        | 0.06        | 0          |
| 17                                                  | Meghalaya         | 3280           | 31867         | 35147          | 90.67        | 14.25       | 10.70       | 7.51        | 9.70        | 6.81        | 45         |
| 18                                                  | Mizoram           | 1676           | 5907          | 7583           | 77.90        | 22.85       | 6.47        | 2.83        | 5.04        | 2.21        | 9          |
| 19                                                  | Nagaland          | 512            | 316           | 828            | 38.16        | 12.44       | 0.41        | 0.33        | 0.16        | 0.13        | 0          |
| 20                                                  | Orissa            | 60365          | 389332        | 449697         | 86.58        | 16.37       | 10.24       | 6.26        | 8.87        | 5.42        | 77         |
| 21                                                  | Punjab            | 685            | 8             | 693            | 1.15         | 9.14        | 0.02        | 0.03        | 0.00        | 0.00        | 0          |
| 22                                                  | Rajasthan         | 11710          | 1031          | 12741          | 8.09         | 11.69       | 0.15        | 0.13        | 0.01        | 0.01        | 5          |
| 23                                                  | Sikkim            | 10             | 5             | 15             | 33.33        | 3.80        | 0.07        | 0.19        | 0.02        | 0.06        | 0          |
| 24                                                  | Tamilnadu         | 4099           | 242           | 4341           | 5.57         | 10.82       | 0.06        | 0.05        | 0.00        | 0.00        | 0          |
| 25                                                  | Telangana         | 895            | 2617          | 3512           | 74.52        | 9.44        | 0.10        | 0.10        | 0.07        | 0.08        | 1          |
| 26                                                  | Tripura           | 1001           | 9545          | 10546          | 90.51        | 8.92        | 2.68        | 3.00        | 2.42        | 2.72        | 14         |
| 27                                                  | Uttarakhand       | 914            | 47            | 961            | 4.89         | 3.71        | 0.09        | 0.26        | 0.00        | 0.01        | 0          |
| 28                                                  | Uttar Pradesh     | 39080          | 158           | 39238          | 0.40         | 2.40        | 0.20        | 0.81        | 0.00        | 0.00        | 0          |
| 29                                                  | West Bengal       | 29308          | 5928          | 35236          | 16.82        | 9.76        | 0.37        | 0.38        | 0.06        | 0.06        | 59         |
| 30                                                  | A & N Islands     | 345            | 140           | 485            | 28.87        | 12.36       | 1.04        | 0.84        | 0.30        | 0.24        | 0          |
| 31                                                  | Chandigarh        | 157            | 0             | 157            | 0.00         | 9.65        | 0.14        | 0.15        | 0.00        | 0.00        | 0          |
| 32                                                  | D & N Haveli      | 345            | 30            | 375            | 8.00         | 13.66       | 0.82        | 0.60        | 0.07        | 0.05        | 0          |
| 33                                                  | Daman & Diu       | 41             | 7             | 48             | 14.58        | 11.65       | 0.16        | 0.13        | 0.02        | 0.02        | 0          |
| 34                                                  | Delhi             | 31             | 0             | 31             | 0.00         | 0.72        | 0.00        | 0.02        | 0.00        | 0.00        | 0          |
| 35                                                  | Lakshdweep        | 2              | 0             | 2              | 0.00         | 0.62        | 0.03        | 0.50        | 0.00        | 0.00        | 0          |
| 36                                                  | Puducherry        | 65             | 11            | 76             | 14.47        | 11.42       | 0.06        | 0.05        | 0.01        | 0.01        | 0          |
|                                                     | <b>All India</b>  | <b>374511</b>  | <b>716213</b> | <b>1090724</b> | <b>65.66</b> | <b>9.74</b> | <b>0.85</b> | <b>0.87</b> | <b>0.56</b> | <b>0.57</b> | <b>331</b> |

# ANNEXURE – 2

## Statewise Categorisation of Districts/Units

|    |                      |  |  | Category and number of districts by API |     |     |     |    |       |
|----|----------------------|--|--|-----------------------------------------|-----|-----|-----|----|-------|
| SN | States               |  |  | 0-                                      | <1  | 1-2 | 2-5 | 5+ | Total |
| 1  | Andhra Pradesh       |  |  |                                         | 10  | 2   | 1   |    | 13    |
| 2  | Andaman & Nicobaar   |  |  |                                         | 2   |     |     | 1  | 3     |
| 3  | Arunachal Pradesh    |  |  |                                         | 3   | 4   | 7   | 2  | 16    |
| 4  | Assam                |  |  |                                         | 22  |     | 5   |    | 27    |
| 5  | Bihar                |  |  | 26                                      | 12  |     |     |    | 38    |
| 6  | Chandigarh           |  |  |                                         | 1   |     |     |    | 1     |
| 7  | Chattisgarh          |  |  |                                         | 6   | 4   | 6   | 11 | 27    |
| 8  | Dadra & Nagar Haveli |  |  |                                         | 1   |     |     |    | 1     |
| 9  | Daman & Diu          |  |  |                                         | 2   |     |     |    | 2     |
| 10 | Delhi                |  |  | 1                                       |     |     |     |    | 1     |
| 11 | Goa                  |  |  |                                         | 2   |     |     |    | 2     |
| 12 | Gujarat              |  |  |                                         | 34  | 7   |     |    | 41    |
| 13 | Haryana              |  |  |                                         | 20  |     |     | 1  | 21    |
| 14 | Himachal Pradesh     |  |  | 4                                       | 6   |     |     |    | 10    |
| 15 | J&K                  |  |  | 3                                       | 9   |     |     |    | 12    |
| 16 | Jharkhand            |  |  |                                         | 8   |     | 12  | 4  | 24    |
| 17 | Karnataka            |  |  | 2                                       | 29  | 1   | 2   |    | 34    |
| 18 | Kerala               |  |  |                                         | 14  |     |     |    | 14    |
| 19 | Lakhadweep           |  |  |                                         | 1   |     |     |    | 1     |
| 20 | Madhya Pradesh       |  |  |                                         | 25  | 16  | 7   | 3  | 51    |
| 21 | Maharashtra          |  |  | 3                                       | 30  | 2   |     | 1  | 36    |
| 22 | Manipur              |  |  | 1                                       | 12  |     |     |    | 13    |
| 23 | Meghalaya            |  |  |                                         | 1   |     | 2   | 4  | 7     |
| 24 | Mizoram              |  |  |                                         | 1   | 1   | 2   | 5  | 9     |
| 25 | Nagaland             |  |  |                                         | 8   | 3   | 1   |    | 12    |
| 26 | Odisha               |  |  |                                         | 8   | 1   | 5   | 16 | 30    |
| 27 | Puducherry           |  |  | 1                                       | 3   |     |     |    | 4     |
| 28 | Punjab               |  |  | 4                                       | 18  |     |     |    | 22    |
| 29 | Rajasthan            |  |  |                                         | 32  | 1   |     |    | 33    |
| 30 | Sikkim               |  |  |                                         | 4   |     |     |    | 4     |
| 31 | Tamil Nadu           |  |  | 13                                      | 30  |     |     |    | 43    |
| 32 | Telangana            |  |  | 1                                       | 8   |     | 1   |    | 10    |
| 33 | Tripura              |  |  |                                         | 2   |     | 2   | 4  | 8     |
| 34 | Uttar Pradesh        |  |  | 11                                      | 58  | 5   | 1   |    | 75    |
| 35 | Uttarakhand          |  |  | 5                                       | 8   |     |     |    | 13    |
| 36 | West Bengal          |  |  |                                         | 18  | 1   | 1   |    | 20    |
|    | Total                |  |  | 75                                      | 448 | 48  | 55  | 52 | 678   |

## ANNEXURE – 3

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### Urban Vector Borne Disease Scheme (UVBDS)

#### Background

Urban malaria as a specific problem in India was first recognised in 1969, when an in-depth review of malaria situation in India was undertaken by Madhok Committee. This committee reviewed the problem and found that 10 urban areas in Andhra Pradesh and Tamil Nadu contributed 11.2 percent of the total malaria cases in the two states during 1963. The committee felt that if effective anti-larval measures were not undertaken in urban areas, the proliferation of malaria cases from urban to rural areas might spread in a bigger way in the many states and recommended central assistance adequately for tackling the problem. Malaria control methods developed by Covell facilitated a rational approach to urban and industrial malaria control. Thus, the spread and increasing trends of malaria in urban areas necessitated the concerted efforts of malaria control in urban areas with a problem of mainly *An. stephensi* as a malaria vector. The Urban Malaria Scheme (UMS) was sanctioned during November 1971. Initially 23 towns having more than 40,000 population with API 2 or more were covered under this scheme which was extended to 131 towns in a phased manner. The expenditure on this scheme was treated as plan expenditure in the centrally sponsored sector. Urban malaria scheme needs to be addressed now as Urban VBDs Control Scheme, considering resurgence of other vector borne diseases like dengue, chikungunya, Japanese encephalitis etc. in urban areas.

#### Implementation

The central assistance under this scheme was treated as 100% grant to the State Government in kind or cash in the initial years of the Scheme. From 1979-80, the expenditure on this scheme is being shared between Central and State Government on 50:50 basis. After 23 towns in 1971-72, five more towns were added but due to budget constraints no more towns were brought under this scheme till 1976. Addition of 38 in 1976-77, 12 in 1979-80 and 17 in 1980-81 was approved. Gradually more towns were brought under UMS and presently 131 towns and cities in 19 states and Union Territories are under the Urban Malaria scheme covering a population of about 100 million.

The current strategy in urban areas is:

1. Anti-larval measures on weekly intervals
2. Source reduction i.e. land filling / drainage through minor engineering methods
3. Biological control by introduction of larvivorous fish.
4. Anti-parasitic measures through passive surveillance for detection of cases and complete treatment
5. Legislative measures (Enactment of Bye-laws)

Indoor space spray is recommended during outbreaks situation in and around 50 houses with pyrethrum extract. Civic bye-laws exist in some locations (e.g. Municipal Corporation of Greater Mumbai, National Capital Territory of Delhi, Chandigarh, Bhopal, Agartala, Navi Mumbai Municipal Corporation, Thane and Goa) which stipulate that individuals must help eliminate domestic and peri-domestic breeding places. Building bye-laws are also implemented in some towns (e.g. Navi Mumbai Corporation) which require precautions to be taken to prevent congenial conditions for vector breeding on the exterior of buildings and curing tanks to be kept larvae-free during construction and dismantled before the issuing of occupancy certificates. The use of biological method i.e. *Gambusia*

fish, use of different larvicides and inter-sectoral coordination for the control of malaria vector in urban areas is well documented.

### **Organisational Set Up:**

The Urban Malaria Scheme is centrally sponsored state programme and is being operated mainly by the local administrative bodies under the active supervision of state health authorities. The municipal health authorities in the towns were undertaking some sort of anti-larval measures before the initiation of Urban Malaria Scheme and had same staff in this regard. Therefore, the infra-structures provided under UMS by the state was attached to Municipal authorities for better functioning of anti-larval operation. The scheme is thus being implemented at the following level :

1. Town Level: Biologist is in-charge of this scheme for its proper execution. He has been provided with adequate staff following a well planned staffing pattern.
2. State Level: Addl. Director (Malaria & Filariasis) / Joint Director (Malaria & Filariasis) or Deputy Director (Malaria & Filariasis) or State Malariologist is incharge of the scheme at the state level.
3. Central Level: Directorate of NVBDCP (then NMEP) at Central level monitors the urban malaria scheme and provides technical guidance needed for effective implementation of the scheme. It supplies the approved items as per norms directly to the urban malaria towns.

### **Disease situation**

About 10% of the total cases of malaria are reported from urban areas. Maximum numbers of malaria cases are reported from Chennai, Mangalore, Vishakapatnam, Vadodara, Kolkata, Mumbai, Vijayawada, Ahmedabad etc. Cities and towns in the states of Gujarat (Ahmedabad Municipal Corporation (AMC) and 17 towns), Maharashtra (Municipal Corporation of Greater Mumbai (MCGM) and 14 towns), Tamil Nadu (Chennai Municipal Corporation (CMC) and 11 towns) and West Bengal (KMC) together have been contributing most in total malaria cases, Pf cases and deaths due to malaria reported from 131 towns under UMS in the 19 states. The epidemiological data revealed that there was rising trend in malaria cases and deaths in some towns under UMS. More than 75 cases and more than 85% *P.falciparum* under UMS were contributed by Kolkata, Chennai, Mumbai, Ahmedabad Corporation.

### **Issues and challenges**

- Increasing urbanisation and construction activities
- Poor disease surveillance activities
- Migratory Population
- Haphazard growth of towns
- Drinking water supply
- Development project with Health Impact Assessment (HIA)
- Inadequate health infrastructure
- Increase in Slum Clusters

#### **Future Vision for prevention of malaria and other VBD in Urban areas**

In view of the aforesaid, it is apparent that earlier *An. stephensi* was the sole vector and the matching infrastructure was provided to control this species. With expansion of urban areas even villages have now become urban villages, carrying high breeding potential for *An. culicifacies*, which require different control strategy. More than that there is upsurge in the number of dengue and Chikungunya cases in urban situation due to changing dynamics of vector borne diseases. Imported cases of filaria are being reported in the metro-cities and need to be taken care to interrupt active transmission and avoiding the precipitation of problem in future. In addition to malaria, control of dengue, chikungunya

and filariasis require different control strategies and additional human resource with matching budgetary provision shall be required to meet this requirement. Vector control activities should be evidence-based on entomological surveillance and sub-paradigm specific comprising more than one control strategies placed synergistically in an integrated vector management mode (IVM). Emphasis should be on source reduction, environmental and engineering methods of control, i.e. appropriate solid waste disposal and drainage, use of larvivorous fish in rain filled stagnant waters along road sides/ railway lines, abandoned cellars at construction sites and quarry pits and excavated pits of Brick Kilns, use of insecticide treated bed nets/ curtain in slums and use of larvicides at sites which cannot be drained. All activities should be supported by legislative measures.

Urban malaria scheme needs to be addressed as now as Urban VBDs Control Scheme. The community intervention through their active involvement for prevention and control of VBDs is very essential particularly in source reduction in and around their premises. The emphasis should be on inter-sectoral linkages with non-health sector (all development project) to ensure health impact assessment, Communication for Behaviour Impact (COMBI) – approach for community participation for sustainability of source reduction application of larvicides and proper health seeking behavior, Training of health/non health sector in Health Impact Assessment of development projects. Proposed strategy not only fulfills these gaps but will be more cost effective and sustainable.

It is proposed to enhance the capacity of existing 133 urban cities inclusive of 2 new towns to manage all VBDs prevalent in the urban areas. The vector control measures will focus to deal with all VBDs and special emphasis would be given for implementation of health impact assessment (HIA) component in all major developmental projects through enforcing appropriate legislature measures.

Based on it, the objectives of preventing mortality and morbidity due to VBDs with improved surveillance and source reduction with the help of entomological surveillance and monitoring have been highlighted under XII Plan for UMS which has been addressed under National Health Mission (NHM) encompassing both National Rural Health Mission (NRHM) and National Urban Health Mission (NUHM). Surveillance activities of VBDs under UMS will be aligned with the proposed primary health infrastructure under NHM in urban areas.

## ANNEXURE – 4

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### Tribal Malaria Action Plan (TMAP)

#### Background

Malaria is the one of the most common health problems found in tribal areas. The proportion of tribal population varies considerably among states and union territories and is due to multiple factors such as the presence of three or more efficient vectors, triple insecticide resistance and in numerous breeding sites; inaccessible terrains, high degree of mobility, inadequate clothing, outdoor sleeping habits, forest based economy, inadequate health seeking behaviour.

The predominant parasite species in tribal areas is *P. falciparum* which is known to cause severity and lead to mortality if timely treatment is not provided. Asymptomatic reservoir is also prevalent in such areas. The shortfall in trained manpower, supplies and transport further worsen these complexities.

Tribal Malaria Action Programme covers the identified tribal- dominated districts having tribal population of 25% or more and slide positivity rate (SPR) of 1% or more, in the year 2012. Out of a total of 640 districts (2012), 620 are NVBDCP reporting districts and amongst them 152 districts are Tribal and of them, 96 districts fulfill these two criteria, covering 13 states and 2 UTs. These 152 districts comprise about 5% of total population and 31% of total ST population of the country. However, in 2012 these districts contributed 44% of country's total malaria cases, 68% *Plasmodium falciparum* cases and 43% deaths due to malaria.

The overall objective of the TMAP is to reduce the large reservoir of malaria parasite in tribal populations by implementing appropriate strategies and strengthening the available resources. The following areas will receive special emphasis:

Prioritisation of villages according to degree of risk for example, a high proportion of Pf cases, type of vectors, forest- based economy, outdoor sleeping habits etc. for appropriate vector control measures (IRS/ LLINs or treatment of community- owned bed nets with insecticides), social marketing to increase spray coverage and usage of bed nets, community mobilisation by utilising traditional IEC/BCC tools and practices.

#### Strategy of Tmap

##### Surveillance: Increase outreach services for diagnosis and treatment

In tribal areas the population is scattered and the present norm for health infrastructure is generally inadequate for proper coverage. Hamlets are scattered and therefore, it is difficult for one ASHA to cover an entire village. In this regard, the following modalities need to be adopted:

- Provision of hamlet- wise ASHAs instead of village- wise; wherever engagement of ASHAs is not possible, Anganwadi workers of ICDS, faith healers, local medical/ health care providers, village headmen, PRIs or school teachers may be trained and provided relevant logistics to diagnose and treat malaria cases.

- In forest areas where accessibility of workers/ volunteers is impeded due to elephants, involvement of forest department in diagnosis and treatment by delineation of such areas can be explored. In LWE areas (Civic disturbance), provision of well- informed and pre- scheduled mobile health services.
- Involvement of locally available, credible NGOs, strengthening of PHCs with quality microscopy facilities, provision of diagnosis and treatment facilities by contractors/ owners of development projects to the laborers on site, should be mandated.
- Identification of serious cases and early referral to specialised health facilities ensuring free transport services available under NRHM as well as provisioning traditional transport in areas inaccessible to motor road either through health systems like VHSC, PPP models or involvement of NGOs.
- Provision of a patient card to all malaria patients to record completion of treatment, adverse events and linking of new malaria episodes, screening of Migrants in the village or forest for providing radical treatment to all positive cases and recording of the same, use of mobile phones for communication of laboratory report to health providers, follow-up for treatment compliance, case- reporting by health providers including ASHAs to the health system and epidemiological tracking of cases.

Vector Control Strategy: Indoor Residual Spray (IRS), LLINs and other measures:

Often insecticide spraying is delayed due to inadequacies in resources, storage space, spraying equipment etc. In tribal areas mud plastering is a very common practice, for example during festivals. Acceptability of IRS is also an issue.

To address these concerns, the following steps are required to be taken:

- Advance stocking of required quantity of insecticides at the PHC level, IRS planning in consultation with community and tribal leaders, village headmen etc. to ensure that IRS is done only when there is least possibility of mud plastering, community sensitisation for enhancing acceptability and to keep the IRS effective for next three months by avoiding mud plastering.
- Supply of LLINs to tribal areas with high malaria endemicity on priority basis, distribution of nets by adopting bed net recommended norms for distribution i.e. one family size net per 1.8 person, to ensure universal coverage of Sub-centres with LLINs, promotion of the use of community - owned bed nets till LLINs are supplied by the programme, organisation of promotional activities by involving traditional healers, tribal councils, NGOs, CBO, School teachers, village guards and/ or volunteers for communicating intended benefits, provision of bed nets by contractors/owners of development projects to the laborers on site, should be mandated.
- Minor environmental engineering like cleaning/ de- silting of drainage, filling pits and ditches, solid waste management through Village Health Nutrition & Sanitation Committee (VHN&SNC) as well as MNREGA, verification of IRS and bed nets to be undertaken fortnightly by Village Health and Sanitation Committees, enforcing enactment of legislation in the industrial and mining areas,

#### **Supply chain management:**

Supply of sufficient RDTs and ACTs based on service delivery points (i.e. number of ASHAs, Community volunteers or other providers in a given area) and not on the basis of number of patient tested and malaria positives recorded in previous year; maintaining buffer stocks of RDTs and ACTs at the sub-centre level to ensure timely supply of RDTs and ACTs when stocks drop below the defined minimum level.

## **Training of ASHAs, Health Workers and Health Providers**

Intensive training for all cadres of staff particularly ASHAs/ community volunteers or any other health provider to ensure accuracy in conduction of RDTs and administration of correct doses of Antimalarials as per NVBDCP treatment policy, preparation of quality blood smears ,record keeping and preparation of reports.

### **Community- specific IEC/BCC activities**

- Information about malaria, its transmission, available treatment facilities, the importance of early diagnosis and treatment, the importance of vector control measures, the effect of mud plastering on spray, the benefit of using LLINs or bed- nets, the added advantage of impregnation of bed nets with insecticide, role of community in prevention of Vector Borne Diseases and other important issues through weekly HAAT (market) for conducting IEC in local language and preferably by a member of the community; during local festivals or VHNDs where other health care delivery personnel are also present; small skits/ nukkadnataks in local language during the local gathering or community meetings; These should be followed up by sensitisation sessions conducted by local health workers.
- Utilisation of prevailing folk media for carrying out IEC/ BCC activities.

### **Ownership and Motivation**

To be generated through advocacy and advisory; special incentive for workers deployed in TMAP areas; timely release of ASHA performance-based incentives; motivating ASHAs/ health providers by involving them in monthly review meetings, listening to their concerns, and strengthening linkages with local leadership; provision of transport allowance to ASHAs/health provider for transporting RDTs/blood smears to sub centre and collecting supplies from the sub centre.

## **12.4.5 Malaria in Cross Border Areas**

### **12.4.5.1 Background:**

Cross-border malaria encompasses malaria transmission along international borders as a result of interconnections between human settlements and population movement, including localised border crossings and population migration over larger distances. Cross-border migration can be defined as the movement of people from a country of origin to a destination country with or without passing border control checkpoints for either short-term or long-term immigration with different channels of migration. Population movements can be differentiated by their temporal and spatial dimensions. Temporal dimensions include circulation and migration. Circulation encompasses a variety of movement, usually short-term and cyclical and involving no longstanding change in residence. Migration movements involve a permanent change of residence.

People cross international borders for a number of reasons, including migration for work opportunities, visiting friends and relatives (VFRs), tourism, travel for business purposes or cross-border trade, social relations, cultural exchanges (pilgrimages, festivities, fairs, etc.) and displacement as a result of natural and artificial calamities (e.g. wars) and major development projects, such as construction of dams. Some of these movements increase exposure to malaria parasites, particularly in forests or areas of deforestation, where occupational exposure may occur.

### **12.4.5.2 Treatment-seeking behaviour in border areas:**

The porous nature of many borders encourages people to migrate and seek treatment across borders. For example, malaria patients from the state of Assam, India, often travel to hospitals in

neighbouring Bhutan to receive treatment because treatment is free on the Bhutanese side of the border. Due to poor health infrastructure in Nepal, a large number of people from the plains and hills in the south of the country travelled in the past to hospitals in India to access health care. However, in the last few decades, Nepal has been able to develop health facilities in the country, particularly in the plains, with the establishment of regional, zonal and district hospitals with modern medical facilities. This has resulted in the large-scale reverse flow of people from India seeking treatment in these hospitals. Migrant workers are less likely than the general population to get blood tested for malaria parasites and get radical treatment. Migrant workers and border people have often demonstrated suboptimal health-seeking behaviours and often self-medicate. Malaria treatment in the border areas is often inadequate. Inadequate public health facilities in border areas lead local populations to seek treatment from private health professionals, many of whom provide counterfeit or substandard antimalarial drugs, or monotherapies, resulting in an increased risk of antimalarial drug resistance.

#### **12.4.5.3 Epidemiological drivers of malaria in border areas:**

Malaria control in border areas is often more difficult than in central and non-border areas due to heavily forested, mountainous and inaccessible terrain, and because of unregulated population movements across the border. In addition, many border areas are inhabited by ethnic minorities with limited formal education and less access to health education efforts. The impact of different national policies for control and prevention in neighbouring countries is potentially causing a lack of political will to invest in border areas.

##### **12.4.5.3.1 Misalignment of programmatic approaches:**

Differences in programmatic approaches between neighbouring countries commonly occur making the coordination of control and preventive measures in the border areas challenging. There are also differences in malaria diagnosis and treatment between the two countries. Even where the approaches are similar between neighbouring countries, the specific drugs or chemicals used can influence their effectiveness due to parasite or vector resistance. Effective control or elimination requires both countries across the international boundary to be committed to malaria interventions. In addition, control and preventive activities including IRS need to be synchronised to achieve maximum benefit.

##### **12.4.5.3.2 Forests and deforestation:**

Both the presence of forests and occurrence of deforestation have impact on increasing malaria risks and transmission in border areas. Populations in border areas are at a greater risk of malaria infections because they frequently visit forestlands, forest fringe areas or forested plantations at or near the border. Many species of Anopheles mosquitoes that transmit malaria are common fauna of natural forests and forested plantations in border areas. Border populations are particularly at a risk of occupational exposure to malaria through working in crop plantations, forestry, mining, development projects and tourism. Occupational exposures affect the age profile of malaria infections, for example, in forest fringe villages, adult rather than childhood infections are more prevalent due to forest-related activities. such as logging, bamboo cutting, charcoaling, foraging and overnight stays in the forests.

##### **12.4.5.3.3 Socioeconomic factors:**

Residual transmission in some malaria-eliminating countries is concentrated in a few hard-to-reach populations, of which mobile populations within border areas are included. These populations often have unofficial status and few economic resources, and can be difficult to locate for the purposes of control and effective treatment of malaria. Ethnic minorities in border areas often have limited formal

education, impeding health promotion efforts, resulting in prevalent risk behaviour such as improper use of insecticide-treated nets and other protective measures, and limiting access to healthcare.

Cross-border malaria will continue to be a problem as long as there are differences in the malaria incidence between neighbouring countries. Cross border malaria is difficult to control due to (1) the huge number of people crossing international boundaries to engage in a wide variety of activities; (2) most crossings of international borders occurring informally through porous borders; (3) populations residing in the border areas comprising ethnic minority groups with limited formal education and few financial resources; (4) hard-to-reach populations that are typically impoverished and mobile, often being driven to more remote areas by marginalisation; (5) a paucity of information on cross-border movement of people and (6) inadequate health systems in many border areas.

#### **12.4.5.4 Activities:**

In order to achieve successful malaria elimination, novel approaches for malaria control and prevention need to be identified and implemented in border areas. These include joint collaboration in the prevention and of control measures targeting malaria by neighbouring countries, robust surveillance systems that can identify any importation or reintroduction of malaria for prompt treatment and containment, development of a regional (i.e. multi-country) data sharing framework that could be used by the relevant partners to target and coordinate cross-border malaria interventions and alternative personal protective measures focussing on the needs of border populations; and harnessing technological developments such as using mobile telecommunications data to assess likely sources and rates of malaria importation arising from the movement of people across borders.

#### **12.4.6 Industrial Development Project Areas**

##### **12.4.6.1 Background**

Malaria remains as a crucial obstacle to industrial activities throughout much of the world's tropics. The burden appears to be increasing, mainly due to a loss of drug susceptibility by the various malaria pathogens, increasing insecticide resistance by vector populations and a general deterioration of anti-malaria programs. By disturbing drainage and encouraging immigration, mining operations tend to exacerbate malaria transmission. As a result, industrial activity in endemic regions depends increasingly on the development of appropriate anti-malaria interventions. Various kinds of industrial activities tend to promote risk of malaria due to deforestation, excavation and human movement. Investors, therefore, should endeavor to prevent environmental changes that might increase human exposure to vector insects and should identify and collaborate with local partners in order to increase sustainability by capacity building.

#### **Policy/Guidelines:**

Industrial operations in malaria-endemic regions require a cogent plan for anti-malaria interventions. Industrial anti-malaria interventions should conform to certain "Best Practice" guidelines, based on substantiated epidemiological evidence. Risk of infection of the residents of the region must be minimised, and non-immune visitors should be protected totally. The quality of the general environment in the vicinity of the industrial operation must be preserved and improved, as appropriate. An integrated programme of anti-malaria interventions directed at appropriate components of the transmission cycle is critical. The programme must be well administered, and the worker community must be educated in various facets of malariology and recruited into the anti-malaria effort programmes.

**Activities:****Industries operating in malarious regions to have programs that:**

- Protect locally resident employees against malaria infection. Such programmes preserve worker productivity, reduce health-care costs, limit insurance costs and increase the companies' ability to compete for workers of the best quality.
- Protect workers dependents. The business case rests on the worker absenteeism that results from caring for a sick dependent. In addition, programmatic effectiveness increases where worker families receive effective health care. Lastly, given the burden of malaria mortality on children, we believe that the responsibility is ethically compelling.
- Protect nationals residing near the industrial operation. The concept of 'local license to operate' mandates corporate responsibility to protect the health of communities located close to sites of industrial activity.
- Protect expatriate employees to the greatest extent possible. Because expatriates lack anti-malaria immunity they are far more vulnerable to severe morbidity and mortality than are long-term residents of malaria-endemic sites. The health-care costs for expatriates, including the cost of evacuation and treatment, are particularly great. Liability, health and life insurance for such employees are also costly, but can be reduced by demonstrating effective protective measures.
- Prevent breeding of mosquitoes in and around industries by undertaking Larval Source management (LSM).

Establish malaria clinic with adequate supply of diagnostics and antimalarial drugs as per national malaria treatment policy for detection, of suspected malaria cases and radical treatment of confirmed malaria cases.

As ODs achieve interruption of transmission, programmatic focus needs to shift to prevention of reintroduction. The probability of malaria becoming re-established in a malaria free area varies according to the areas receptivity and vulnerability. When importation of malaria (e.g. migrant workers from a malaria endemic area) coincides with high receptivity (e.g. halting of anti-malaria measures or of socioeconomic changes) re-establishment of malaria transmission can occur. The following activities should be implemented in such areas/ODs. Establish early warning system to monitor malaria risk factors in terms of vulnerability and receptivity in order to predict and prevent re-establishment of malaria transmission.

- Establish a reliable malaria case and entomological surveillance system with full coverage of malaria risk areas.
- Maintain adequate epidemiological and entomological capabilities with an effective operational research component, to determine risk and underlying causes of transmission resumption,
- Ensure easy access to reliable laboratory diagnosis and effective and radical treatment for every individual.
- Establish an epidemic preparedness and alert system.
- Ensure participation of at risk communities and population groups in malaria prevention activities.

In short, ODs that have achieved interruption of transmission would continue with all activities as recommended for district in low/very low transmission settings.

## ANNEXURE – 5

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### Mobile and Migrant Populations (MMPs)

#### Back ground:

Today's globalised world is witnessing unprecedented human mobility and migration trends. There are 214 million international migrant along with 740 million internal migrants. One out of 7 persons is on the move. The increasingly multi-directional massive movements of people with marked feminisation raises complex implications on global health throughout the phases of migration – before departure, during travel and transit, at destination and upon return. Migrants and mobile populations face many obstacles in accessing equitable essential health care services due to factors such as living and working conditions, education level, gender, irregular migration status, language and cultural barriers, anti-migrant sentiments, and lack of migrant-inclusive health policies among others. Thus migration is considered a social determinant of health for migrants and other marginalised and vulnerable groups. Migrant labour is an integral part of many country economies such as in the mining, transportation and construction industries, or in health care or domestic work. Development is contingent upon a healthy workforce and thereby healthy migrant and mobile populations.

#### Mobile and migrant populations in India:

At this junction in the economic development, in the country, especially when many states are undergoing faster economic development, particularly in areas, such as, manufacturing, information technology or service sectors, data migration profile of population has become more important. The data on migration by last residence in India as per Census 2001 shows that the total number of migrants has been 314 million. Out of these migrants by last residence, 268 million (85%) has been intra-state migrants, those who migrated from one state to another. 41 million (13%) were interstate migrants and 5.1 million (1.6%) migrated from outside of the country.

Opportunities in urban areas for employment, education, etc have been a pull factor attracting migrants from rural to urban areas and from smaller towns and cities to larger urban areas. There is also migration in the opposite direction from urban to rural areas due to various reasons.

There are various reasons for migration as per information collected in Census 2001 for migration by last residence. Most of the female migrants have cited 'Marriage' as the reason for migration, especially when the migration is within the state. For males, the major reasons for migration are 'work/employment' and 'education',

#### Malaria and MMPs:

When populations move from low malaria transmission areas to high transmission areas, they are more susceptible than the resident population. Migration from these high transmission areas to the low transmission area can expose previously malaria-free vectors to the disease. This cycle of re-introduction threatens progress towards malaria elimination and the control of artemisinin resistance. In addressing malaria control and elimination among migrants and mobile populations, several considerations need to be in place. These include access to vector control programming and services, prevention and early access to malaria diagnosis and treatment using culturally-understood methods as well as surveillance of artemisinin resistance. Efforts should be directed towards implementation of integrated interventions through multilateral partnerships across health and non-health sectors.

The National Strategic Plan for the Elimination of Malaria in India 2017 – 2022 recognises MMPs as a priority intervention group to halt resistance and reduce the burden of malaria in India. In order to reach strategic goal of interruption of transmission in category .1 and category – 2 states by 2020/2022, NVBDCP and partner will aim “to ensure universal access to early malaria diagnosis and treatment services with an emphasis on detection of all malaria cases (including among mobile/migrant populations)”. There are a number of activities outlined in NSP in order to achieve this goal, such as the provision of free LLINs, case management services offered through ASHAs/ health workers and BCC campaigns including coverage of MMPs.

There is perceptible gap in the mapping of the migrant and mobile populations as well as in the strategy to approach them for prevention and case management. As the polio programme (NPSP) has over the years done extensive mapping of migrant and mobile populations, this information will be capitalised to help the malaria elimination programme.

Develop and assess effectiveness of interventions for mobile and migrant populations in collaboration with relevant partners

- NVBDCP and its partners will make an attempt to determine the most effective strategies to reach MMPs, to identify knowledge gaps, and harmonise their activities in a combined effort to achieve stated national goal.
- To ensure universal access to preventive measures and specifically prevent transmission of artemisinin resistant malaria parasites among mobile and migrant populations by mosquito control, personal protection and environmental manipulation.-
- To ensure universal access to early malaria diagnosis and treatment services with an emphasis on detection of all malaria among mobile/migrant populations and ensure effective treatment including clearance of *P. falciparum* gametocytes and dormant liver stage of *P. vivax*.
- To ensure universal community awareness and behaviour change among the population at risk including mobile and migrant populations and support the containment of artemisinin resistant parasites and eliminate all forms of malaria through comprehensive behaviour change communication (BCC), community mobilisation, and advocacy
- To halt drug pressure for selection of artemisinin resistant malaria parasites by improving access to appropriate treatment and preventing use of monotherapies and substandard drugs in both public and private sectors.

#### **Surveillance/Coordination/management**

- To provide effective management (including information systems and surveillance) and coordination to enable rapid and high quality implementation of the elimination strategy among mobile/migrant populations.

## ANNEXURE – 6

### Key Indicators for Monitoring and Evaluation

GOAL: To attain zero indigenous infection and zero death in category-1 districts by the year 2020 and category-2 districts by 2022; and reduce malaria incidence to less than 1 case per 1000 people at risk and zero death in category-3 districts by year 2022

| Impact indicator                                                                                          | Base line | 2020 target                     | 2022 target                     | Data source | frequency | Responsibility                         |
|-----------------------------------------------------------------------------------------------------------|-----------|---------------------------------|---------------------------------|-------------|-----------|----------------------------------------|
| Number of confirmed malaria cases per 1000 population per year                                            | 2015      | Zero indigenous case            | Maintain Zero indigenous case   | MIS         | Monthly   | State NBVDCP and other reporting units |
| Number of severe malaria cases per 100 confirmed malaria cases per year                                   |           | Zero                            | Zero                            | MIS         | Monthly   | State NBVDCP and other stakeholders    |
| Number of parasitological tests carried out per 100 persons                                               |           | 10% - 15% in targeted districts | 10% - 15% in targeted districts | MIS         | Monthly   | State NBVDCP and other stakeholders    |
| Percentage of indigenous cases out of total malaria cases by classification                               |           | 0% indigenous case              | 0% indigenous cases             | MIS         | Monthly   | State NBVDCP and other stakeholders    |
| Number of malaria deaths                                                                                  |           | 0                               | 0                               | MIS         | Monthly   | State NBVDCP and other stakeholders    |
| Number (%) of districts reporting zero indigenous case out of districts targeted for zero indigenous case | 2015      | 90%                             | 100%                            | MIS         | Monthly   | State NBVDCP and other stakeholders    |
| Percentage of districts reporting zero indigenous case out of all districts                               |           | 75%                             | 80%                             | MIS         | Monthly   | State NBVDCP and other stakeholders    |

**Objective – 1:** Achieve universal coverage of case detection and treatment services in endemic districts to ensure 100% parasitological diagnosis of all suspected malaria cases and complete treatment of all confirmed cases.

| Impact indicator                                                                                                                                                                                           | Base line     | 2020 target | 2022 target | Data source                              | frequency   | Responsibility                         |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------|-------------|------------------------------------------|-------------|----------------------------------------|
| Percentage of malaria cases confirmed by parasitological diagnosis that received treatment as per national guidelines                                                                                      |               | 100%        | 100%        | MIS                                      | Monthly     | State NBVDCP and other reporting units |
| Percentage of designated microscopy points participating in QA/QC management system (all positive slides and 10% of negative slides sent for retesting and the blind proficiency test completed each year) |               | 100%        | 100%        | MIS                                      | Monthly     | State NBVDCP and other reporting units |
| Percentage of microscopy facilities achieving both sensitivity and specificity greater than 90% during blind proficiency tests                                                                             | Not available | 90%         | 90%         | Microscopy QA database (to be developed) | Half yearly | State NBVDCP and other stakeholders    |
| Percentage of malaria RDT tested that met international or equivalent national QC standards                                                                                                                | Not available | 100%        | 100%        | DCGI                                     | Half yearly | DCGI                                   |
| Percentage of private sector outlets in endemic states not selling artemisinin monotherapy                                                                                                                 | Not available | 100%        | 100%        | DCGI                                     | Annual      | DCGI                                   |
| Percentage of target villages with trained ASHAs                                                                                                                                                           | Not available | 100%        | 100%        | ASHA data base                           | Half yearly | State NBVDCP and other stakeholders    |
| Percentage of ASHAs who received incentives for testing fever cases &/or treating malaria cases                                                                                                            | Not available | 90%         | 90%         | ASHA/ data base                          | Monthly     | State NBVDCP and other stakeholders    |

|                                                                                                                                                                      |               |     |     |               |        |                   |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----|-----|---------------|--------|-------------------|
| Percentage of mobile/migrant population with fever in the last 3 months that accessed parasite based diagnosis (disaggregated by category of mobile/migrant persons) | Not available | 80% | 90% | Annual Survey | Annual | NVBDCP – M&E unit |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-----|-----|---------------|--------|-------------------|

**Objective – 2:** Strengthen the surveillance system to detect, notify, investigate, classify and respond to all cases and foci in all districts to move towards malaria elimination.

| Outcome/ coverage indicators                                                                                                                                                                          | Base line     | 2020 target | 2022 target | Data source | frequency | Responsibility                                                                |
|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------|-------------|-------------|-----------|-------------------------------------------------------------------------------|
| Percentage of health facilities submitting timely MIS report according to national guidelines.                                                                                                        | >90%          | 100%        | 100%        | MIS         | Monthly   | NVBDCP – M&E/ epidemiological unit                                            |
| Percentage of ASHAs who submitted reports timely into MIS according to national guidelines                                                                                                            |               | 100%        | 100%        | MIS         | Monthly   | NVBDCP – M&E/ epidemiological unit                                            |
| Percentage of PPs reporting to PPM data timely into MIS according to national guidelines                                                                                                              | Not available | 100%        | 100%        | MIS         | Monthly   | NVBDCP – M&E/ epidemiological unit                                            |
| Percentage of foci fully investigated and registered within 7 days of detection (including malaria focus investigation form, entomological investigation form and focus geo-referencing and mapping). | Not available | 100%        | 100%        | MIS         | Monthly   | State NBVDCP and other stakeholders<br>NVBDCP – M&E/ State Entomological Unit |
| Percentage of confirmed active foci that received an appropriate intervention as per national guideline.                                                                                              | Not available | 100%        | 100%        | MIS         | Monthly   | State NBVDCP and other stakeholders<br>NVBDCP – M&E/ epidemiological unit     |

**Objective – 3:** Achieve near universal coverage of population at risk of malaria with an appropriate vector control intervention.

| Impact indicator                                                                                            | Base line     | 2020 target | 2022 target | Data source              | frequency | Responsibility                    |
|-------------------------------------------------------------------------------------------------------------|---------------|-------------|-------------|--------------------------|-----------|-----------------------------------|
| Percentage of people in target villages who slept under LLIN during the previous night                      | Not available | 90%         | 90%         | Community Malaria survey | Annually  | NVBDCP – M&E/epidemiological unit |
| Percentage of children under 5 living in target villages who slept under a LLIN during the previous night   | Not available | 100%        | 100%        | Community Malaria survey | Annually  | NVBDCP – M&E/epidemiological unit |
| Percentage of pregnant women in target villages who slept under a LLIN during the previous night            | Not available | 100%        | 100%        | Community Malaria survey | Annually  | NVBDCP – M&E/epidemiological unit |
| Percentage of households in targeted villages covered by indoor residual spray (IRS) during last 12 months. | Not available | >75%        | >85%        | MIS                      | Annually  | NVBDCP – M&E/epidemiological unit |

**Objective – 4:** Achieve near universal coverage by appropriate BCC activities to improve knowledge, awareness and responsive behavior regarding effective preventive and curative interventions for malaria elimination.

| Impact indicator                                                                                                                     | Base line     | 2020 target | 2022 target | Data source | frequency | Responsibility                   |
|--------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------|-------------|-------------|-----------|----------------------------------|
| Percentage of suspected malaria cases reporting to ASHAs/ health facility within 24 hours of onset of fever.                         | Not available | >90%        | >90%        | MIS         | Annually  | M&E unit State NVBDCP            |
| Percentage of target population aware of availability of diagnosis & treatment of malaria with ASHAs/ nearest public health facility | Not available | >90%        | >90%        | CMS         | Annually  | NVBDCP M &E/epidemiological unit |

|                                                                                                                     |                |      |      |               |          |                                       |
|---------------------------------------------------------------------------------------------------------------------|----------------|------|------|---------------|----------|---------------------------------------|
| Percentage of primary schools implementing malaria leadership programme on concept of “malaria free village”        | New initiative | >70% | >80% | School Survey | Annually | State NVBDCP M & E unit               |
| Percentage of at risk population utilising an appropriate protection tool (LLIN/IRS) in districts/ units with API>1 |                | >90% | >90% | HHS           | Annually | NVBDCP M&E Unit and other stakeholder |

**Objective - 5:** Provide effective programme management and coordination at all levels to deliver a combination of targeted interventions for malaria elimination.

| Outcome/coverage Indicators                                                                                                                                                                                                                  | Base line     | 2020 target | 2022 target | Data source       | frequency | Responsibility                     |
|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|-------------|-------------|-------------------|-----------|------------------------------------|
| Percentage of health facilities with no stock out of RDTs lasting more than 1 week at any time during the past three months. This indicator will be disaggregated according to type of health facility                                       | Not available | 100%        | 100%        | Health facilities | Annually  | PSCM unit of NVBDCP                |
| Percentage of health facilities with no stock out of first-line antimalarials (CQ, ACT and PQ) lasting more than 1 week at any time during the past three months. This indicator will be disaggregated according to type of health facility. | Not available | >90%        | >90%        | CMS               | Annually  | PSCM unit of NVBDCP & state office |

## ANNEXURE – 7

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### Detailed Methodology

To provide a comprehensive analytical picture of financial situation and resource requirement “One Health Tool v 4.55” (OHT) is used which is developed by Avenir Health in consultation with World Health Organization (WHO). Given the limitation of the software in providing flexibility in sub-national level analysis and customized calculation other statistical software like MS Excel, STATA and SPSS are used for generating various estimates. Analytical add-in like Kutools was also helpful in providing statistical analysis in excel.

Database used for analysis includes published reports from NVBDCP, financial and non-financial information sought from NVBDCP, National Sample Survey 71st Round (2014), IMS database on pharmaceutical industry, guidelines and policy documents published by NVBDCP and/or WHO. A series of interview with officers of NVBDCP at national and sub-national level were conducted to gather qualitative as well as quantitative information related to various activities related to the program.

OHT was configured for use in Indian context by populating information related to various components of health system like Human Resource, Public Health Infrastructure, Drug & Diagnostics, Delivery Channel, Demographics and Financial Planning.

There are 144 activities outlined under NSP 2017-22. These activities are categorised into broadly three categories viz. 1. Interventions, 2. Program Related Activities and 3. Governance related activities and further sub classified into various sub-categories as per One Health Tool template requirement. Some activities are of administrative nature and part of routine administrative work hence no cost is associated to those activities. All the cost in the calculation is adjusted to annual inflation rate of 5.7%.

Detailed calculation and methodology for each line item is outlined in following paragraph.

### Intervention Cost

There are mainly two type of interventions considered for costing NSP viz. prevention and Diagnosis & Treatment. Prevention include distribution of Long Lasting Insecticide Nets (LLINs) and Insecticides Residual Spraying. Diagnosis and treatment include screening of suspicious cases for Malaria, treatment of p.vivax, p.falciparum, mixed and complicated cases of malaria. Intervention cost includes cost of drugs, supplies and diagnostics consumed in provisioning of services. It also include cost of incentives offered to ASHA for diagnosis and treatment as per NVBDCP policy.

One Health Tool uses modified DemProj based estimated projected population for the year 2017 to 2021 using 2015 reported population by HMIS as base year population. District wise population is calculated with an assumption that growth rate is distributed as a proportion to district population. Age-wise distribution was also done using DemProj module of One Health Tool. Unit Price of drugs and supplies used in the calculation is summarized in Annexure – 1.

### LLINs

As per NSP LLINs will be distributed to high endemic area having API > 1 per 1000 population. Given the limited availability of sub-centre wise population data for the country we have used District level

population data for calculation of need of LLINs. As the sub-centre level data is not available with NVBDCP the recently done household level survey for distribution of LLINs in North-East states is used as basis for calculation of factor for entire district level population. The factor suggested by NVBDCP was 1 LLIN per 3 person to cover entire population in the sub-centres having API>1. The reference for the calculation was taken as 1 LLIN for 1.8 person.

There was also provision for replacement every 3 years as per the guidelines and estimation for the year 2017-18 is adjusted with previous procurements in the year 2016 and 2017. Similarly the demand was adjusted to the last two years' procurement.

## IRS

Indoor residual spraying (IRS) is one of the important intervention for control of mosquitoes in endemic area. The calculation for IRS was based on standard dosage guidelines for NVBDCP. There are two type of IRS used in India viz. DDT and SP. For the purpose of calculation of population in need of IRS we have used district level population for high endemic area with API > 1 per thousand. i.e. category 2 & 3 districts. It is assumed that 30 per cent of the district population will be in need of IRS. The population in need is calculated based on DemProj estimates for the year 2017 to 2021. Population for the calendar year is assumed to be same as population for respective financial year. All the calculations are done based on financial year. It is assumed that both the above mentioned insecticides will be used in a ratio of 70:30.

Quantity is estimated using following norms as per guidelines of NVBDCP.

|                          | Req. per Million<br>Population (in MT) | % of population covered<br>by type of IRS |
|--------------------------|----------------------------------------|-------------------------------------------|
| DDT 50% WP               | 150                                    | 70%                                       |
| Deltamethirin 5% WP (SP) | 30                                     | 30%                                       |

Cost of equipment used for spraying is not included here assuming that the equipment is already available at state level.

## Diagnostics

Population in need for diagnostic is estimated based on total population to be screened for malaria is taken at 10% for the year 2017-18 assuming intensified screening activities in initial period. The number of symptomatic cases are expected to come down slightly over the period of 5 years' time hence, the diagnosis rate will come down to 9% gradually in the year 2021-22. Out of total diagnostics 70% will be done using Bivalent RDT kit whereas remaining 30% will be done by Microscopy. ASHA will use 70% of RDT kit for all diagnostics done by her whereas remaining 30% RDT will be used in health facilities.

Cost of diagnosis include cost of RDT kit @ Rs. 11.57. Given the limited time constraint we have not done time motion study on lab technician to estimate resources required for blood slide examination. It is assumed that total cost incurred per Blood Slide Examination through microscopy will cost Rs. 10/- which include cost of blood slide, reagents and chemicals and other institutional overheads for maintenance of laboratory. The average time of laboratory technician in examination of one blood slide is estimated at 20 minutes and for community health worker is at 30 minutes.

## Treatment of Malaria

For the purpose of estimating population in need of treatment of malaria we have used published data

on NVBDCP website. The estimated reduction in number of cases over five year is estimated at 50%. Total reported cases of Malaria in India was further divided by type of malaria to arrive at the ratio of p.falciparum and p.vivax cases.

Unit cost of each treatment and diagnostic interventions was calculated by multiplying unit price of drugs & Supplies consumed per episode of respective case to arrive at total resources used in treatment / diagnosis of one cases of malaria or malaria suspect as the case may be. Treatment protocol is populated with drugs and diagnostics required as per recommended dosage (National Drug Policy for Malaria 2014) As the treatment and diagnosis is taking place at different level of care the unit cost at each level of care is estimated separately. Unit cost include cost of drug & diagnostics and incentives to ASHA if eligible. Cost of paracetamol tablets were also considered as it was suggested by NVBDCP to include paracetamol for all fever cases.

To arrive at right distribution by level of care we have used National Sample Survey (71st Round) 2014 data for all the cases of fever who sought treatment at public health facilities. For the purpose of normal case of malaria we have considered only OPD treatment whereas for the complicated case of Malaria an inpatient case load is considered for allocation of resources. Preventive screening through active and passive surveillance is assumed to be done by ASHA, Sub-Centre and PHC whereas treatment for treatment other level of care is also involved.

It is worth noting here that cases going to private sector (Clinic or Hospitals) for treatment is exempted for generating distribution key.

Following table summarizes distribution of cases by to be treated/population to be covered per year.

**Table 7.1 Distribution of cases by to be treated/population to be covered per year**

|                                                                                                   | 2017         | 2018         | 2019         | 2020         | 2021         |
|---------------------------------------------------------------------------------------------------|--------------|--------------|--------------|--------------|--------------|
| Malaria                                                                                           |              |              |              |              |              |
| Prevention                                                                                        |              |              |              |              |              |
| Insecticide treated materials                                                                     | 1,62,75,819  | 1,62,09,391  | 1,30,19,351  | 1,76,73,367  | 3,77,40,672  |
| Indoor residual spraying                                                                          | 26           | 58           | 59           | 60           | 60           |
| Case management                                                                                   |              |              |              |              |              |
| Malaria diagnosis (malarial fevers)                                                               | 12,95,71,930 | 13,11,26,797 | 13,27,00,326 | 13,42,92,723 | 13,59,04,230 |
| Treatment of severe malaria (5+)                                                                  | 56,794       | 49,957       | 42,946       | 35,761       | 28,397       |
| Treatment of P.Falciparum Malaria (Adult)                                                         | 7,52,657     | 6,62,046     | 5,69,138     | 4,73,919     | 3,76,332     |
| Treatment of P.Vivax (<1 Yr)                                                                      | 6,428        | 5,654        | 4,861        | 4,048        | 3,214        |
| Treatment of P.Vivax (1-4 Yrs)                                                                    | 29,274       | 25,750       | 22,136       | 18,432       | 14,637       |
| Treatment of P.Vivax (5-8 Yrs)                                                                    | 32,758       | 28,814       | 24,770       | 20,626       | 16,379       |
| Treatment of P.Vivax (9-14 Yrs)                                                                   | 49,415       | 43,466       | 37,365       | 31,114       | 24,707       |
| Treatment of P.Vivax (Adult)                                                                      | 2,65,348     | 2,33,404     | 2,00,646     | 1,67,077     | 1,32,674     |
|                                                                                                   |              |              |              |              |              |
| <b>Assumptions:</b>                                                                               |              |              |              |              |              |
| * Estimation of cases are based on reported case of p.vivax and p.falciparum from NVBCDP for 2015 |              |              |              |              |              |
| * 2017 cases were estimated based on previous three year's average                                |              |              |              |              |              |

Cost of drugs, supplies and diagnostics are estimated considering 20% buffer stock and 5% wastage factor. Unit price used to calculate total treatment cost is taken from NVBDCP procurement price for 2017 which was further adjusted to national inflation rate of 5.7 per cent.

### **Program Management Cost**

Program management cost include direct costs incurred in management of program through manpower, capacity building, supervision, monitoring and evaluation, coordination, communication, advocacy etc. These cost are based on inputs provided by NVBDCP and available data on each line items. For the purpose of estimation of program management cost a series of consultation with officials at NVBDCP was undertaken to collect data on existing resources.

### **Human Resources**

Requirement of human resources are estimated at five levels viz. National, Regional, State, District and Block (Sub-District) considering malaria endemic situation. Presently there are consultants, data entry operators, Malaria Technical Supervisor (MTS), Laboratory Technician Supervisor (LTS) and Secretarial Assistant are supported through two source of funds viz. Global Fund and Domestic Budgetary Support.

Existing Structure of contractual staff is enclosed in Annexure – 2. To accelerate the efforts of malaria elimination a huge investment in terms of hiring new HR at different level is proposed. It was proposed to have consultants at state level in each state for monitoring and evaluation, public health, training, procurement and supply chain and finance. There are huge vacancies of MPW at state level and it was proposed to provide replacement staff against vacant position of MPW which can be called as Community Disease Workers (CDW). It was assumed that replacement CDW will be recruited by beginning of 2018-19 in a phased manner. There was also proposal for MTS and LTS at block level in high endemic areas.

Year wise estimate of staff required is detailed in Annexure – 3 along with proposed remuneration. It is also assumed that the annual increase in the remuneration will be at the rate of 5%.

The calculation of replacement worker in place of MPW vacancies are calculated based on vacant position as on 31st march 2017 as published in rural health statistics. Public health infrastructure and Indian Public Health Standards Revised (2012) is followed to estimate manpower requirement at facility level and training need assessment.

### **Training**

Capacity building is the integral part of program. It is proposed to train all the cadre of staff involved in providing treatment and diagnosis of malaria in country with either refresher or induction training. There are following type of training proposed during the National Strategic Plan. Following table illustrate the type of training, batch size, number of participants to be trained and unit cost of training which include cost of transport for the participants and facilitator, cost of food, lodging, venue, audio-visuals, stationary etc.

Following are the type of training proposed along with number of participants to be trained based on available position and new recruitments as per HMIS.

**Table 7.2 Training**

| Type of training                                        | Number of staff needing to be trained | % of Total Staff To be trained each year |      |      |      |      |
|---------------------------------------------------------|---------------------------------------|------------------------------------------|------|------|------|------|
|                                                         |                                       | 2017                                     | 2017 | 2017 | 2017 | 2017 |
| ASHA Refresher Training (1 day)                         | 1287000                               | 30                                       | 40   | 10   | 10   | 1    |
| DMO/SPO Training (12 days)                              | 707                                   | 30                                       | 40   | 10   | 10   | 10   |
| DMO/SPO Refresher Training (3 days)                     | 707                                   | 30                                       | 40   | 10   | 10   | 10   |
| Medical Officer Refresher Training (3 days)             | 37634                                 | 30                                       | 40   | 10   | 10   | 10   |
| Medical Officer training for Severe Malaria (2 days)    | 37634                                 | 30                                       | 40   | 10   | 10   | 10   |
| District VBDC Staff Refresher Training (3 days)         | 671                                   | 30                                       | 40   | 10   | 10   | 10   |
| MTS Induction Training (10 days)                        | 5177                                  | 30                                       | 40   | 10   | 10   | 10   |
| MTS Refresher Training (3 days)                         | 5177                                  | 30                                       | 40   | 10   | 10   | 10   |
| Lab Technician Refresher Training (7 days)              | 23679                                 | 30                                       | 40   | 10   | 10   | 10   |
| IMA State Level Training (1 day)                        | 53055                                 | 30                                       | 40   | 10   | 10   | 10   |
| IMA District Level Training (1 day)                     | 88426                                 | 30                                       | 40   | 10   | 10   | 10   |
| Informal private practitioners Training (1 Day)         | 53055                                 | 30                                       | 40   | 10   | 10   | 10   |
| Training of Entomologist                                | 19                                    | 30                                       | 40   | 10   | 10   | 10   |
| State Consultants Induction Training (7 Days)           | 198                                   | 30                                       | 40   | 10   | 10   | 10   |
| Training of CDC Worker (2 days)                         | 73111                                 | 30                                       | 40   | 10   | 10   | 10   |
| Finance Management System Training (3 days)             | 696                                   | 30                                       | 40   | 10   | 10   | 10   |
| Logistic Management System Training (3 days)            | 696                                   | 30                                       | 40   | 10   | 10   | 10   |
| Malaria Information Management System Training (5 days) | 2574                                  | 30                                       | 40   | 10   | 10   | 10   |
| National Competency Assessment (NCA) Training (5 days)  | 891                                   | 30                                       | 30   | 20   | 10   | 9    |
| Lab Technician Induction Training (21 days)             | 4736                                  | 20                                       | 20   | 20   | 20   | 19   |

Unit cost of each of above mentioned training along with participants per batch and trainers required is detailed below.

**Table 7.3 Costing For Training**

| Type of training                                        | No. of Days | Cost per Participant | Number of Participant | Number of trainers |
|---------------------------------------------------------|-------------|----------------------|-----------------------|--------------------|
| ASHA Refresher Training (1 day)                         | 1           | 615.00               | 40                    | 2                  |
| DMO/SPO Training (12 days)                              | 12          | 14,575.00            | 25                    | 4                  |
| DMO/SPO Refresher Training (3 days)                     | 3           | 4,752.00             | 25                    | 2                  |
| Medical Officer Refresher Training (3 days)             | 3           | 4,987.00             | 25                    | 2                  |
| Medical Officer training for Severe Malaria (2 days)    | 2           | 5,676.00             | 30                    | 2                  |
| District VBDC Staff Refresher Training (3 days)         | 3           | 4,752.00             | 25                    | 2                  |
| MTS Induction Training (10 days)                        | 10          | 11,532.00            | 30                    | 7                  |
| MTS Refresher Training (3 days)                         | 3           | 4,601.00             | 30                    | 3                  |
| Lab Technician Refresher Training (7 days)              | 10          | 3,522.00             | 30                    | 2                  |
| IMA State Level Training (1 day)                        | 1           | 2,750.00             | 100                   | 5                  |
| IMA District Level Training (1 day)                     | 1           | 1,700.00             | 20                    | 5                  |
| Informal private practitioners Training (1 Day)         | 1           | 500.00               | 20                    | 5                  |
| Training of Entomologist                                | 2           | 6,442.33             | 20                    | 2                  |
| State Consultants Induction Training (7 Days)           | 7           | 17,416.67            | 10                    | 2                  |
| Training of CDC Worker (2 days)                         | 2           | 6,442.00             | 40                    | 2                  |
| Finance Management System Training (3 days)             | 3           | 14,480.00            | 20                    | 2                  |
| Logistic Management System Training (3 days)            | 3           | 14,480.00            | 20                    | 2                  |
| Malaria Informaiton Management System Training (5 days) | 5           | 16,480.00            | 20                    | 3                  |
| National Compitancy Assessment (NCA) Training (5 days)  | 5           | 16,480.00            | 20                    | 3                  |
| Lab Technician Induction Training (21 days)             | 21          | 16,480.00            | 20                    | 3                  |

### Supervision

National program require continuous supervision from headquarter, region, state and district level to coordinate and monitor the progress of the program objectives.

A regional level coordination meeting is proposed at an approximate cost of Rs. 8 Lakh per meeting including cost of venue, expert's transportation, logistics and food. This unit cost was agreed upon using previous experiences by regional directors. Three regional coordination meeting is proposed in four zones every year.

Following are the assumed supervisory visits at national and state level along with unit cost per visit of 5 days covering air/rail fare, local transport, accommodation, and per diem.

**Table 7.4 Supervision And Monitoring**

| Type of Supervision                       | Cost per Visit (INR) | Number of visits |      |      |      |      | Assumption                                       |
|-------------------------------------------|----------------------|------------------|------|------|------|------|--------------------------------------------------|
|                                           |                      | 2017             | 2018 | 2019 | 2020 | 2021 |                                                  |
| Type of Supervision                       | 50000                | 120              | 120  | 120  | 120  | 120  | 10 person visiting 1 states every month          |
| From State to District Level              | 34500                | 1728             | 1728 | 1728 | 1728 | 1728 | 36 person visiting 4 districts every month       |
| Staff Visits to Referral Facilities/Sites | 23500                | 432              | 432  | 432  | 432  | 432  | 36 person visiting 1 health facility every month |

### Monitoring and Evaluation

Continuous monitoring of a large scale ambitious project is of utmost important and require proper planning and implementation of robust framework for evaluation. A provision of Rs. 7 lakh is made for the year 20017-18 and 2020-21 for development and review of M&E framework. This include cost of consultant, meetings, stakeholder consultation and printing and publishing expenses. A provision of Rs. 5 lakh is also made in remaining years for annual review meeting with stakeholder consultation and continuous improvement of the framework.

Data management system is proposed to be developed during the plan period for real time monitoring of disease progression and maintain epidemiological data to formulate effective policies. The cost of procurement / development of software for real time monitoring at district level is proposed at the cost of Rs. 5 Crore which is estimated based on IT expert's opinion and previous purchase details of NVBDCP. There is also provision of Rs 50 lakh for annual maintenance of the software including cost of server for hosting the large database of millions of records.

To improve real time monitoring of the disease there is provision for purchasing computer system with necessary software like MS Office, Anti-Virus Subscription for 5 year and other peripherals. The Unit cost and quantity by level of care is estimated below.

**Table 7.5 Hardware Costs**

| Unit Cost    |              |          |          |         |       |                            |             |                       |
|--------------|--------------|----------|----------|---------|-------|----------------------------|-------------|-----------------------|
|              | Total Qty.   | Computer | Software | Printer | Total | Server Cost                | Server Qty. | TOTAL Comp.           |
| National HQ  | 10           | 70000    | 10000    | 150000  | 80000 | 150000                     | 8           | 2150000               |
| State        | 180          | 70000    | 10000    | 20000   | 80000 | 0                          | 0           | 15120000              |
| District     | 673          | 70000    | 10000    | 10000   | 80000 | 0                          | 0           | 60570000              |
| CHC          | 5510         | 50000    | 10000    |         | 60000 | 0                          | 0           | 330600000             |
| PHC          | 25354        | 50000    | 10000    |         | 60000 | 0                          | 0           | 1521240000            |
| <b>Total</b> | <b>31717</b> |          |          |         |       | <b>TOTAL Hardware Cost</b> |             | <b>1,92,96,80,000</b> |

Total hardware will be purchased in two years i.e. 2017-18 (70%) and 2018-19(30%).

There is also provision of annual maintenance of these computers @ Rs. 3000 per unit per year. (Based on IT Expert's Comments) for all the computers from 3rd Year onwards.

Apart from this software there is also provision for development of Android Based App for creating awareness and monitoring of cases through self-reporting as well as private sector reporting. The cost of development is estimated at Rs. 30 Lakh with an annual maintenance cost of Rs. 5 Lakh. Data collection cost from private sector is estimated at Rs. 10 Lakh per annum.

Active surveillance for malaria cases is estimated by multiplying high endemic districts 155 by number of MPW by per day cost of Rs 150/- assuming they travel 10 days per month.

\*Active Surveillance in 155 district of category 2 & 3 assuming 10 days of active surveillance by MHW/CDW @₹300 per day

There is a provision for bi-monthly state level meeting for coordination of monitoring and evaluation activities. The cost for this meeting is estimated at Rs. 50,000/-

### **Infrastructure and Equipment**

There is provision for procurement of microscopes for PHC, CHC, District Hospitals, SDH and DMOs which is estimated as follow. 2500 PHCs are planned to be upgraded with replacement of old microscopes at the rate of Rs. 60,000/- per microscope. There is provision to upgrade 5000 PHCs per year. The priority is given to health facilities in endemic areas.

The provision for procurement of 500 microscope each year for hospitals including CHC, District Hospitals and SDH targeting up gradation of 2500 hospitals at the cost of Rs. 60,000/- each.

Transport/Vehicles

To improve active supervision and monitoring a provision of MUV at district level and motorcycles for MTS is proposed. The purchase price of MUV is estimated at Rs. 9 lakh whereas motorcycle is estimated at Rs. 45,000/-. Annual maintenance cost and POL is estimated at 10% of the purchase price of the vehicle. Total vehicles to be purchased includes

MUV at each District, State and Regional level. (728)

Motorcycle for each MTS in high endemic area. (6621)

### **Communication, Media and Outreach**

Effective communication strategy lead to boost the morale of the people and create a motion to eliminate malaria in the country. There is a provision for quarterly meeting to review communication strategy with NVBDCP team members. The cost of each meeting is estimated at Rs. 30,000/- There is provision for hiring a communication strategist (Agency) for effective planning of communication strategy at a cost of Rs. 10 Lakh per annum. This will facilitate planning and designing of communication strategy for effective impact of the messages.

There is sufficient provision made to cover all media of communication as a combination strategy for highest impact of malaria elimination.

Following are the quantity of each media used for calculation. The rate for advertisement is taken from government of India published rates for each media.

**Table 7.6 IEC Costs**

|                         | Development Costs (INR) | Cost per Campaign (INR) | No. of Campaigns to Run |       |       |       |       |
|-------------------------|-------------------------|-------------------------|-------------------------|-------|-------|-------|-------|
|                         |                         |                         | 2017                    | 2018  | 2019  | 2020  | 2021  |
| Newspapers              | 1,00,000                | 25,000                  | 1,500                   | 1,500 | 1,500 | 1,500 | 1,500 |
| Magazines               | 1,00,000                | 30,000                  | 0                       | 0     | 0     | 0     | 0     |
| Outdoor (Hoarding)      | 50,000                  | 50,000                  | 773                     | 773   | 773   | 773   | 773   |
| Outdoor (Wall Painting) | 10,000                  | 100                     | 90000                   | 90000 | 90000 | 90000 | 90000 |
| Radio                   | 5,00,000                | 3,174                   | 3000                    | 3000  | 3000  | 3000  | 3000  |
| Television              | 10,00,000               | 3,174                   | 9,000                   | 9,000 | 9,000 | 9,000 | 9,000 |
| Online                  | 3,00,000                | 50,000                  | 10                      | 10    | 10    | 10    | 10    |

| Type of Media           | Quantity Assumption                                                |
|-------------------------|--------------------------------------------------------------------|
| Newspapers              | 5 newspaper in each state with 10 insertion per year in each state |
| Magazines               | 20 Magazine with 12 insertion per year                             |
| Outdoor (Hoarding)      | 673 districts + 100 for Metro Cities                               |
| Outdoor (Wall Painting) | On an average 3000 running feet of wall painting per state         |
| Radio                   | Five Radio Station Covering 100 slots for 6 months                 |
| Television              | 10 Television for 200 slots per month in peak season               |
| Online                  | 10 online portals                                                  |

**Advocacy****Table 7.7 Advocacy Costs**

|                                     | Cost per Meeting (INR) | Number of Meetings |       |       |       |       |
|-------------------------------------|------------------------|--------------------|-------|-------|-------|-------|
|                                     |                        | 2017               | 2018  | 2019  | 2020  | 2021  |
| National Co-ordination Meeting      | 5,00,000               | 2                  | 2     | 2     | 2     | 2     |
| Regional Co-ordination Meeting      | 0                      | 0                  | 0     | 0     | 0     | 0     |
| Inter-Sectoral Coordination Meeting | 2,00,000               | 2                  | 2     | 2     | 2     | 2     |
| Mission Steering Group              | 3,00,000               | 1                  | 1     | 1     | 1     | 1     |
| State Health Mission                | 1,50,000               | 72                 | 72    | 72    | 72    | 72    |
| District Health Mission             | 50,000                 | 2,712              | 2,712 | 2,712 | 2,712 | 2,712 |
| Rogi Kalyan Samiti (block level)    | 5,000                  | 26448              | 26448 | 26448 | 26448 | 26448 |
| VHNSC (Village Level)               | 0                      | 0                  | 0     | 0     | 0     | 0     |

|                                     | Assumption                                                        |
|-------------------------------------|-------------------------------------------------------------------|
| National Co-ordination Meeting      | Half Yearly National Coordination Meeting                         |
| Regional Co-ordination Meeting      | Regional Coordination Meeting Once A year at Each Regional Office |
| Inter-Sectoral Coordination Meeting | Half Yearly Meeting at National Level                             |
| Mission Steering Group              | Natoinal Level Meeting once in a Year                             |
| State Health Mission                | Twice a Year in 36 States (36*2)                                  |
| District Health Mission             | Quarterly meeting at District Level (673*4)                       |
| Rogi Kalyan Samiti (block level)    | Quarterly meeting at Block Level (6612*4)                         |
| VHNSC (Village Level)               | No Cost as the cost to be borne by NHM Routine Exp.               |

### General Program Management

General program management includes design and review of country strategy at the cost of Rs. 1.5 Lakh every alternate year along with printing cost for 2000 copies at the rate of Rs. 200 each.

There are also other meetings proposed for general management of program.

**Table 7.8 Other Meeting Costs**

| Type of Activity                    | Meeting Cost (in Rs.) | Frequency per year |
|-------------------------------------|-----------------------|--------------------|
| Annual Work Plan                    | 10200                 | 2                  |
| HR Plan                             | 10200                 | 3                  |
| National Staff Program Coordination | 100000                | 2                  |
| Inter-Agency Coordination Meeting   | 100000                | 2                  |

Document printing cost @ Rs. 200 per document for 2000 copies is estimated.

### Others

Others include setting up of Training Cell at Headquarter as well as all regional directorate. The cost of setting up include hiring of a consultant training and maintenance cost for conference room including purchase of audio-visual aids and students' microscope. The total cost for setting up of training cell is coming at Rs. 13.4 Lakh for headquarter and Rs. 216 Lakh including first years operating cost which is factored in the year 2017-18. Further to this operating cost of these training cell is estimated at Rs. 8.4 Lakh and Rs. 159 lakh respectively for headquarter and all regional offices.

### Governance

Activities of related to policy formation, research, surveys etc. are summarized under the head governance.

State level Task-Force to be formed for Malaria Elimination

\* State level task force to meet every year for review of progress of the program

\* Cost of 36 meetings is estimated at Rs. 30,000/- per state per year at ` 10,80,000/-

## **Guidelines and SOPs**

- \* Development of new guidelines/manuals/SOPs are estimated at ₹5 Lakh per document.
- \* Guideline development include cost of consultant, meeting, workshop etc. required for evidence based policy formation
- \* Update / Review of existing guidelines/manuals/SOPs are estimated at ₹2 Lakh per document
- \* Printing of document is estimated at @ ₹200/- for 2000 copies (New Development) and 1500 Copies (Revision/ Limited circulation copy)

## **Reports and Policy Briefs**

- \*Only publication cost is considered for preparation of Report and Policy Briefs as the task will be undertaken by existing consultants through consultative meetings.

## **Research and Surveys**

There is a proposal for conducting various evaluation surveys, operational research and economic evaluations during the project period. Following are the research activities undertaken along with costing estimates. Detailed justification about cost and assumptions are available in Annexure – 4. The cost of the research project include cost of surveys, design and development of protocol, ethical clearance, publication of report etc. The average cost of similar studies in institute like ICMR is taken for the purpose of calculation.

## **Limitation**

The estimates are based on public sector reported cases which may not reflect the total demand of the country from private sector. Indian health sector is private sector dominated as around 77% of all fever cases are treated by private physicians or private hospitals. To ensure universal coverage of diagnostic and treatment to entire population in need availability of diagnostics and medicines in private sector is must. An estimate from IMS reveals that total annual sale of anti-malaria medicines are valued at ₹360 Cr should be ensured through public provisioning. Given the economies of scale and price variation into consideration an additional ₹40 Cr will be required for treatment of remaining 77% of malaria cases visiting private sector.

## Annexure – 7A- Drug & Supplies Rate

| Drug or supply                     | Classification | Pack Size | Unit cost (INR) (2017) |
|------------------------------------|----------------|-----------|------------------------|
| ACT-AL (Adult)                     | Drug           | 24        | ₹ 55.92                |
| ACT-AL 9-12 yrs Age                | Drug           | 18        | ₹ 45.00                |
| ACT-AL 5-8 yrs Age                 | Drug           | 12        | ₹ 30.00                |
| ACT-AL 6 month - 4 yrs Age         | Drug           | 6         | ₹ 16.98                |
|                                    |                |           |                        |
| Artemether 150 mg Inj              | Drug           | 1 Amp     | ₹ 90.00                |
| Artemether 40 mg Cap ?             | Drug           | 1 Cap     | ₹ 18.33                |
| Artesunate 50 mg Tab?              | Drug           | 1 Tab     | ₹ 13.85                |
| Artesunate 60 mg Inj               | Drug           | 1 Amp     | ₹ 26.50                |
| Quinine Inj.                       | Drug           | 1 Amp     | ₹ 7.57                 |
| Quinine Sulphate Tab               | Drug           | 1 Tab     | ₹ 2.17                 |
| Chloroquine Tabs 250 mg            | Drug           | 1 Tab     | ₹ 0.51                 |
| Primaquine Tab 2.5 mg              | Drug           | 1 Tab     | ₹ 1.35                 |
| Primaquine Tab 7.5 mg              | Drug           | 1 Tab     | ₹ 1.61                 |
| Paracetamol, tablet, 500 mg        | Drug           | 1 Tab     | ₹ 0.83                 |
| Bivalent RDT                       | Supply         | 1 Kit     | ₹ 11.21                |
|                                    |                |           |                        |
| DDT (in MT)                        | Supply         | 1 MT      | ₹ 2,99,870.00          |
| SP (WDP) for Malaria in 5% (in MT) | Supply         | 1 MT      | ₹ 92,600.00            |
|                                    |                |           |                        |
| LLIN (Size-1)                      | Supply         | 1 Pc      | ₹ 152.72               |
| LLIN (Size-2)                      | Supply         | 1 Pc      | ₹ 166.37               |
| LLIN (Size-3)                      | Supply         | 1 Pc      | ₹ 178.71               |
|                                    |                |           |                        |
| Microscopy for Malaria Parasite    | Supply         | 1 Test    | ₹ 10.00                |

Annexure – 7B- Staffing Pattern at Different Levels

|                   |                              | State Level         |           |           |       |     |            |                     |                        | District               |     |      |     | Sub-District |  |
|-------------------|------------------------------|---------------------|-----------|-----------|-------|-----|------------|---------------------|------------------------|------------------------|-----|------|-----|--------------|--|
| State             | Const<br>(Vector<br>Control) | Total<br>Consultant | Stat.Asst | Sec.Asst. | Acct. | DEO | GIS<br>DEO | Insect<br>collector | Dist.<br>VBD<br>Const. | Fin. &<br>Log.<br>Asst | DEO | MTS  | LT  |              |  |
| Arunachal Pradesh |                              | 5                   | 1         | 1         |       | 1   |            |                     | 21                     |                        | 21  | 94   | 42  |              |  |
| Assam             |                              | 5                   |           | 1         |       | 1   |            |                     | 27                     |                        | 27  | 247  | 54  |              |  |
| Manipur           |                              | 5                   | 1         | 1         |       | 1   |            |                     | 12                     |                        | 12  | 39   | 24  |              |  |
| Meghalaya         |                              | 5                   | 1         | 1         |       | 1   |            |                     | 7                      |                        | 7   | 39   | 14  |              |  |
| Mizoram           |                              | 5                   | 1         | 1         |       | 1   |            |                     | 9                      |                        | 9   | 22   | 18  |              |  |
| Nagaland          |                              | 5                   | 1         | 1         | 1     | 1   |            |                     | 11                     |                        | 11  | 74   | 22  |              |  |
| Tripura           |                              | 5                   | 1         | 1         |       | 1   |            |                     | 8                      |                        | 8   | 45   | 16  |              |  |
| Bihar             |                              | 6                   |           | 1         | 1     |     |            | 2                   | 31                     | 31                     |     |      | 0   |              |  |
| Andhra Pradesh    | 1                            | 6                   |           | 1         | 1     |     | 1          | 1                   | 4                      | 4                      | 4   | 23   | 12  |              |  |
| Telangana         | 0                            | 3                   |           | 1         | 1     |     | 1          | 1                   | 2                      | 2                      | 2   | 11   | 6   |              |  |
| Chhattisgarh      | 1                            | 6                   |           | 1         | 1     |     | 1          | 2                   | 20                     | 16                     | 16  | 96   | 48  |              |  |
| Gujarat           | 1                            | 6                   |           | 1         | 1     |     | 1          | 2                   | 12                     | 12                     | 12  | 72   | 36  |              |  |
| Jharkhand         | 1                            | 8                   |           | 2         | 2     |     | 1          | 4                   | 22                     | 26                     | 26  | 132  | 66  |              |  |
| Karnataka         | 1                            | 6                   |           | 1         | 1     |     | 1          | 2                   | 7                      | 7                      | 7   | 42   | 21  |              |  |
| Madhya Pradesh    | 1                            | 6                   |           | 1         | 1     |     | 1          | 2                   | 19                     | 19                     | 19  | 114  | 57  |              |  |
| Maharashtra       | 1                            | 6                   |           | 1         | 1     |     | 1          | 2                   | 5                      | 5                      | 5   | 30   | 15  |              |  |
| Odisha            | 1                            | 7                   |           | 1         | 1     |     | 1          | 2                   | 30                     | 30                     | 30  | 180  | 90  |              |  |
| West Bengal       | 1                            | 6                   |           | 2         | 2     |     | 1          | 2                   | 18                     | 18                     | 18  | 42   | 21  |              |  |
| ROHFW             |                              | 0                   |           |           |       |     |            |                     |                        |                        |     |      |     |              |  |
| NATIONAL          |                              | 11                  |           | 10        | 2     | 4   |            |                     |                        |                        |     |      |     |              |  |
| TOTAL             | 9                            | 112                 | 6         | 30        | 16    | 11  | 10         | 22                  | 265                    | 170                    | 265 | 1302 | 562 |              |  |

## Annexure – 7C- Proposed contractual staff requirement by year.

| National-Level Staff            |                               |      |      |      |      |      |
|---------------------------------|-------------------------------|------|------|------|------|------|
| Staff Type                      | Annual salary per staff (INR) | 2017 | 2018 | 2019 | 2020 | 2021 |
| Accountant                      | 3,26,736                      | 2    | 2    | 2    | 2    | 2    |
| Accounts Asst.                  | 2,33,376                      | 2    | 2    | 2    | 2    | 2    |
| Computer Prog.                  | 3,15,068                      | 3    | 3    | 3    | 3    | 3    |
| Consultant (Entamology)         | 7,56,000                      | 1    | 1    | 1    | 1    | 1    |
| Consultant (D&C)                | 11,02,500                     | 1    | 1    | 1    | 1    | 1    |
| Consultant (Finance)            | 9,15,600                      | 3    | 3    | 3    | 3    | 3    |
| Consultant (IT/GIS.)            | 9,60,000                      | 2    | 2    | 2    | 2    | 2    |
| Consultant (M&E)                | 7,93,800                      | 2    | 2    | 2    | 2    | 2    |
| Consultant (NGO/PPP)            | 7,93,800                      | 1    | 1    | 1    | 1    | 1    |
| Consultant (PH)                 | 7,93,800                      | 1    | 1    | 1    | 1    | 1    |
| Consultant (PSCM)               | 7,93,800                      | 1    | 1    | 1    | 1    | 1    |
| Consultant (Soc.Dev./BCC)       | 6,87,372                      | 1    | 1    | 1    | 1    | 1    |
| Consultant (Training)           | 7,93,800                      | 1    | 1    | 1    | 1    | 1    |
| Consultant (Vector Control)     | 7,93,800                      | 2    | 2    | 2    | 2    | 2    |
| Data Entry Operator             | 2,19,816                      | 9    | 9    | 9    | 9    | 9    |
| Data Manager                    | 3,50,064                      | 2    | 2    | 2    | 2    | 2    |
| Data Processing Asst.           | 2,33,376                      | 1    | 1    | 1    | 1    | 1    |
| Informtion & HR Manager         | 11,02,500                     | 1    | 1    | 1    | 1    | 1    |
| Office Assistant                | 2,33,376                      | 3    | 3    | 3    | 3    | 3    |
| Office Attendant                | 1,19,184                      | 1    | 1    | 1    | 1    | 1    |
| Secretarial Assistant           | 2,43,539                      | 15   | 15   | 15   | 15   | 15   |
| Section Coordinator             | 4,28,844                      | 4    | 4    | 4    | 4    | 4    |
| Statistician                    | 3,50,064                      | 1    | 1    | 1    | 1    | 1    |
| Technical Assist                | 6,27,516                      | 1    | 1    | 1    | 1    | 1    |
| Consultant (Q.A.)               | 7,20,000                      | 0    | 1    | 1    | 1    | 1    |
| Database Administrator (QA/M&E) | 10,80,000                     | 0    | 2    | 2    | 2    | 2    |
| IT Coordinator                  | 14,40,000                     | 0    | 1    | 1    | 1    | 1    |
| IT Manager                      | 12,00,000                     | 0    | 2    | 2    | 2    | 2    |
| IT Consultant                   | 9,60,000                      | 0    | 2    | 2    | 2    | 2    |
| IT Programmer                   | 7,20,000                      | 0    | 2    | 2    | 2    | 2    |
| IT Assistant                    | 3,60,000                      | 0    | 1    | 1    | 1    | 1    |
| Network Administrator           | 7,20,000                      | 0    | 1    | 1    | 1    | 1    |
|                                 |                               |      |      |      |      |      |
|                                 |                               |      |      |      |      |      |
| Region/State-Level Staff        |                               |      |      |      |      |      |

| Staff Type                               | Annual salary per staff (INR) | 2017 | 2018  | 2019  | 2020  | 2021  |
|------------------------------------------|-------------------------------|------|-------|-------|-------|-------|
| Consultant (PH/Vector Control)           | 6,00,000                      | 9    | 19    | 19    | 19    | 19    |
| Entomologist                             | 8,40,000                      | 7    | 19    | 19    | 19    | 19    |
| Insect Collector                         | 1,80,000                      | 20   | 38    | 38    | 38    | 38    |
| Lab. Tech.                               | 1,92,000                      | 0    | 57    | 57    | 57    | 57    |
| DEO                                      | 1,20,000                      | 20   | 19    | 19    | 19    | 19    |
| Consultant (M&E/PH)                      | 9,15,600                      | 23   | 44    | 44    | 44    | 44    |
| Consultant (BCC/IEC/Soc.Dev.)            | 6,87,372                      | 19   | 17    | 17    | 17    | 17    |
| Consultant (Fin./PSCM)                   | 7,93,800                      | 35   | 36    | 36    | 36    | 36    |
| Consultant (Entomology/VC)               | 7,93,800                      | 11   | 36    | 36    | 36    | 36    |
| Consultant (Training)                    | 7,93,800                      | 11   | 36    | 36    | 36    | 36    |
| Stat. Asst. /DEO                         | 2,40,000                      | 11   | 36    | 36    | 36    | 36    |
| Sec. /Office Asst.                       | 2,40,000                      | 11   | 36    | 36    | 36    | 36    |
| Insect collector                         | 1,80,000                      | 8    | 34    | 34    | 34    | 34    |
|                                          |                               |      |       |       |       |       |
| <b>District/Sub-District-Level Staff</b> |                               |      |       |       |       |       |
|                                          |                               |      |       |       |       |       |
| Dist. VBD Consultant                     | 4,20,000                      | 265  | 678   | 678   | 678   | 678   |
| FLA Cum DEO                              | 1,92,000                      | 265  | 678   | 678   | 678   | 678   |
| Lab Tech.                                | 1,68,000                      | 562  | 562   | 562   | 562   | 562   |
| MTS                                      | 1,68,000                      | 1302 | 5229  | 5229  | 5229  | 5229  |
| CDW                                      | 1,20,000                      | 7380 | 73849 | 73849 | 73849 | 73849 |

## Annexure – 7D- Details about research surveys to be undertaken

| Research & Survey                                                                                   |                                                                                                                                                        | (Rs. In Lakh) |         |         |         |         |
|-----------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------|---------------|---------|---------|---------|---------|
| Type of Activity                                                                                    | Details of Activity                                                                                                                                    | 2017-18       | 2018-19 | 2019-20 | 2020-21 | 2021-22 |
| 4.1 Identify and map PPM private providers on start of the programme and on a rolling, ad hoc basis | * Mapping of private sector provider for PPM is estimated through Research Agency @ 100 Lakh for baseline and @ subsequent year @ ₹ 10 Lakh.           | 100           | 10      | 10      | 10      | 10      |
| 4.2 Conduct nation-wide PPM assessment                                                              | * ₹ 10 Lakh per state is provided for assessment of PPM providers to be spend on visiting identified PPM by team of experts from State/Regional Office | 360           | 360     | 360     | 360     | 360     |
| 4.3 Utilise risk stratification to identify Villages and hamlets to ensure deployment of ASHA/AWW   | * ₹ 1 lakh per state is provided for village identification in the first year and ₹ 30,000 for remaining year for updation.                            | 36            | 10.8    | 10.8    | 10.8    | 10.8    |
| 4.4 Review data on entomology, vector control & insecticide resistance                              | * National Level study every year to review entomology data received from the state/district/village @ ₹ 5 Lakh per study                              | 5             | 5       | 5       | 5       | 5       |
| 4.5 Conduct annual village stratification and distribution strategy of LLINs for population at risk | * National level study to assess the distribution strategy @ ₹ 10 Lakh include travelling of national/regional staff to endemic area.                  | 10            | 10      | 10      | 10      | 10      |
| 4.6 Conduct research on the acceptability and ownership of LLIN                                     | * 3 National level research is proposed by research institute @ ₹ 25 lakh during the plan period.                                                      | 25            | 0       | 25      | 0       | 25      |
| 4.7 Review potential tools for reducing residual transmission                                       | * National Level Study to review                                                                                                                       | 0             | 20      | 0       | 20      | 0       |
| 4.8 Evaluate the safety, utilization, and impact of personal protection measures                    | * Sample survey of endemic districts where bednets are distributed. To be done twice in project period                                                 | 0             | 0       | 50      | 0       | 50      |
| 4.9 Assess impact of potential environmental management/Swach Bharat interventions in targeted foci | * Sample survey of impact evaluation twice during the project period                                                                                   | 10            | 0       | 0       | 10      | 0       |

|                                                                                                                                 |                                                                                                        |     |     |     |     |     |
|---------------------------------------------------------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------------|-----|-----|-----|-----|-----|
| 4.10 Design & implement operational research project on the feasibility and impact of housing improvement in high endemic areas | * Sample survey of endemic districts where bednets are distributed. To be done every alternate years   | 100 | 0   | 100 | 0   | 100 |
| 4.11 Conduct Therapeutic Efficacy studies (TES) on ACTs at recommended sentinel sites                                           | * Large scale study / clinical trail in representative population is estimated at Rs. 1.2 Crore.       | 120 | 120 | 120 | 120 | 120 |
| 4.12 Conduct mapping of households in every village in ODs selected for elimination to complete household location data base    | Household mapping exercise is to be done in first two years. Subject to follow up in subsequent years. | 50  | 150 | 30  | 30  | 30  |
| 4.13 Conduct Mid term review of NSP for elimination                                                                             | * Large scale household survey to evaluate impact of the program i.e. mid-term evaluation              | 0   | 0   | 150 | 0   | 0   |
| 4.14 Conduct Malaria programme review                                                                                           | * Large scale household survey to evaluate impact of the program i.e. full-term evaluation             | 0   | 0   | 0   | 0   | 150 |
| 4.15 Conduct KABP survey                                                                                                        | * Study on behaviour pattern of the consumer of LLIN .                                                 | 150 | 0   | 150 | 0   | 0   |





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