NATIONAL PLAN FOR MALARIA ELIMINATION IN MYANMAR 2016 - 2030

National Malaria Control Programme
Department of Public Health
Ministry of Health and Sports
The Republic of the Union of Myanmar
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IN MYANMAR
2016 - 2030

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The National Plan for Malaria Elimination (NPME) in Myanmar 2016-2030 has been developed under the leadership of the National Malaria Control Programme through an extensive consultative process with Central and State/Regional level staff, members of Technical and Strategy Group on Malaria (TSG-Malaria) and many others stakeholders, in close collaboration with and technical support from the WHO Country Office for Myanmar.

The NMCP gratefully acknowledges the indispensable contributions received towards the drafting and revisions of the document from WHO country office for Myanmar.

The valuable comments and suggestions received from the members of TSG-Malaria have been extremely helpful towards the finalization of the NPME, and NMCP is thankful for all these contributions.
Foreword

Myanmar has signed APLMA declaration to eliminate malaria by 2030 in 9th East Asia Summit in 2014. The National Malaria Control Programme is also committed to pursue malaria elimination by 2030. "National Malaria Strategic Plan (NSP) for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020" has been developed and finalized which is in alignment with the "Global Technical Strategy for Malaria (2016-2030)" and "Strategy for Malaria Elimination in the Greater Mekong Subregion (GMS) (2015-2030)". The Monitoring and evaluation Plan 2016-2020 has also been finalized.

In recent years, Myanmar has made a significant progress in reducing malaria morbidity and mortality. The incidence of reported malaria has dropped by 49% in 2015 in comparison to 2012. The goal of the National Strategic Plan 2010-2016 is to reduce malaria morbidity and mortality by at least 60% by 2016 relative to 2007 figures which has been achieved before the target year. The total number of cases and deaths were 371,619 and 1,261 respectively in 2007, 182,616 and 37 respectively in 2015. NMCP also achieved malaria related MDG goal by the year 2004 even ahead of target year 2015. The morbidity and mortality rates were 24.35/1,000 population and 12.62/100,000 population, respectively in 1990 and 11.10/1,000 population and 3.65/100,000 population, respectively in 2004. The achievements have been threatened by emergence and spread of artemisinin resistance in the GMS including Myanmar. Therefore, the programme has committed to eliminate malaria by 2030.

The "National Plan for Malaria Elimination in Myanmar 2016-2030" has been developed with the vision of Plasmodium falciparum elimination by 2025 and malaria elimination by 2030. Development of the plan is in line with the commitment made by the Ministry of Health and Sports to eliminate malaria by 2030 in the 9th East Asian Summit. The National Malaria Control Programme under the Department of Public Health has developed this plan with the support from malaria Technical and Strategy Group, WHO and partners and other stakeholders which will guide the country for 15 years to achieve malaria elimination. The plan will act as a guide to support planning and implementation and act as an advocacy tool to secure funding- both domestic and external. This will also serve as a guide for all partners and stakeholders for programme planning and implementation.

I would strongly endorse the "National Plan for Malaria Elimination in Myanmar 2016-2030" and provide all necessary support to ensure its full implementation.

Dr. Myint Htwe
Union Minister
Ministry of Health and Sports
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PLAN AT A GLANCE

VISION

A Malaria free Myanmar by 2030.

MISSION

The NMCP of the Ministry of Health and Sports of the Government of Myanmar aims to achieve malaria elimination by ensuring equitable and universal access to effective curative and preventive services to everyone at risk of malaria. This shall be done by working in close coordination with all communities, national and international non-government organizations, private sector stakeholders, United Nations agencies and financial partners.

Achieving the vision of “A Malaria free Myanmar by 2030” will contribute significantly to poverty alleviation as malaria is mostly prevalent in the poorest segment of the population: those living or spending time in remote forested areas including mobile and migrant populations.

GOALS

- Interrupt transmission of and eliminate indigenous malaria throughout the entire country by 2030; and

- Maintain malaria-free status in areas where malaria transmission has been interrupted and prevent re-establishment of local transmission.

OBJECTIVES

- Reducing the incidence of malaria to less than 1 case per 1000 population at risk in all States/Regions by 2020;

- Interrupting transmission of and eliminating indigenous *P. falciparum* malaria at least in 6 states/regions (Yangon, Bago, Magway, Mandalay, Nay Pyi Taw Union Territory* & Mon) by 2020 and throughout the entire country by 2025, considering the urgent action required against multi-drug including artemisinin resistance in the country and the Greater Mekong Sub-Region (GMS) as well;

*Nay Pyi Taw Union Territory is no longer a part of Mandalay and now a separate entity*
Interrupting transmission of and eliminating indigenous malaria in a phased, progressing manner across the country by 2030; and

Preventing the re-establishment of local malaria transmission due to importation in all areas where it has been eliminated before and beyond 2030.

**PRIORITIES**

- Flattening the epidemiological landscape by reducing transmission in high-transmission areas;

- Interrupting transmission of and eliminating *P. falciparum* malaria with special emphasis on areas of multi-drug resistance, including artemisinin resistance;

- Additional country-level priorities such as measures targeting certain mobile and migrant populations as identified by local analysis.

This prioritization does not mean that efforts to eliminate malaria in low transmission areas and prevent its re-establishment should be put on hold, only that such efforts must not take precedence over addressing burden reduction and drug resistance.

**KEY INTERVENTIONS**

- Case management
- Disease prevention
- Malaria surveillance
- Prevention and control of malaria outbreaks

**CROSS-CUTTING INTERVENTIONS**

- Political commitment and partnership action
- Programme organization, management and administration
- Services for mobile and migrant populations
- Capacity building
- Community-based interventions
- Inter-sectoral collaboration and advocacy
- Cross-border and regional cooperation
- Health system strengthening
- Focused research
- Malaria in conflict areas
Executive Summary

Over recent years Myanmar has made a significant progress in reducing malaria morbidity and mortality. However, despite these recent advances, malaria remains a major public health issue in the country accounting for about 56% of all reported cases in the GMS.

The malaria situation in Myanmar is rather complicated, because of its heterogeneity and parasite resistance, and the declared elimination goal is still distant because the rapidity in achieving the goal is influenced by the relatively high burden of malaria, a suboptimal national health systems and technical/operational constraints. The presence of multi-drug resistance (MDR), including to artemisinin, and the likely emergence of multi-ACT resistance in Myanmar call for urgent actions at national and regional levels. The best strategy for coping with the problem of MDR and artemisinin resistance in Myanmar is to aim for the elimination of \textit{P. falciparum}.

The NPME 2016-2030 has been developed in line with the WHO Global Technical Strategy (GTS) for Malaria 2016-2030, the Strategy for Malaria Elimination in the GMS 2015-2030 and the National Strategic Plan (NSP) for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020. The WHO Malaria Policy and Advisory Committee recommended that the elimination of \textit{P. falciparum} in the GMS by 2030 is technically, operationally and financially feasible and at the 9th East Asia Summit in November 2014 all Asia Pacific leaders committed to a region free of malaria by 2030. The initial concept of NPME was prepared by WHO and discussed with NMCP on 26 August 2016 and the first draft was discussed thoroughly with Central and State/Regional level staff on 16 September 2016 and was further refined with the support of WHO. The draft document was presented by NMCP to the TSG – Malaria on 19 September 2016 and was finalized.

The ultimate goal of the NPME in Myanmar 2016-2030 is to interrupt transmission of and eliminate indigenous malaria throughout the entire country by 2030; and maintain malaria-free status in areas where malaria transmission has been interrupted and prevent re-establishment of local transmission.

The proposed NPME emphasizes massive scaling up of existing disease management and preventive approaches and interventions to reduce the burden of malaria in high transmission areas in a short run where elimination of malaria does not appear to be feasible at present. This may form a transitional stage on the path to elimination. Wherever malaria elimination has good prospects it should be pursued with vigor towards the defined goal.

The NPME highlights the necessity of a conductive policy environment and support from the highest level of the State to ensure effective multi-sectoral engagement. NMCP needs to address human resources requirements for malaria elimination at all levels. National leadership and governance, including stakeholder coordination needs to be assured. Curative and preventive services including community-based approaches should be in place to provide full access to effective case management and disease prevention for everyone at risk of malaria. Malaria in border areas of Myanmar and neighboring GMS countries also becomes a major problem that requires special attention because of the intense population movements within as well as across national borders.

To succeed, special attention should be given to establishing adequate epidemiological services and information systems, with an operational research component, capable of planning, monitoring and evaluating control interventions in the transmission-reduction phase. Once the administrative unit enters the elimination phase or even before, the attention should be re-focused to ensure that an adequate surveillance system is fully operational and properly functional with absolutely total coverage of this administrative unit. Monitoring & Evaluation (M&E) is the central component in the elimination phase, and its main requirement is to indicate exactly which administrative units have reached the elimination target at a given point in time. Indicators on impact and adequacy of surveillance are central to verify the interruption of malaria transmission, its elimination and the maintenance of malaria-free status.
A successful malaria elimination programme requires campaigns with adequate planning and budgeting, and should be conducted with sufficient lead time for necessary resource mobilization. It is crucial for any country aiming for elimination to ensure that adequate financial support is available from beginning to end. A continuous flow of financial inputs from different governmental sources and partners is critical to the success of the NPME in Myanmar.

NPME will serve as a technical guide for States/Regions in rolling out specific interventions for eliminating malaria. After launching of the NPME, a nation-wide planning exercise and orientation workshop will be carried out with participation of all States and Regions to agree jointly on milestones/targets as well as specific cross-cutting interventions, training needs and administrative/financial provisions. Particular attention will be given to those States/Regions that are already in the elimination phase, and where it is rational and necessary to initiate surveillance and other elimination activities without any delay.

The National Malaria Elimination Committee (NMEC) that is responsible for overall coordination and guidance of elimination activities will periodically review the programme to ensure that it remains on track. NMEC will provide inputs to measure the desired programme impact is achieved and sustained through advocacy for adequate resource mobilization. A mechanism for periodic external reviews of the programme to assess the progress against milestones and targets, identify possible gaps and challenges to advise on actions to solve these problems will be built-in.
1. Introduction

Over recent years Myanmar has made a significant progress in reducing malaria morbidity and mortality. The number of deaths and cases of malaria has dropped significantly from, respectively, 1,707 and 516,041 in 2005 to 37 and 182,616 in 2015, reflecting a substantial improvement in case management, particularly at the periphery and among populations at risk of malaria. Due to funding support from Global Fund and other donors, data from 2012 onwards is robust and demonstrates a steady and impressive reduction in caseload year by year. Since 2012 the incidence of reported malaria has dropped by 49% from 8.09 in 2012 to 4.16 per 1000 population in 2015. The goal of the previous National Strategic Plan 2010-2016 was to reduce malaria morbidity and mortality by at least 60% by 2016 relative to 2007 figures.

By 2015 morbidity and mortality were down by respectively 65% (in 2007 there were 520,887 cases and in 2015 there were 182,616 cases) and 97% (in 2007 there were 1,261 deaths and in 2015 there were 37 deaths) relative to 2007.

Despite these recent advances, malaria remains a major public health issue in the country. In 2015 Myanmar accounted for about 56% and 10% of all reported cases in the GMS and in the entire South East Asia Region (2), respectively.

The proposed NPME will provide strategic guidance and technical support for those involved in planning and implementing malaria interventions, and monitoring and evaluating the progress towards malaria elimination in the country. NPME will serve as a guide for States/Regions in rolling out specific interventions for eliminating malaria.

2. The need for malaria elimination in Myanmar

The magnitude and threat of further spread of multi-drug (MDR) including artemisinin resistance at country, regional and global levels, combined with the substantial impact of scaled up interventions in Myanmar and other GMS countries, the serious commitment of the government and international partners along with momentum of scientific advances, all converge to impose urgency of action to move towards malaria elimination in the GMS including in Myanmar. The WHO Malaria Policy and Advisory Committee has recommended that the elimination of malaria in the GMS by 2030 is technically, operationally and financially feasible (3) and at the 9th East Asia Summit in November 2014 all Asia Pacific leaders committed to a region free of malaria by 2030 (4).

High-level political commitment on malaria elimination in Myanmar and other GMS countries in recent years is being presently translated into real actions to move towards malaria elimination. The NPME 2016-2030 will be implemented in a phased approach. During the first 5 years the Plan will be based on the ‘NSP for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020’ (5). The elimination of *P. falciparum* is targeted by 2025, and by 2030 Myanmar will become free from malaria.
The rationale for undertaking a malaria elimination effort in Myanmar is based on the following principles:

- The substantial progress achieved towards addressing the malaria problem and lowering the disease burden in the country;
- Any further delay in addressing the problem of MDR including artemisinin resistance would lead to the emergence of untreatable *P. falciparum* malaria;
- It has been proven that the elimination of *P. falciparum* is technically, operationally and financially feasible within the GMS including Myanmar;
- The strategy for Malaria Elimination by 2030 in the GMS has been endorsed by all GMS countries including Myanmar and is being successfully implemented in the Sub-region;
- The government and partners reaffirmed their political and financial commitments to achieve a greater impact by eliminating malaria by 2030 in the GMS including Myanmar;
- The NSP for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020 is being presently implemented in the country, and it is expected that the entire country will enter into the elimination phase by 2020;
- Solid evidence accumulated in relation to proven approaches for malaria control in the last decade, and new tools are on the near horizon to eliminate malaria in the GMS including Myanmar; and
- Effective mechanism established to ensure proper coordination of malaria elimination activities, particularly where movement across international boundaries occurs, between Myanmar and neighboring countries.
3. National Plan for Malaria Elimination in Myanmar 2016-2030

3.1 Vision
A Malaria free Myanmar by 2030.

3.2 Mission
The NMCP of the Ministry of Health of the Government of Myanmar aims to achieve malaria elimination by ensuring equitable and universal access to effective curative and preventive services to everyone at risk of malaria, in close coordination with all communities, national and international non-government organizations, private sector stakeholders, United Nations agencies and financial partners.

Achieving the vision of “A Malaria free Myanmar by 2030” will contribute significantly to poverty alleviation as malaria is most prevalent in the poorest segment of the population: those living or spending time in remote forested areas including mobile and migrant population.

3.3 Goals
In line with the WHO GTS for Malaria 2016-2030 (6), the Strategy for Malaria Elimination in the GMS 2015-2030 (7), the Asia Pacific Leaders Malaria Alliance Malaria Elimination Roadmap and the NSP for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020, the goals of the National Plan for Malaria Elimination in Myanmar 2016-2030 are as follows:

- Interrupt transmission of and eliminate indigenous malaria throughout the entire country by 2030; and
- Maintain malaria-free status in areas where malaria transmission has been interrupted and prevent re-establishment of local transmission.

3.4 Objectives
The plan has four objectives:

1. Reducing the incidence of malaria to less than 1 case per 1000 population at risk in all States/Regions by 2020;

2. Interrupting transmission of and eliminating indigenous *P. falciparum* malaria at least in 6 states/regions (Yangon, Bago, Magway, Mandalay, Nay Pyi Taw Union Territory* & Mon) by 2020 and throughout the entire country by 2025, considering the urgent action required against MDR including artemisinin resistance in the country and in the GMS as well;

3. Interrupting transmission of and eliminating indigenous malaria in a phased, progressive manner across the country by 2030; and

4. Preventing the re-establishment of local malaria transmission due to importation in all areas where it has been eliminated before and beyond 2030.

*Nay Pyi Taw Union Territory is no longer a part of Mandalay and now a separate entity*
4. Strategic Approaches

4.1 Programme priorities

Parasite species

MDR including artemisinin resistant \textit{P. falciparum} malaria is the main technical impediment to a successful implementation of the new GMS elimination strategy \((8,9)\). Bearing in mind the utmost public health importance of \textit{P. falciparum} malaria in terms of threat of drug resistance, disease burden and socio-economic losses, there is mutual agreement that for the elimination of malaria in the GMS including in Myanmar, \textit{P. falciparum} malaria should be a priority. The best strategy for coping with the problem of MDR including artemisinin resistance in the GMS is to aim for elimination of \textit{P. falciparum}, and any further delay in this regard would lead to the emergence of untreatable \textit{P. falciparum} malaria. Even if there were no resistance problems, this would be justified, like everywhere else, by the greater danger of this form of malaria and the greater ease with which it can be eliminated.

Based on past experience it can be expected that \textit{P. falciparum} disappears from an area before \textit{P. vivax} \((3-5 \text{ years earlier})\), and \textit{P. falciparum} elimination is usually sustainable. Current disease diagnostic, management and preventive interventions perhaps better target and have a greater impact on \textit{P. falciparum} than on \textit{P. vivax} \((10)\).

It is worthwhile to note that the planned interventions against \textit{P. falciparum} in Myanmar will impact on \textit{P. vivax} transmission as well, because in most endemic areas of the country both parasite species are found together, and are targeted by disease management and preventive strategies simultaneously.

Parasite resistance and malaria burden

The malaria situation in Myanmar is rather complicated, because of its heterogeneity and parasite resistance. Resources (human more than financial) are likely to be limited initially, imposing a need for prioritization, where the following should be considered:

- The presence of MDR including artemisinin resistance and the likely emergence of multi-ACT resistance in Myanmar call for urgent actions at national and regional levels. The magnitude and geographical extent is obviously related to the transmission intensity, the size and mobility of the affected populations and the pattern of antimalarial drugs used;

- Despite visible progress in dealing with malaria in all affected countries of the GMS \((11)\), the goal of eliminating malaria in Myanmar is more distant because the rapidity in achieving the declared goal is influenced by the relatively high burden of malaria, the suboptimal development of national health systems and technical and operational constraints (resistance to antimalarial drugs, vector behaviours, accessibility of remote/border areas, uncontrolled migration etc.). In areas where elimination of malaria does not appear to be feasible at present, massive scaling up of existing disease management and preventive approaches and tools, aimed at a further reduction in the burden of malaria in a short run, may form a transitional stage on the path to elimination. Wherever malaria elimination has good prospects it should be pursued with vigor towards the defined goal;

- Areas of high transmission are likely to be important exporters of parasites. If a high burden area is located near a low burden area, then an early reduction of transmission in the high burden area will make it easier to achieve elimination in both areas.
Furthermore, an area of high transmission, which has not yet been affected by resistance, poses a high risk, because the arrival of one carrier of resistant parasites could ignite transmission of resistance there. Finally, burden reduction saves lives.

The proposed priorities should be as follows:

- Flattening the epidemiological landscape by reducing transmission in high-transmission areas;
- Interrupting transmission of and eliminating *P. falciparum* malaria with special emphasis on areas of MDR including artemisinin resistance;
- Additional country-level priorities such as measures targeting certain mobile and migrant populations (MMPs) identified by local analysis.

**Eliminating malaria and preventing its re-establishment**

The priorities mentioned above do not mean that efforts to eliminate malaria in low transmission areas and prevent its re-establishment should be put on hold, only that such efforts must not take precedence over addressing burden reduction and drug resistance. Once the epidemiological landscape has been flattened, and an area has malaria incidence below 1 case per 1000 population at risk per year, then this area should be eligible for elimination phase (10). The results achieved in some central parts of Myanmar, where malaria transmission is limited and incidence/risk became extremely low, need to be further consolidated with the goal of interrupting the transmission of malaria as soon as possible.

The probability of malaria becoming re-established in a malaria-free area varies with the degrees of receptivity and vulnerability of a given area. If either of these factors is zero, the probability of malaria becoming re-established is zero even if the other factor has a high value. When importation of malaria due to the arrival of refugees, migrant workers from an endemic area coincides with increasing in receptivity as a result of halting anti-malaria measures, socio-economic development of an area etc., the re-establishment of malaria transmission could take place. In the absence of appropriate action, the area is likely to become malarious again and the time is determined by the level of receptivity and vulnerability (12). In this settings, special attention should be paid to:

- Notifying early on and investigating each suspected case of malaria;
- Detecting any possible re-introduction and re-establishment of malaria transmission;
- Determining the underlying causes of resumed transmission of malaria;
- Applying rapid curative and preventive measures;
- Maintaining malaria-free status in areas where it had been eliminated.
4.2 Programme phasing

Phasing is necessary, because premature application of the elimination phase interventions would be prohibitively demanding: the malaria burden must first be lowered, before it will be possible and rational to investigate and treat every case. Programme phasing on the path to malaria elimination can be summarized as follows:

- Transmission reduction phase is aimed at bringing the malaria incidence down to less than 1 case per 1000 population at risk per year, after which elimination could be considered. The revision of the surveillance system and development of elimination programme should be completed by the end of this phase before entering into elimination;

- Elimination phase, where surveillance becomes the core intervention. Elimination should start in an area where data from all health facilities/services show a malaria incidence of less than 1 case per 1000 population at risk per year, which is confirmed by very high and reliable case notification, mandatory reporting of each case, full participation of the public/private/community-based sectors assuming the presence of well-developed health services and a strong conviction that nothing is being missed.

Malaria elimination in Myanmar will be carried out in a phased manner and interim targets have been set up by (a) parasite species, with a priority to be given to elimination of *P. falciparum* and by (b) geographical areas, with different parts of the country being at different programme phases simultaneously.

Phasing should be applied to large areas, where certain parts of a country may belong to the different phases. For a relatively large and heterogeneous country like Myanmar, the emphasis will be given to assessing major administrative areas, typically starting from 1st State/Region administrative level. In Myanmar, some states/provinces have already entered into the elimination phase and become eligible for elimination. If their health systems are strong enough, it will be rational to start surveillance and other elimination activities focusing on setting up adequate surveillance, databases and quality assurance systems, preparing and testing relevant SOPs and training different categories of health staff.

4.3 State/Region as the unit of planning and Township as the unit of implementation

Based on API that has been used as a primary criterion for selection and other secondary criteria such as political and development priorities of the government, the degree of development of health systems and the extent of the malaria problem within each State/Region, the entire country can be sub-divided into three malaria Categories (see Annexes 5 & 6), namely:

- **Category 1**: States/Regions/Townships that are still in the transmission-reduction phase where API of 1 or above case per 1000 population at risk and elimination of malaria does not appear to be feasible at present;

- **Category 2**: States/Regions/Townships where a malaria incidence of less than 1 case per 1000 population at risk per year, where malaria elimination is recommended;

- **Category 3**: States/Regions/Townships that presently free from malaria, where prevention of malaria re-establishment of transmission is recommended.
Some States/Regions are already in the elimination phase while others are still in the transmission-reduction phase. States/Regions that are presently in the elimination phase may have some townships that are still in the transmission-reduction phase with API of 1 case per 1000 population at risk or above. At the same time there are some States/Regions which are still in the transmission-reduction phase but have some townships that are already in the elimination phase. Each State/Region will be advised to classify their townships to figure out which of them are eligible for initiating elimination activities.

In townships that became eligible for elimination, adequate case- and foci-based surveillance should be established in order to mark the limits of locations with different types of foci of malaria, namely:

Active foci: locations with ongoing transmission where locally acquired cases (introduced and/or indigenous) are reported;

Non-active residual foci: locations with no evidence of local transmission where transmission has been interrupted recently (1-3 years ago); and

Cleared foci: locations with no evidence of local transmission for more than 3 years, which are no longer considered as non-active residual foci.

Micro-stratification was actually conducted in 231 townships in 2012, 2014 and 2015, and most of these townships have village-wide parasitological data that can be used to stratify villages in line with the changing strategic direction from control to elimination. The unit of micro-stratification is “village” and that stratification is determined using API instead of using risk factors alone. Risk factors are still used to evaluate the receptivity and vulnerability in potential transmission areas where malaria data is incomplete. Due to limitation on the availability of population by village, sub-centres have been considered as the unit of measurement for calculating population at risk under each setting (see Table 1).

<table>
<thead>
<tr>
<th>Stratum</th>
<th>Transmission levels</th>
<th>N. of Sub-centres</th>
<th>Population at risk</th>
<th>% of Population at risk</th>
</tr>
</thead>
<tbody>
<tr>
<td>3a</td>
<td>High</td>
<td>1,026</td>
<td>3,542,647</td>
<td>7%</td>
</tr>
<tr>
<td>3b</td>
<td>Moderate</td>
<td>1,461</td>
<td>6,328,845</td>
<td>12%</td>
</tr>
<tr>
<td>3c</td>
<td>Low</td>
<td>2,062</td>
<td>12,664,333</td>
<td>24%</td>
</tr>
<tr>
<td>2</td>
<td>Potential</td>
<td>4,439</td>
<td>21,354,063</td>
<td>41%</td>
</tr>
<tr>
<td>1</td>
<td>Malaria free</td>
<td>1,531</td>
<td>8,116,373</td>
<td>16%</td>
</tr>
</tbody>
</table>

Table 1: Population breakdown by malaria stratum in relation to transmission level based on micro-stratification, 2015

It is recognized that in areas with highly mobile populations, even moderate or high API in a village does not necessarily imply that local transmission is occurring directly in that village. The improved surveillance methods can distinguish between locally transmitted and imported malaria to guide the choice of interventions. Measuring API in the human population is considered usually a more reliable indicator of local transmission than ecological and other risk factors that pertain only to the mosquito vector(s).
5. Milestones and Targets

The following timetable with broad milestones and targets is proposed for implementation of the national elimination plan in Myanmar (See Table 2 and Annexes 5 & 6):

By the end of 2016:

- Myanmar has developed and endorsed the NPME 2016-2030, and national elimination campaign has been officially launched across the country.

By the end of 2018:

- An estimated reduction in the reported malaria incidence of 50% at the national level compared with 2015;
- API reached the elimination threshold in 5 States/Regions (Mon, Shan, Ayeyarwady, Kayah & Tanintharyi) and these States/Regions moved from Category 1 to Category 2; and
- Transmission of malaria interrupted and zero incidence of indigenous cases of malaria attained in 5 States/Regions (Yangon, Bago, Magway, Mandalay & Nay Pyi Taw Union Territory) and these States/Regions moved from Category 2 to Category 3.

By the end of 2020:

- An estimated reduction in the reported malaria incidence of 85% at the national level compared with 2015;
- Transmission of *P. falciparum* malaria interrupted and zero incidence of indigenous cases of *P. falciparum* attained at least in 6 States/Regions (Yangon, Bago, Magway, Mandalay, Nay Pyi Taw Union Territory & Mon);
- API reached the elimination threshold in all States/Regions including Chin, Kachin, Kayin, Rakhine & Sagaing and the entire country entered into Category 2; and
- The re-establishment of local transmission prevented in areas (Yangon, Bago, Magway, Mandalay & Nay Pyi Taw Union Territory) where malaria has already been eliminated.

By the end of 2025:

- An estimated reduction in the reported malaria incidence of 90% at the national level compared with 2015;
- Transmission of *P. falciparum* interrupted and zero indigenous *P. falciparum* cases attained throughout the entire country;
- Transmission of malaria interrupted and zero incidence of indigenous malaria attained in additional 5 States/Regions (Mon, Shan, Ayeyarwady, Kayah & Tanintharyi) and 10 States/Regions (Yangon, Bago, Magway, Mandalay, Nay Pyi Taw Union Territory, Mon, Kayah, Shan, Ayeyarwady & Tanintharyi) are in Category 3; and
- The re-establishment of local transmission prevented in areas where malaria has been eliminated.

By the end of 2030:

- Transmission of malaria interrupted and zero incidence of indigenous cases attained in all States/Regions throughout the entire country;
- The re-establishment of local transmission prevented in areas where malaria has been eliminated.
It is worthwhile to note that the progress towards interrupting local transmission and eliminating malaria will be, to a large extent, conditional to how successfully technical/operational challenges are addressed within each particular State/Region and Township, taking into account: reaching universal coverage and good quality of curative/preventive measures covering everyone at risk; setting up adequate information, surveillance and M&E systems; strengthening general health services; motivating and sustaining health staff concerned; and providing administrative and management provisions to govern the programme properly.

Table 2: Projected States/Regions by programme phase and year, 2015-2030

| State/Region/Union Territory | 15 | 16 | 17 | 18 | 19 | 20 | 21 | 22 | 23 | 24 | 25 | 26 | 27 | 28 | 29 | 30 |
|------------------------------|----|----|----|----|----|----|----|----|----|----|----|----|----|----|----|
| Ayeyarwady                   |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Bago                         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Chin                         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Kachin                       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Kayah                        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Kayin                        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Magway                       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Mandalay                     |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Mon                          |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Nay Piy Taw Territory        |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Rakhine                      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Sagaing                      |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Shan                         |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Tanintharyi                  |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |
| Yangon                       |    |    |    |    |    |    |    |    |    |    |    |    |    |    |    |

- Transmission Reduction Phase: Category 1
- Elimination Phase: Category 2
- Prevention of Re-establishment Phase: Category 3
6. Key Interventions

The possible choices of malaria interventions for each particular Strata/Category should be based on existing situation and risk factors related to malaria as well as the established objectives:

- In areas under Category 1, where malaria is still widespread and the primary objective is to reduce further the malaria burden, the interventions should be focused on the progressive strengthening of capacities and capabilities of public and private health services and mobilizing community actions to provide early diagnosis and adequate treatment, to promote technically sound and sustainable preventive measures, to prevent, detect early and contain outbreaks and to assess regularly a changing malaria situation;

- In areas under Category 2, where malaria elimination is recommended, malaria shows a focal distribution of indigenous cases and imported cases may comprise a significant proportion of all cases. In this phase, the country has to consider changing the approach to malaria surveillance and has to investigate each case to ascertain whether it is locally acquired or imported;

- In areas which can be under Categories 1 & 2 with reported or suspected MDR including artemisinin resistance, attention should be given to assessing the present geographical distribution, evolution and profiles/patterns of MDR; monitoring antimalarial therapeutic efficacy of first-line and alternative drugs to guide national treatment policy; developing/applying intervention strategies for sustainable elimination of MDR and prevention of emergence of multi-ACT resistance; and

- The transition from malaria elimination to prevention of malaria re-establishment is possible only when adequate and effective surveillance of the disease in the country has proved that malaria transmission has been interrupted, and that all reported cases of malaria have an imported nature. For these areas under Category 3, particular focus should be placed on maintenance of the results achieved by deploying all efforts to detect any possible occurrence of malaria transmission, notifying as soon as possible all suspected cases and applying rapid remedial actions. Prevention of re-establishment of local transmission is a long-term policy that requires continuous investment of funds and personnel.

6.1 Case management

In recent years, the coverage and quality of case management has greatly improved in Myanmar as a result of strengthening public health services, expanding community-based services and engaging with the private sector for delivery of malaria curative services as well as providing adequate diagnostics and medicine, particularly at the periphery. Substantial effort has been taken to enhance quality assurance of diagnostics, antimalarial medicines and case management services.

Table 3 lists the main differences between case management policies and practices in areas under Categories 1 (Transmission-Reduction Phase), 2 (Elimination Phase) & 3 (Prevention of Re-Establishment Phase).
### Table 3: Case management policies and practices recommended for different Categories

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Transmission-Reduction Phase (Category 1)</th>
<th>Elimination Phase (Category 2)</th>
<th>Prevention of Re-Establishment Phase (Category 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Early diagnosis and effective treatment of all symptomatic infections to reduce morbidity and mortality and transmission as well</td>
<td>Early detection and management of all infections, to prevent onward transmission</td>
<td>Early diagnosis and treatment of imported malaria, and prevention of introduced and indigenous cases</td>
</tr>
<tr>
<td>Diagnosis policy</td>
<td>All suspected cases should be examined by RDT or microscopy</td>
<td>All suspected cases must be examined by RDT or microscopy</td>
<td>Adequate case notification system is established and fully functional</td>
</tr>
<tr>
<td></td>
<td></td>
<td>All positive cases confirmed by RDT should be re-confirmed by microscopy</td>
<td>Awareness on drug resistance patterns within and outside the country, to formulate preventive guidelines for evidence-based pre-travel health advice</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Mandatory reporting and notification of each confirmed case within 24 hours</td>
<td></td>
</tr>
<tr>
<td>Treatment policy</td>
<td>Pf: ACT as defined by national treatment policy and as long as efficacy is confirmed by TES; single dose of PQ is recommended in areas that are about to move to elimination</td>
<td>Pf: ACT as defined by national treatment policy and a single dose PQ is mandatory</td>
<td>Cases should be treated in line with national treatment policy</td>
</tr>
<tr>
<td></td>
<td>Pf: ACT as defined by national treatment policy and as long as efficacy is confirmed by TES, otherwise ACT</td>
<td>Pv: CQ as defined by national treatment policy and PQ is mandatory with testing for G6PD deficiency</td>
<td>DOT approach can be considered for treatment of imported cases</td>
</tr>
<tr>
<td>Service delivery</td>
<td>By all public health services, private medical practitioners, not-for-profit sectors (NGOs), informal private sector and community-based services</td>
<td>Largely, universal coverage has been achieved in this stage</td>
<td>Public and private health services involved</td>
</tr>
<tr>
<td></td>
<td>Public health sector must play a major role and supervise other sectors involved</td>
<td>Public health sector must play a major role and supervise other sectors involved</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Over-the counter-sale of antimalarial drugs prohibited</td>
<td>Over-the counter-sale of antimalarial drugs prohibited</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Service provision by other sectors, e.g. defense, police, corporate sector etc. should follow national norms and is monitored</td>
<td>Service provision by other sectors, e.g. defense, police, corporate sector etc. should follow national norms and is monitored</td>
<td></td>
</tr>
</tbody>
</table>
Stand-by treatment

| May be considered for certain MMPs, in case if impossible to provide diagnosis through existing health facilities/VHVs | The same as in Transmission Reduction Phase, but it should be exceptional and be monitored | - |

Quality assurance of diagnostics, antimalarial medicines and case management services

| Yes | Yes | - |

Monitoring of antimalarial therapeutic efficacy

| Monitoring of suspected resistance | Monitoring of suspected resistance |
| Therapeutic efficacy studies (TES) in areas with MDR including artemisinin resistance reported or suspected | Therapeutic efficacy studies (TES) in areas with MDR including artemisinin resistance reported or suspected |

Achieving universal coverage with case management

- While malaria incidence remains high, the optimal mix of three channels of service delivery (public, private and community based) is the best approach to improve quality and increase coverage for case management.

- In Myanmar the public health sector is still under-resourced, facing human resource and supply chain challenges, and its service network is not sufficiently dense in many areas. NMCP has engaged with the private sector for delivery of malaria curative services. The private health sector includes medical practitioners, licensed pharmacies, non-licensed drug vendors, authorized services belonging to private companies catering to their employees and not-for-profit services e.g. non-governmental organizations (NGOs) and faith based organizations, and many of them are actively involved in case management. The public sector usually invests in communication, training, monitoring and in many cases provision of diagnostics and medicines. NGOs including international ones play a key role in providing quality services, especially in areas where government health services encounter difficulties. However, the informal private sector including drug vendors is still a major source of irrational treatment and substandard medicines. Unlicensed providers should not be allowed to provide malaria diagnosis or treatment for malaria. Malaria staff along with State/Region and district health departments should identify facilities in violation of this statute and enforce this regulation. Where possible, public health staff should help qualified providers become licensed to provide diagnosis and treatment according to national guidelines. The country needs to develop a strategy for involvement and supervision of the different kinds of private providers. Community-based services are usually the best solution for remote areas. There are, however, many challenges. The large numbers and high turnover of staff lead to challenges of training, retraining, supply, supervision and reporting. Supervision is usually the responsibility of the lowest level health facility and therefore not of the highest quality, unless there is quality assurance. When malaria incidence is very low, Village Health Volunteers (VHVs) may not see enough cases to maintain their skills and the population may not see their value.
In the elimination phase, the roles and responsibilities for each channel should be defined, considering that public health sector must play a major role and supervise all other sectors involved to ensure optimal case management and surveillance with a total coverage of all active foci. The principle of total coverage of all active foci should be applied to case management. Blood samples should be taken for parasitological examination by microscopy or Rapid Diagnostic Tests (RDTs) or even, where feasible, by polymerase chain reaction (PCR)-based diagnostics from all febrile patients including those with history of fever in the past weeks and clinically suspected asymptomatic infections by passive and active case detection (PCD/ACD). Active screening for malaria cases should be actively advocated for focus investigation. ACD should be particularly enhanced in active foci of malaria that show signs of refractoriness. The norms may be less rigid in foci that have demonstrated a good response to the applied measures. Along with PCD, every attempt should be taken to screen mobile and migrant populations (MMPs) and ethnic groups by ACD in remote and border areas. It is well known that malaria tends to take refuge in such places and populations, as they are often neglected and not adequately covered by the health services. A good working relation has to be established with the defense and police medical services, and the same applies to jails and other institutions across the country.

The detection of malaria infection should be based on blood examination by RDTs and microscopy. The role of quality-assured microscopy remains critical and even increases in the elimination phase, and laboratory facilities should be improved at township- and higher-level hospitals. Microscopy has advantages for follow-up of patients, detection of gametocytes and determination of parasite density. Blood examination by RDTs can provide a result on the spot. In settings eligible for elimination, it is recommended that RDTs and blood slides should be taken simultaneously from suspected cases. Blood slides should be promptly dispatched to a nearest laboratory for rapid examination. It is recommended that all the positive cases confirmed by RDTs should be cross-checked by quality-assured microscopy (or even by PCR-based diagnostics) that should be available at township and higher levels. RDTs are usually used in situations where microscopy is not available, particularly at peripheral level in high-risk MMPs without access to adequate laboratory facilities and in the private sector as well. National standard operating procedures (SOPs) on PCD and ACD and the role of RDTs, microscopy and PCR-based diagnostics at different levels in the transmission-reduction and elimination phases should be developed. Regular RDT-based malaria screening for pregnant women should be introduced through ANC services in high-transmission areas. The annual blood examination rate (ABER) for populations at risk in active and non-active residual foci should be kept at level of well above 5%, and preferably increased to 10% or even higher.

PCR-based and other nuclear acid amplification (NAA) techniques with a higher sensitivity than RDTs and microscopy, although not presently recommended by WHO for routine diagnosis of malaria, could be considered for detection of low-density parasite carriers in some special situations, namely case detection and focus investigation in the elimination phase. Since RDTs and light microscopy are not sufficiently sensitive for mass screening and treatment programmes in low-transmission settings, field-adapted classic and quantitative PCR to detect low-density infections might be needed.

Treatment of \textit{P. falciparum} and non-\textit{P. falciparum} malaria should be based on national treatment policies (13) and WHO guidelines (14). ACTs (Artemether plus Lumefantrine - AL) for 3 days together with primaquine (PQ) at Day 0 with first dose) are currently recommended for treatment of uncomplicated \textit{P. falciparum} malaria in Myanmar. A safe, low dose of primaquine recommended by WHO is mandatory and has to be included in the treatment of all confirmed cases of \textit{P. falciparum} to eliminate gametocytes and reduce mosquito-borne transmission in areas eligible for elimination. In case of treatment failure within 28 days, an alternative ACT such as Artesunate plus Mefloquine (AS+MQ) or Dihydroartemisinin plus Piperaquine (DHA+PPQ) is recommended for 3 days with PQ at Day 0.
In case of treatment failures after 28 days, a case is considered as a new infection and it is treated with AL for 3 days with a single dose of PQ. Hospitalization of malaria patients should be mandatory in relation to severe and complicated cases. Uncomplicated malaria cases usually do not need to be hospitalized.

- The radical treatment of uncomplicated *P. vivax* and *P. ovale* malaria includes a combination of chloroquine (CQ) for 3 days and PQ for 14 days to ensure elimination of hypnozoites, which cause relapses. Weekly administration of PQ for 8 weeks can be considered for prescription in G6PD deficient patients. Health staff and VHVs should be actively involved in diagnosis and supervision of treatment of *P. vivax* cases in the elimination phase. This is important since some patients do not feel that they need to take PQ any longer after having apparently been cured and PQ may harm them - by causing haemolysis in G6PD deficient patients. While such haemolysis is self-limiting if the drug has been stopped, it may be dangerous if PQ is continued. The screening for G6PD deficiency (even if the level of G6PD deficiency is low) is recommended prior to PQ administration, and it can be rolled out gradually in the country. The directly observed/supervised treatment (DOT) of *P. vivax* cases with PQ should be always considered, particularly in the elimination phase, when the number of cases becomes low. CQ is given only for treatment of *P. malariae* malaria.

- All service providers authorized to diagnose malaria should be properly trained. The National malaria programmes should standardize training curriculum and ensure consistent knowledge and skills related to malaria diagnosis among the entire healthcare workforce concerned. The programme staff on a regular basis should carry out regular support and supervision visits to monitor the quality of laboratory services at all public facilities. Training and re-training of all laboratory technicians should be continued, and all laboratories should participate in quality assurance and control procedures. Private pharmacies certified for malaria diagnosis should refer all confirmed malaria cases to public health providers and facilities for treatment. The programme staff should target all service providers from public and private health sectors including VHVs who are involved in malaria treatment for training on case management, which can be combined with training on diagnosis and surveillance. Ad hoc training should be provided if there are changes to national treatment guidelines. The programme staff on a regular basis should carry out regular support and supervision visits to monitor the quality of treatment services at all public, private and community-based facilities and services. Among other service providers (military, police etc.), stakeholders should be designated to carry out the monitoring visits.

- In areas with poor public health infrastructure and services, the establishment of a network of VHVs is the best and often only option to reach the total coverage of curative and preventive services, in order to detect, notify and treat every malaria infection in a proper and timely manner. The role of Integrated Community Malaria Volunteers (ICMVs) to deal with other diseases including malaria at all age groups under the integrated Community Care Management (iCCM) will be promoted and expanded, particularly for hard-to-reach areas, to cover all endemic settlements more than 2 km from a functioning health facility. At the grassroots level, VHVs/ICMVs can be considered as the connecting point between community and public health services in provision of adequate case management and disease prevention. To improve access to case management, especially in remote communities, the number of villages and working sites with migrant and mobile populations, where VHVs/ICMVs are present should be increased. The target should be to place at least one VHV/ICMV or work site volunteer or backpacked mobile volunteer in every village and major working sites that are considered with on-going local transmission or at risk of malaria. The main responsibilities of VHVs/ICMVs should include providing diagnosis of malaria, supporting the referral of severe/complicated cases, engaging in LLINs distribution and other preventive measures, and, along with health staff, raising awareness of public campaigns and health education activities on malaria.
In addition, he/she should also support the National Tuberculosis, leprosy, AIDS, Reproductive, Maternal and Child Health Programmes to identify/screen, treat, refer (as appropriate) and generate awareness.

In low-transmission areas eligible for elimination, VHVs/ICMVs along with health staff should be actively involved in case detection and reporting, and may support case and foci investigation and response. The public health staff should manage the work of VHVs/ICMVs and other volunteers in collaboration with relevant malaria health personnel.

- A proper national guide should be developed to assist in implementation of VHV-related interventions, including regular supervision of VHVs/ICMVs. All VHVs/ICMVs should receive annual training on case management, malaria prevention and health education, and case reporting as well. VHVs/ICMVs should participate in regular meetings with township- and lower-level health staff. Malaria and general health staff with support of VHVs/ICMVs should develop materials and organize campaigns to sensitize communities about the availability of free malaria diagnosis/treatment at public health facilities to increase their demand.

- Special case management and screening services should continue to be provided through new malaria clinics/posts in high risk areas and at key migration transit points, including formal and informal international border crossings. Support to these malaria clinics should include the provision of training and supply of RDTs and antimalarial drugs. Township health teams and NGO partners should conduct intensified case detection in high burden villages without VHVs, and in new settlements and in migrant work sites in endemic areas as necessary. Mobile teams should travel to wherever mobile populations spend time, and they should work with groups or individuals recruiting migrants. A number of NGOs already have mobile outreach teams for managing malaria in MMPs and remote areas through the provision of case management services and forest-packages for forest goers. This approach should be expanded by NGOs and the malaria programme to cover all areas where populations are currently underserved. For settled populations, mobile services should be only a temporary measure to fill the gap-pending provision of static community-based services, which should be rolled out as quickly as possible. Malaria case detection and management services within the Defense and Police Services should be strengthened and brought in line with national standards and norms.

**Improving quality**

- Quality assurance of diagnostics, treatment and patient care is important in the transmission reduction and elimination phases (15, 16). The only difference is that quality assurance (QA) of microscopy has a higher priority in the elimination phase. For case management, it is critical to ensure quality of both microscopy and RDTs as well as the quality of available and to-be-supplied malaria commodities through adequate registration, good procurement practices and regular quality monitoring at all levels. The ban on import, manufacture, export, registration, distribution and sale of artemisinin monotherapy should be reinforced by the FDA through communication with importers, manufacturers, exporters, distributors, pharmacies and drug sellers.

The programme should support the police to enforce the ban. National guidelines on QA and quality control (QC) along with SOPs for laboratory diagnosis of malaria should be developed and disseminated to all service providers. Health staff at central, State/Region and district laboratories should be trained on QA/QC. For QC, performance of work of laboratory technicians should be assessed by reference laboratories usually at State/Region and central levels. The blood slides should be cross-checked by reference laboratories in the elimination phase., as per the WHO QA/QC manual, v2 2016. A national slide bank should be developed to support QA/QC and training on malaria diagnosis.
Standby treatment and chemoprophylaxis

- Standby treatment decided without a diagnostic test by the patient is a common practice, which has often been incriminated in relation to resistance to antimalarials. With greatly improved service coverage and especially the availability of RDTs, this should be much less needed. However, there may be some mobile groups, who are so small and so isolated that standby treatment is the best that can be done.

- Chemoprophylaxis as a short-term measure should be provided to international travelers going to high risk areas in Myanmar. It may be considered as an alternative to standby treatment in certain mobile groups (soldiers, police, labor forces) serving in high endemic areas, if good adherence can be ensured and should be complimented by personal protection and, where feasible, by other methods of vector control.

Monitoring of resistance to antimalarials

- Monitoring of antimalarial therapeutic efficacy and carrying out relevant studies (TES) at sentinel sites throughout the country should be continued in collaboration with WHO to keep relevant maps updated and revise national treatment policy accordingly. In these sentinel sites blood samples can also be collected for K13 and mdr1 copy number. In addition to the existing eleven sites, more new sites should be established as necessary to ensure that TES results provide a representative overview of the national situation.

- Day3 positivity rate and treatment failures after 28 or 42 days are indicators for monitoring of antimalarial therapeutic efficacy in high-transmission settings. All malaria cases detected in the MDR low-incidence areas should be followed-up on day 7 and 28 after confirmation of diagnosis to ensure parasite clearance. If a patient is positive on day 7 or 28, they should be admitted to a nearest in-patient public health facility and treated with second-line drugs. Admitted patients may be remunerated and consent may be secured to ensure compliance with in-patient care. National treatment guidelines should be revised as necessary based on available evidence.

- When the number of patients becomes low, it is no longer possible to perform TES studies; it should then be attempted to follow up all patients, especially *P. falciparum* patients with clinical and blood slide checks on the same days as recommended in TES protocols. Complete adherence cannot be expected, but in an elimination perspective, the advantage of this practice is that any treatment failure case will be given a second-line treatment. For this, patient mobility makes it necessary for treatment providers to give each patient an identifier number and a malaria/treatment card.
6.2 Disease prevention

Long-lasting insecticidal nets, hammocks, curtains and screens which prevent mosquitoes from biting and kill them if they attempt to do so, are widely used for personal and community protection in the GMS. They have a potential for reducing transmission when used on a large scale in malaria settings, where their efficacy and health impact have been ascertained or are anticipated. The protective effect of insecticide-treated materials could be influenced by: behavioral characteristics of the vector(s) involved, i.e. feeding habits (indoors/outdoors feeding preferences, peak biting periods), human behavior; addressing MMPs; human sleeping patterns (indoors/outdoors); preferences for feeding on humans or animals; and variations in net/hammock use patterns.

Indoor Residual Spraying (IRS), which does operate both through repelling mosquitoes from entering houses and by killing mosquitoes who are resting inside houses after having bitten can be an option in special circumstances. These can include usage in areas where nets are not accepted and used due to cultural or other factors; during outbreaks; when a high percentage of the structures in an operational area have adequate spray-able surfaces and can be well sprayed; when local malaria vectors are endophilic and susceptible to the insecticide in use, and when there is good public acceptance.

There are two principal vector control measures - long-lasting insecticidal nets (LLINs) and, to much lesser extent, indoor residual spraying (IRS) - that are currently part of the national malaria strategic plan 2016-2020 in Myanmar.

Table 4 lists the main differences between disease preventive policies and practices in areas under Categories 1 (Transmission-Reduction Phase), Category 2 (Elimination Phase) & Category 3 (Prevention of Re-Establishment Phase).

Table 4: Disease prevention policies and practices recommended for different Categories

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Transmission-Reduction Phase (Category 1)</th>
<th>Elimination Phase (Category 2)</th>
<th>Prevention of Re-Establishment Phase (Category 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Purpose</td>
<td>To reduce transmission intensity</td>
<td>To reduce onward transmission from existing cases</td>
<td>To reduce onward transmission from imported cases</td>
</tr>
<tr>
<td>Stratification of malaria situation</td>
<td>Definition of major eco-epidemiological types with selection of appropriate vector control options for different malaria strata based on local epidemiology (High, Moderate, low and potential transmission areas)</td>
<td>Foci-based stratification with categorization of different foci of malaria</td>
<td>-</td>
</tr>
</tbody>
</table>

Table continues on the next page
## Vector control policy

Transmission reduction through universal population coverage and usage of LLINs, IRS and personal protective measures

Special emphasis on MDR areas and MMPs

Larval control wherever is feasible in areas with *An. dirus* and *An. sundaicus*

Sustainable and cost-effective vector control based on IVM is recommended

IEC/BCC activities

---

## Geographical reconnaissance

Vector control, on a strict total coverage of all active foci of malaria, with a view to interrupting transmission as soon as possible all over the target area

IEC/BCC activities

In areas of high vulnerability and receptivity, it may be necessary to reduce receptivity by the use of appropriate vector control measures

---

<table>
<thead>
<tr>
<th>Entomological surveillance</th>
<th>Yes</th>
<th>Yes</th>
<th>As a part of vigilance (responsibility of the general health system), particularly in areas with high receptivity and vulnerability</th>
</tr>
</thead>
<tbody>
<tr>
<td>Monitoring and management of insecticide resistance</td>
<td>Yes</td>
<td>Yes</td>
<td>-</td>
</tr>
<tr>
<td>Epidemic preparedness and response</td>
<td>To be established in epidemic-prone areas with focus on populations at risk</td>
<td>The system must be fully functional throughout the areas eligible for elimination</td>
<td>As a part of a malaria alert and response system, particularly in areas with high receptivity and vulnerability</td>
</tr>
<tr>
<td>Research, introducing modern technology, monitoring and evaluation</td>
<td>To introduce a GIS-based database on malaria vectors</td>
<td>A central repository of information related to entomological monitoring and applied vector control interventions established and fully functional</td>
<td>-</td>
</tr>
</tbody>
</table>
Long-lasting insecticidal nets (LLINs) and other materials

- At present, LLINs are a core intervention that is widely used to reduce transmission and prevent malaria in local communities and high-risk MMPs. Indoor residual spraying (IRS) can reduce malaria transmission in plains to low-level areas but has only a limited impact in hilly and forested areas, and now is mostly restricted to the control of outbreaks and addressing MMPs in some situations.

- Achieving and maintaining universal coverage with LLINs to ensure that a) each household has sufficient nets (the target coverage rate for large sized LLINs is 1.8 people per net in line with WHO standards) and b) every inhabitant at risk sleeps under a LLIN every night is critical to reduce transmission in high-transmission settings. Under certain circumstances a single LLIN should be given to every inhabitant within the family. The urban areas will be excluded. LLINs should be distributed at no cost to reach universal coverage of all populations at risk, and distribution should be based on outcomes of stratification of transmission intensity. As the quality of surveillance improves, endemic villages and villages with imported cases only can be distinguished. Endemic villages should continue receiving periodic mass distribution of LLINs every 3 years but in villages with imported cases, LLINs should be provided only to targeted population like forest goers. Thus, the programme will move away from blanket coverage and increasingly focus on maximizing cost-effectiveness and sustainability. Distribution of LLINs should be coupled with locally appropriate and gender sensitive Information, Education & Communication (IEC) as well as Behavior Change Communication (BCC) to ensure community participation and correct LLIN usage.

Distribution campaigns, particularly in areas reporting low LLINs ownership, should be carried out based on their actual utilization and needs, and led by trained health staff and VHV at township level. Continuous distribution of LLINs should be provided to forest goers, employers to give to their workers, farmers to give to their seasonal workers, outbreak areas and transmission foci, new settlement sites, disaster areas, distribution by ANC and RMNCH clinics and defense forces. Continuous distribution of LLINs should be provided through the VHV network in order to address any LLIN attrition in-between mass distributions. LLIN stores should be held at township level. Among MMPs, LLINs and other materials should be distributed to workers at their workplace through employers, malaria clinics and volunteers (e.g. farms, plantations, gold/gem miners, industrial commercial projects, dam/bridge/road/railway construction sites, new settlements etc. as identified by malaria programme and health staff), and efforts will be taken to encourage employers to provide this service to their employees at their own cost in future. Additional LLINs should be given to pregnant women in communities targeted for mass LLIN distribution through ante-natal care (ANC) services maximizing LLIN coverage for infant. Defense/police service personnel based in or operating in malaria risk areas should be protected by distributing LLINs. In the event of disasters and outbreaks, LLINs should be provided to anyone who has not already been covered. LLINs ownership and utilization should be regularly monitored and evaluated following distribution campaigns.

Focal indoor residual spraying (IRS)

- The programme should conduct focal IRS in the event of outbreaks, addressing MMPs in some situation, and active foci of malaria in areas eligible for elimination where case and foci investigations are in place, and entomological evidence and other factors indicate that interruption of transmission can be expected. In accordance with the national policy, the choice of insecticide will take into account safety, efficacy, cost, availability and susceptibility of vectors. To be effective IRS requires careful planning, well-organized operations with skilled technical staff, very strong supervision and community mobilization and participation to achieve the high level of IRS coverage (more than 80%) to maximize impact of this operation. Well-defined SOP should be developed for IRS planning, implementation, and monitoring. Malaria entomological and health staff should be trained on IRS to support its application and monitor the quality of IRS operations.
- In the elimination phase, focal IRS should be considered (if feasible) along with other preventive measures (LLINs and other insecticide-treated materials etc.), with a view to interrupting transmission as soon as possible in all active foci over the target area. In addition to IRS and other measures, mass drug administration (MDA), which implies the distribution of an antimalarial drug to every individual in a given population can be considered, particularly in situations when (1) persistent active foci of malaria continue to exist in areas where its transmission has been interrupted elsewhere, or (2) a small-scale outbreak is reported in a malaria-free area or (3) IRS and/or other vector control measures have reduced substantially intensity of transmission but cannot fully interrupt it and 4) in case of conflict emergency situation. There are, however, numerous difficulties connected with the use of MDA. It is therefore not a procedure that should be adopted without very careful consideration. Every effort will be provided to comply with the recent WHO recommendations about MDA.

Larval source management

- Larval control is realistic only in restricted areas, where the breeding sites are few, fixed and easier to locate. In areas where wells are identified as a significant source of *An. dirus*, and in disused shrimp farms and coastal lagoons which are generating high densities of *An. sundaicus* associated with significant level of malaria transmission, the use of chemical and biological larvicides can be recommended as a successful preventive measures. The measure is costly because of the need for many repetitive applications during the season.

Environmental management

- Environmental management, which deserves to be used more often by communities for collective protection from malaria vectors, can be classified into (1) environmental modification that includes drainage, filling, land leveling etc.; (2) environmental manipulation that includes water salinity changes, stream flushing, regulation of the water level in reservoirs, vegetation removal, shading and exposure to sunlight etc., and (3) modification/manipulation of human habitation/behavior that includes the position of settlements away from vector sources, zooprophylaxis etc. High costs and the length of time required for completion are the main disadvantages of environmental management operations; however, small-scale operations are feasible and can be applied in combination with other vector control options. In active foci where entomological surveillance is carried out, the impact of potential environmental management interventions should be assessed and policy guidance for deployment of these techniques should be developed. A strong inter-sectoral collaboration is required for deployment of environmental management at local level. Malaria programme and health staff should work with local communities to engage them in environmental management activities.

Integrated vector management

- It is logical to assume that a combination of different vector control options may compensate for deficiencies of each individual method. An integrated vector control approach which suits the country's conditions, responds to local needs and is cost-effective should be actively promoted in high-transmission settings to bring malaria transmission down as soon as possible. The application of vector control measures and their combinations should be always guided by consideration of their technical feasibility, operational applicability, cost-effectiveness and sustainability, and some of them are in need of better QA.
Entomological surveillance and insecticide resistance

- The National malaria programme should build capacity necessary for entomological surveillance, and SOPs related to entomological monitoring and surveillance should be developed. Entomological surveillance should include identification of vector species, monitoring vector behaviors and bionomics, mapping species distribution and density, identification of host preference, seasonal fluctuation of species, and assessment of an area’s receptivity. Entomological surveillance should also be carried out in epidemic-prone areas based on set outbreak thresholds. Insecticide resistance is one of the greatest threats to any concerted or prolonged attempt at malaria transmission control, whether the goal is transmission reduction or elimination. Particular attention should be paid to monitoring and management of insecticide resistance (17). All existing and possible breeding sites of Anopheles mosquitoes should be properly mapped in relation to active foci of malaria, particularly in areas eligible for elimination.

6.3 Malaria surveillance

Currently there are multiple malaria surveillance approaches used in Myanmar. The design of malaria surveillance systems depends on the level of malaria transmission, the implementing strategy, its goal and the resources available to conduct surveillance. In the transmission reduction phase, where there are still many cases of malaria and it is not possible to investigate and react to each confirmed case individually, the programme goal is to reduce disease transmission. In this case, surveillance is based on aggregate numbers, and indicators such as mortality/morbidity rates, incidence of severe/complicated cases, case fatality rate (CFR), annual parasite incidence (API) etc. are calculated to measure the impact of programme interventions (18). In the elimination phase, as transmission is progressively reduced, it becomes increasingly possible and necessary to track and respond to each individual case (19). In the phase of prevention of re-establishment of local transmission, priority should be given to the immediate notification of imported cases and to prevent the occurrence of possible introduced cases as a result of onward transmission from imported cases and indigenous cases.

Table 5 lists the main differences between malaria surveillance policies and practices in areas under Categories 1 (Transmission-Reduction Phase), 2 (Elimination Phase) & 3 (Prevention of Re-Establishment Phase).

Table 5: Malaria surveillance policies and practices recommended for different Categories

<table>
<thead>
<tr>
<th>Purpose</th>
<th>Transmission-Reduction Phase (Category 1)</th>
<th>Elimination Phase (Category 2)</th>
<th>Prevention of Re-Establishment Phase (Category 3)</th>
</tr>
</thead>
<tbody>
<tr>
<td>To allow targeting interventions, detecting potential outbreaks and tracking progress</td>
<td>To discover any evidence of the continuation or resumption of transmission, detect local and imported cases as early as possible and notify them within 24 hours of detection, investigate and classify each case and focus of malaria, provide a rapid and adequate response and monitor progress towards malaria elimination</td>
<td>To prevent introduced cases and indigenous cases secondary to introduced ones</td>
<td></td>
</tr>
</tbody>
</table>

Table continues on the next page
### Epidemiological evaluation

- Reduction of the malaria burden in terms of prevalence, incidence and mortality
- Proven disappearance of locally acquired cases
- Reduction of onward transmission from imported cases
- Prevention of introduced and indigenous cases secondary to introduced ones

### Data reporting, recording and indicators used

<table>
<thead>
<tr>
<th>Data reporting, recording and indicators used</th>
<th>Private sector is requested to report cases</th>
<th>Malaria must be a notifiable disease</th>
<th>Malaria is a notifiable disease - must report every case by law</th>
</tr>
</thead>
<tbody>
<tr>
<td>Aggregate numbers of out-and in-patients, uncomplicated malaria, severe malaria and deaths due to malaria</td>
<td>Private sector, defence medical services and others must report every case by law</td>
<td>Reported number of acquired locally and imported cases</td>
<td>Reported number of active, non-active residual and cleared foci of malaria</td>
</tr>
<tr>
<td>Indicators (API, SPR, ABER) are reported</td>
<td></td>
<td></td>
<td>Day3 positivity rate and treatment failures after 28 or 42 days of TES are reported</td>
</tr>
<tr>
<td>Day3 positivity rate and treatment failures after 28 or 42 days of TES are reported</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

### Detection methods

- PCD health facility-based and through VHVs/other volunteers at worksites
- The same as in the Transmission-Reduction Phase with special attention to ACD
- In principle, PCD
- However, under exceptional circumstances, especially where importation of malaria is intense and when introduced and indigenous cases are reported, ACD is recommended
- Screening of returnees/migrants from endemic areas can be recommended

ACD by health staff and mobile teams is recommended for remote villages, border areas and development projects (if it is not covered by PCD)

Blood screening and treatment of positive cases at border crossing and transit points, and new settlements as well

Confirmatory TES

### Case and foci identification, investigation and classification

- No
- Yes
- Yes

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Table continues on the next page
Technology, monitoring and evaluation

<table>
<thead>
<tr>
<th></th>
<th>Consolidating the use of new tools such as web-based data transmission, volunteer reporting via SMS and introducing case-based malaria surveillance</th>
<th>Adequate case- and foci-based malaria surveillance fully functional across the entire country</th>
<th>Adequate case-based malaria surveillance fully functional across the entire country</th>
</tr>
</thead>
<tbody>
<tr>
<td>National computerized malaria elimination database/registers established</td>
<td>National malaria elimination monitoring committee set up</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Adequate case-based malaria surveillance fully functional across the entire country</td>
<td>National computerized malaria elimination database/registers established</td>
<td>Adequate case-based malaria surveillance fully functional across the entire country</td>
<td>Adequate case-based malaria surveillance fully functional across the entire country</td>
</tr>
</tbody>
</table>

Integration with other health programmes

<table>
<thead>
<tr>
<th></th>
<th>Often as an integrated public health programme usually with a centralized management component</th>
<th>Usually as a special programme with a highly specific and time-limited objective</th>
<th>Usually as an integrated public health programme</th>
</tr>
</thead>
</table>

**Surveillance policies and practices in the elimination phase**

- When a decision has been made to go for elimination, the national malaria programme should conduct an expert review to assess these various approaches and prepare a roadmap for the development of elimination-specific activities, including case-based reporting system, case investigation and classification, foci reporting and foci investigation and response. In order to develop an adequate surveillance system for malaria elimination adapted to country’s conditions a working group should be set up to review current approaches and systems as well as to propose the best surveillance practices on elimination including those from other GMS countries.

- In the elimination phase, the country should concentrate on detecting every symptomatic and asymptomatic infections and reacting to every confirmed case. Therefore, a major surveillance paradigm change occurs when countries embark on elimination. In this phase, each malaria symptomatic and asymptomatic infection and focus has to be targeted for action. Surveillance activities have to be enhanced so that every focus (village, or sub-village or working site) where there are indigenous cases of malaria are targeted to intensified surveillance (*P. vivax* presents surveillance difficulties because of relapses related to hypnozoites that cannot be detected). The elimination phase is defined by the application of malaria surveillance according to specific and rigorous standards (19).

- Routine malaria surveillance should be strengthened across the country to ensure complete and timely reporting from all health actors including public facilities and the private sector, I/NGOs, VHV/ICMVs, defense health services/police health services, and other parties concerned. The national malaria information system (MIS) in the townships under Category 1 (Transmission-Reduction Phase) should be expanded and modernized in support of the move towards elimination. The system should be upgraded to allow weekly reporting and presentation of data based on Geographical Information System (GIS), and more emphasis should be placed on providing timely feedback from Central and State/Region levels to Township teams and peripheral health staff. A case-based surveillance and response system based on GIS should be established initially in 5 priority States/Regions with low malaria incidence which are eligible for malaria elimination, and later it should be expanded to other States/Regions as appropriate. In addition to MIS, malaria data will be incorporated into the MoH’s “District Health Information System (DHIS2)”. 

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The malaria programme will collaborate with Myanmar’s “Emergency Operating Center” to integrate malaria related surveillance and response mechanisms into the broader health sector approach implemented by the multi-task detection and response teams associated with other epidemic-prone diseases.

- The transition from the transmission reduction phase to elimination will require revision of guidelines, recruitment of staff, training and supervision related to surveillance. In the elimination phase, national operational manual along with respective SOPs on malaria surveillance should be developed including detailed description of tasks and responsibilities for malaria programme and other health staff at all levels, and updated as necessary. To ensure adherence to standard surveillance procedures and practices in line with national guidelines and SOPs, malaria programme staff should lead trainings on surveillance for all categories of health staff concerned and other partners involved. Such trainings can be integrated into other malaria trainings if possible.

- Thus, malaria surveillance in the elimination phase is aimed at (1) immediate detection and mandatory notification of all malaria infections, whether symptomatic or not, within 24 hours to ensure that they are early and properly treated in order to prevent generating secondary cases; and (2) investigation of each malaria case to determine whether it was locally acquired or imported, ideally within 24 hours but not later than 3 days.

- Once a local case of malaria has been detected and notified, a focus investigation is carried out by malaria staff within 72 hours (3 days) to describe the locality where malaria occurred for determining the underlying causes of ongoing transmission, and rapid measures (responses) should be applied in a given focus as early as possible but not later than 7 days to interrupt transmission and prevent its further spread.

- A malaria focus is defined as “a defined and circumscribed locality situated in a currently or formerly malarious area and containing the continuous or intermittent epidemiological factors necessary for malaria transmission”. Since the focus as a minimum entity is the object of action, this concept is crucial for a malaria programme that aims to interrupting transmission, and the functional status of malaria foci is a cornerstone for measuring the progress towards reaching set targets and stated goals. Focus investigation includes clinical and epidemiological diagnosis of the reported case, description of the locality in relation to receptivity and vulnerability and anti-malarial measures carried out, and, as a result, the focus is classified.

Tables 6 and 7 list the types of malaria foci by definition, operational criteria and recommended minimum of standards of response.

**Table 6: Types of malaria foci based on evidence of transmission and presence of cases**

<table>
<thead>
<tr>
<th>Type</th>
<th>Evidence of transmission</th>
<th>Presence of cases</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active focus</td>
<td>A focus with transmission</td>
<td>Yes, locally acquired cases – indigenous and/or introduced cases reported</td>
</tr>
<tr>
<td>Non-active residual focus</td>
<td>A focus with no transmission that has been interrupted recently (1-3 years ago)</td>
<td>Yes, but only imported or induced or relapsing cases may occur</td>
</tr>
<tr>
<td>Cleared focus</td>
<td>A focus with no local transmission for more than 3 years and which is no longer considered as non-active residual focus</td>
<td>Yes, but only imported or induced or relapsing cases may occur</td>
</tr>
</tbody>
</table>
Table 7: Types of malaria foci with operational criteria and recommended minimum standards of response

<table>
<thead>
<tr>
<th>Type</th>
<th>Operational criteria</th>
<th>Recommended minimum standards of response</th>
</tr>
</thead>
<tbody>
<tr>
<td>Active focus</td>
<td>Locally acquired case(s) - indigenous and/or introduced - have been detected within the current transmission season/ calendar year</td>
<td>All feasible measures including detailed investigation of each case and focus of malaria to interrupt local transmission as soon as possible should be applied</td>
</tr>
<tr>
<td></td>
<td>Contact survey, mass blood survey and active case detection</td>
<td>Entomological surveillance</td>
</tr>
<tr>
<td></td>
<td>Epidemiological investigation and classification of every case reported</td>
<td>Health education</td>
</tr>
<tr>
<td>Non-active residual focus</td>
<td>The last locally acquired case(s) – indigenous and/or introduced - have been detected in the previous transmission season/ calendar year or up to 3 years earlier</td>
<td>PCD is accessible to the entire population at risk and supported by supervision</td>
</tr>
<tr>
<td></td>
<td>Imported or induced or relapsing cases may occur</td>
<td>ACD is conducted regularly and covers the entire population at risk</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Epidemiological investigation and classification of every case reported</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Diagnosis by quality-assured microscopy and RDTs or even PCR-based techniques</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Early/adequate/radical treatment of all cases</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Continuous use of LLINs</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Entomological surveillance</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Health education</td>
</tr>
<tr>
<td></td>
<td>Measures applied in a non-active residual focus may be less comprehensive than in an active focus, but standards of quality and coverage should be the same</td>
<td></td>
</tr>
<tr>
<td>Cleared focus</td>
<td>A focus with absence of locally-acquired case(s) for more than 3 years</td>
<td>Vigilance measures by general health services</td>
</tr>
<tr>
<td></td>
<td>Only imported, induced or relapsing cases may occur</td>
<td>PCD, and ACD if cases reported</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Entomological surveillance is recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td>In case of high degree of receptivity and vulnerability vector control measures can be recommended</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Health education</td>
</tr>
</tbody>
</table>
Key criteria for case definition, reporting, investigation and classification in elimination settings

- A person in whom, regardless of the presence or absence of clinical symptoms, malaria parasites have been confirmed by quality-assured parasitological diagnosis must be considered as a malaria case in the elimination phase.

- Malaria must be a notifiable disease for all providers in public, private and community-based health sectors. Recording and reporting mechanisms and systems within existing public, private and community-based health sectors should be established to address elimination challenges by timely detecting and immediately notifying the malaria programme of all confirmed cases by the fastest means possible. National legislative/legal requirements and administrative acts should be in place to facilitate compulsory notification of confirmed malaria cases. All private health sector providers must report every case diagnosed. In addition to immediate reporting of persons with a positive malaria result, the private health sector should report on the number of suspected cases tested for malaria usually by RDTs and on the proportion of positive cases among them on a regular (monthly) basis.

- The country may consider adding health posts with public health staff or VHVs in high-risk areas or populations with on-going transmission that are not covered by existing public health services, and these posts may also serve a surveillance function. As mentioned earlier, national SOPs on PCD and ACD should be developed. PCD is an important approach to detect malaria cases, but ACD including mass blood screening (preferably by PCR) plays a crucial role in investigating active foci with on-going transmission and in special situations such as high-risk population groups. Since RDTs and microscopy are not sufficiently sensitive to detect asymptomatic and low-density infections, PCR-based techniques can be considered in low-transmission areas to improve knowledge and report on the residual transmission and the remaining reservoir of infection. Data from ACD should be reported and tagged separately so that separate analysis can be performed. Submission of records of services provided by formal health providers is regulated by the government and makes it easier to include them into the national malaria surveillance system. In contrast, the informal health sector may be more difficult to include because of a lack of regulation or enforcement, making it difficult to obtain records in a timely and coordinated manner. In the elimination phase, the roles for each provider should be clearly defined to ensure that adequate and quality malaria data are provided on a timely basis from public, private, community-based health sectors and autonomous health services, such as defense, border forces, police, private companies, development projects etc.

- All confirmed cases have to be epidemiologically investigated to determine whether it is locally acquired or imported, and a standard case investigation record form has to be completed. Before the focus investigation that should be based on the case investigation, a malaria case investigation form should be completed with as much information as possible by either peripheral health staff or a VHVs at the time when the positive malaria diagnosis is parasitologically confirmed and be sent to the township malaria focal point. All confirmed malaria cases should have a case investigation form completed. This form should include information on name, age, gender, home address, place of work, date of blood slide/RDT taken and result confirmed, recent history of illness, result of malaria diagnosis, treatment and its outcome, source and place of possible infection including travel history and, finally, case classification. If a suspected case is examined and confirmed as positive by microscopy, the respective laboratory staff should immediately inform the malaria programme at township, state/region or central levels about the confirmed case. The same should be done in case of a diagnosis confirmed by RDTs at community level (VHVs or health staff). The township malaria focal point should send information about the confirmed case to the state/region level, usually by several methods. Firstly, the partially completed case form is sent to the state/region level (by phone or email) once the initial history is taken, and secondly, after completion of the investigation,
the form is immediately sent to state/region and central level to enter the new case into the centralized case malaria register and update the national malaria elimination database accordingly. The township malaria focal point should send information on (1) malaria case investigation, (2) monthly reporting of malaria testing (RDTs and microscopy) and confirmed cases from public and private facilities, (3) enhanced surveillance from ACD, and (4) ACD during focus investigations to the state/region and central level each month. In addition to specialized malaria staff, health personnel and VHVs should be trained to undertake malaria case investigation. Normally, the case investigation form, when filled in by peripheral health personnel and/or VHVs, is forwarded to a township malaria officer, who reviews it, classifies the case and communicates it to higher levels, where again it is reviewed. The investigation and management of foci requires a team including staff trained in epidemiology, entomology and operations management. Such malaria staff deployed on permanent basis and/or mobile malaria teams normally should be present at state/region level, depending on its size.

All confirmed cases have to be classified into locally acquired (introduced, indigenous, relapsing), imported, or induced not due to mosquito-borne transmission. Locally acquired cases include: introduced cases that are contracted locally from an imported case (first generation from an imported case); and indigenous cases that are contracted locally from introduced or relapsing cases or from another indigenous case. It is highly advisable to classify introduced and indigenous cases by place of infection. Cases classified as “introduced” require that the index case and all other infections found during the field investigation of the index case can be linked to a single imported case. During the case and field investigation, investigators should estimate the possible transmission pathways and incubation period between all confirmed cases. If in doubt, cases should be classified as “indigenous” (at least second generation). Relapsing cases are used to describe true relapses from *P vivax* or *P ovale* hypnozoites that were contracted locally some time ago. The period “some time ago” usually lasts from 6 months to 3 years for temperate areas, but could be reduced to 3 months for tropical areas. Classifying cases as “relapsing” is based on the exclusion of other types of classifications and should only be considered in areas without ongoing transmission. Hypnozoites are limited only to *P. vivax* and *P. ovale*. International travelers who take chemoprophylaxis while visiting areas with malaria risk may experience a delayed onset of vivax malaria for several months upon return. This may be due to *P. vivax* strains with a long primary incubation period, or following a suppressed and unnoticed primary clinical attack. Imported case is a case that is imported from outside the country. Induced case is a case induced by contamination with infected blood or congenital infection. It is generally easy to classify if the person lives and works in areas without known transmission for many years and has a history of blood transfusion or other exposure from blood that could have transmitted malaria. An additional classification category called “cryptic”, which presents no plausible mode of infection and no travel history after a complete epidemiological investigation, could be considered depending on the programme's decision. Where possible, the most conservative classification (for example classifying as introduced, indigenous, or relapsing cases instead of imported) should be assigned if evidence is unclear. Conservative classification is in the best long-term interests of national elimination programme, but may contradict the political interest of some health decision-makers who may want to avoid a classification indicating local malaria transmission. The classification system above does not cover all conceivable situations. For example, some malaria cases can be caused by migrant infected mosquitoes crossing international borders. Another example is “Airport malaria”, in which infected mosquitoes are imported by aircraft.
Key criteria for focus definition, reporting, investigation and classification

- A defined and circumscribed locality situated in a currently or formerly malarious area and containing continuous or intermittent epidemiological factors necessary for malaria transmission must be considered as a malaria focus in the elimination phase.

- All foci where locally acquired cases are reported have to be epidemiologically investigated to describe the locality where malaria occurred, and a standard malaria focus investigation record form has to be completed, including entomological investigation. A preliminary conclusion about the likely place and source of infection is recorded on the case investigation form. The team leader of the investigation should have knowledge of the malaria epidemiology and preferably have experience with previous investigations. The investigation starts with a detailed review of the available epidemiological data from the focus of the reported case (hamlet, village, locality, working site etc.). This should include village/working site maps of all previous malaria cases as well as profiles of each previous case in the area showing features related to malaria (rivers, irrigation areas, dams, ponds, forests, roads, altitude, breeding sites, diagnostic/treatment facilities etc.). An entomological expert should participate in the process to delineate likely areas of receptivity and vulnerability, and to plan response activities to interrupt transmission. Based on the current case investigation information, a plan for ACD should be made. This plan should consider the place of residence of the case with mosquito breeding sites, place of employment, and areas of travel. The team leader needs to decide which population groups (family members, neighbors, all persons in the village of the case, all employees at the worksite of the case etc.) are to be sampled as well as the type and geographical extent of blood sampling. The type of sampling should either consider those with recent history of fever in the past week or mass blood screening (without regard to fever). Different blood sampling strategies can be used for active foci of malaria or high-risk MMP groups. A list of all persons whose blood has been taken should be completed. The list should include the name, age, gender and occupation of each person, name of head of household, number of members in the household, date of blood slides taken, and information on preventive measures applied (LLINs ownership and their use, IRS etc.). Results of blood examination are to be added later. Once the focus investigation is complete, the malaria team leader and entomologist should be able to decide if local transmission is occurring and should be able to provide a classification of the focus. The malaria team leader should decide on a response plan based on the results of the focus investigation. Each focus has to be investigated by malaria staff to classify it and decide on measures to be applied to halt transmission. In addition, malaria staff has to provide technical guidance, work with local health authorities and representatives from other sectors, and conduct trainings. Thus, at the state/region level a technical group of adequately trained professionals including malaria mobile team members should be set up, working under the supervision of a state/region malaria coordinator. Malaria programme staff can be based at the state/region capital, and mobile team(s) can be located in the most affected townships of the state/region. The state/region malaria division should also include an administrative officer, a supply officer and data entry clerk. Mobile teams need vehicles to be able to move quickly and storehouses at state/region level, where supplies and training materials are stocked for rapid deployment. It is important to have administrative provisions for rapid recruitment of temporary workers/spray men for ACD/vector control operations. Entomological investigation of focus is likely to involve collection of adult mosquitoes, and may include monitoring the vectors’ resistance to insecticides. Entomological expertise is needed to identify the time and place of transmission of confirmed case(s) within a particular focus. Sometimes it is clear that the foci are associated with particular environmental features that may be favorable to vector breeding or that promote human exposure to vector biting. This information can be used to guide vector control interventions to prevent onward transmission and to suppress the remaining foci.
All foci have to be classified into active, non-active residual and cleared foci. A formal listing of all malaria foci with continuous updates of their functional status should be updated every year. At the beginning of the elimination phase, records for all foci should be entered into the database, then new foci are entered, and the status of the foci is updated on an ongoing basis. The database must be structured so that it records the change in foci classification status and dates of status change are maintained. This database should also contain all data elements for the foci investigation. As such, the database will be very dynamic since foci status may change after each new case. All new foci should be immediately entered, and this becomes the denominator for those new foci needing foci investigation.

6.4 Prevention and control of malaria outbreaks

Outbreaks of malaria of varying magnitudes continue to occur on the fringes of endemic areas in the GMS, including in Myanmar where malaria endemicity has been reduced to a low level as a result of control activities. Outbreaks may occur in areas of intensive and uncontrolled development activities, in areas with frequent population movement and in regions of political and social instability. The appearance and explosive development of outbreaks indicates the failure on the part of national health services to forecast and prevent this kind of events. The genesis and mechanisms of malaria outbreaks in GMS countries including Myanmar are complex and depend on both qualitative and quantitative relationships between the human host, the parasite and its vector as well as on the biological, physical, political and economic characteristics of the environment. One of the major features of malaria ecosystems in the GMS is instability to various degrees and periodic and sporadic outbursts of the transmission leading to excessive morbidity associated, at times, with mortality.

Such epidemic-prone situations should be identified during the process of stratification of the malaria problem into discrete situations, populations and areas with sporadic/seasonal outbreaks of various magnitudes at various points in time. As a result of further analysis it will be possible to define major precipitating factors which cause epidemics so that in the future they can be monitored for epidemic prediction purposes.

At the peripheral level, unusual increase in number of malaria cases should justify further analysis and, if need be, remedial measures. Although a time lag is usually observed between the onset of the disease and reporting to NMCP, the latter should warn the specialized antimalarial services to investigate the cause for such unusual increase.

An outbreak monitoring system should constitute a part of the national malaria epidemiological surveillance system. Its primary task is to identify early signs of an impending epidemic related either to a particular area or to a population group. The recognition of early alarm signals depends upon the adequacy of the variables chosen. Selection of the set of variables and the range of their numerical values is determined by the type of area in regard to the level of malaria prevalence and incidence, existing health service infrastructure, time lag in communication, etc.

It is equally important to determine at what level and who has or should have the capacity to judge the abnormality of the situation, decide on the epidemiological diagnosis and have the authority to initiate epidemic containment measures. While various levels of peripheral health services as well as VHV’s should be encouraged to report early any unusual rise in numbers of malaria cases and associated mortality, it is also important that there is adequate expertise to be able to sort out the information from the periphery and distinguish between true and false alarm signals at the intermediate level (e.g., township).
Control of a malaria outbreak involves measures aimed at (1) minimizing clinical consequences; (2) containing transmission, if possible, in the affected area; (3) preventing further spread of the epidemic; and (4) improving emergency preparedness in order to prevent future epidemics. The first two objectives require the application, as soon as possible, of effective containment measures, while the last two involve assessment of risk and the application of preventive measures.

In pursuance of the first objective, one has to ensure the quality of medical care in the diagnosis and treatment of malaria, particularly for severe and complicated cases. It also implies the provision of adequate stocks of effective antimalarials and other items required for management of the disease. Containment of the outbreak requires some form of transmission control, which should be rapidly introduced unless the epidemic has exhausted itself by the time the health services have recognized it. It is therefore necessary to assess which interventions could and should be implemented for this purpose. The containment of an epidemic requires the implementation of emergency measures including mass drug administration (MDA) to all the people considered to be at risk to reduce quickly the parasite reservoir in the affected population. Space spraying of insecticides is, in principle, the best method of rapidly reducing vector density by attacking adult mosquitoes, but it is nevertheless expensive in insecticides, requires special equipment and vehicle resources, and poses serious problems of accessibility.

The prevention of outbreaks by planned interventions is one of the major tasks of NMCP. It is expected that emergency situations within epidemic-prone areas or population groups in the country are likely occur. Prevention of further spread of the outbreak and its recurrence in subsequent years requires the application of sustainable methods of vector control. IRS, if feasible, continues to be the most easily applicable transmission control measure. IRS, to be fully effective, should achieve total coverage of all houses within the affected area based on adequate provision of insecticides, spraying equipment, transport and deployment of vector control programme staff. In epidemic-prone areas, where LLINs and other insecticide-impregnated materials are already widely used, this approach may be the most effective way of controlling transmission and preventing its spread to new areas or its renewal in subsequent years.

Emergency preparedness for malaria outbreaks should be part of the general organization of emergency health services, which in turn should be an integral part of national health system. Preparedness for malaria outbreaks should be based on an understanding of the epidemiology of malaria and of the epidemic risk factors. The more complete that understanding and the more developed the information system and the monitoring of risk factors, the higher is the level of preparedness; the more accurate is the forecasting and the more adequate the response. Malaria preparedness should include the identification of resources (appropriate manpower, supplies, equipment and logistical arrangements including administrative and technical procedures, responsibilities of health and other sectors) and the required mechanisms for their rapid mobilization (20).
7. Cross-cutting interventions

7.1 Political commitment and partnership action

The international and political attention that has been recently mobilized in Myanmar is presently translated into real commitments and actions to move towards malaria elimination. The country has managed to get its country-level partnership movement off the ground and, as a result, the burden of malaria has been substantially reduced. At present, the government and international partners have reaffirmed their political and financial commitments to eliminate malaria by 2030 in the GMS by endorsing the framework of the GMS malaria elimination strategy 2015-2030 and the National Strategic Plan for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020. This ensures that all possible efforts will be taken to further reduce malaria-specific mortality and morbidity in areas where elimination does not appear to be feasible at present; ultimately interrupting transmission of malaria in areas eligible for elimination and preventing the re-establishment of local transmission in areas where it has been eliminated in Myanmar.

7.2 Programme organization, management and administration

Basic requirements

Having officially endorsed the regional strategy on malaria elimination in the GMS, Myanmar may consider its own insights and ways of dealing with elimination challenges. The following are essential for the malaria elimination programme to become successful:

- The government along with partners concerned should be determined to provide necessary support to the programme in the course of its implementation and should accord it a high financial priority in its health and socio-economic development plans;

- There must be an evidence that elimination of malaria is technically and operationally feasible in the country at present or in the near future;

- General health services including surveillance systems and infrastructure have to be strong enough from central to the most peripheral level, and the government should have a definite plan for further upgrading and improving quality of these system, services and facilities;

- An efficient system of government administration should be in place at central, state/region, district and township levels, to enable the execution of the programme throughout the country;

- There should be a functional system of communications that will allow the movement of health staff and the transportation of necessary supplies and equipment without excessive difficulties and delays throughout the country.

Programme requirements

When the basic requirements have been met, there should be a clear understanding of the commitments to be faced until malaria elimination is achieved. If the government recognizes the full implications of the elimination programme and what it calls for, in terms not only of men, material and money, but also of administration, organization and management, a detailed operational plan based on phased approach should be set clearly out and agreed upon by all those involved at national and international levels, with particular focus on:
• Sufficient background information including epidemiological and operational data, as well as ecological, social, economic and demographic information should be available to provide an adequate basis for planning of elimination operations;

• Goals, objectives, milestones and targets as well as interventions to attain the agreed milestones and targets should be specified in detail and evidence should be provided that the interruption of transmission can be achieved by the interventions proposed. The evidence can be obtained from the experience of pilot projects in the country or from the experience in neighbouring countries;

• Engagement of the country in malaria elimination increases the need for leadership, and the presence of a respected and inspiring national leader is a crucial element for success of the elimination campaign;

• A considerable effort should be taken to increase human resources and train, motivate and sustain health staff including the programme personnel at all levels until malaria is eliminated across the entire country;

• Adequate legislative and administrative provisions to govern the programme should be officially approved to cover the programme’s requirements, including the right of entry by malaria staff with the purpose of investigation or spraying, mandatory notification and reporting of malaria cases etc. Regulation of the private sector as a major elimination challenge in Myanmar should be properly addressed;

• The formulation, authority, organization and responsibility of the programme should be specified and the administrative policy should be clearly defined, with authority to have full control over its budgetary allocations and to formulate financial procedures suitable for its efficient functioning. Moreover, the programme should be delegated powers for formulating the terms of service of its personnel and for exercising administrative and disciplinary control over them;

• Adequate provisions should be made for monitoring and evaluating the progress made towards malaria elimination. Regular assessments by an independent team of experts should form an essential element of the programme;

• The programme’s budget should be sufficient and realistic, including adequate reserve provisions to meet possible problems that are liable to occur during its implementation, and the source(s) of funds should be clearly indicated; and

• Adequate provisions should be made available for effective vigilance activities after the attainment of malaria-free status.

7.3 Services for mobile and migrant populations (MMPs)

MMPs that move either within a GMS country or between these countries for temporary work and national security forces posted along borders are among the highest risk groups for malaria infection. Unfortunately, given the difficulty in reaching and tracking these workers, there is usually poor surveillance of malaria in these groups.
MMPs are biologically more vulnerable to malaria because they often come from malaria-free areas where they are not exposed to the disease, to forested areas where they are. Compared to the local population who will have developed a relative immunity to malaria through repeated exposure, non-immune travelers and migrants have a higher risk of becoming infected, having a high parasitaemia with clinical malaria, severity and death.

Analysis should be carried out on a regular basis within the country to identify the main MMP groups and their areas to be targeted for interventions. The mapping exercises and available outcomes of operational research among these populations should be utilized to update approaches to address MMPs for malaria elimination at national level (21). National focal points can be appointed by NMCP to coordinate activities directed towards MMPs. NMCP will collaborate with other sectors, such as Ministry of Foreign Affairs and the Department of Immigration, the Department of Tourism, Department of Forestry, state/region/township administration and partners’ organizations involved to appropriately target these populations at risk.

Cross-border activities should take into consideration specific interventions for MMPs. IEC/BCC activities should be considered for ethnic minority groups and at the working sites of large-scale deployment of mobile population groups using VHVVs. Military and police personnel deployed inside and travelling outside the country, who are considered the most easily accessible MMP group, should be targeted for engagement. Industries supporting employment of MMPs, forestry, plantation and farming, construction, and tourism in at-risk areas should be engaged in malaria elimination and prevention. Table 8 lists the main differences in MMPs, their profiles and activities between main MMPs in the GMS countries including in Myanmar.

Table 8: Profiles and activities of main MMPs

<table>
<thead>
<tr>
<th>MMPs</th>
<th>Profile</th>
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<tbody>
<tr>
<td>Static, affiliated with local village</td>
<td>Ethnic minority groups with visits to forest for farming (cassava plantations), hunting, collecting valuable products for days or weeks</td>
</tr>
<tr>
<td>Semi-static, often affiliated with company</td>
<td>Activities related to infrastructure construction or gold/gem mining in forested areas</td>
</tr>
<tr>
<td>Seasonal aggregation of labour, affiliated with land owner</td>
<td>Work for a company (e.g. rubber plantation) in an area at risk of malaria; often workers come from other provinces/places; some of them are non-immune</td>
</tr>
<tr>
<td>Mobile groups</td>
<td>Small mobile groups engaged in activities in heavily forested and remote areas</td>
</tr>
<tr>
<td>Security personnel, affiliated with government</td>
<td>Military, police and border guards who deploy or patrol in forested border areas or other malaria risk areas</td>
</tr>
<tr>
<td>Visitors</td>
<td>Tourism, visits to relatives which could include spending up to one week in or near forest</td>
</tr>
</tbody>
</table>
To address MMPs’ malaria-related issues, especially in the context of malaria elimination the following approaches and measures are recommended:

- Ensuring and intensifying DOT approach provided by VHVs/ICMVs with malaria patients cards based on SOPs;
- Mapping formal and informal work sites and hard-to-reach populations for malaria prevention using SOPs;
- Intensifying case detection at development sites and hard-to-reach populations and identifying/training mobile vendors to provide health education and referral services;
- Setting up malaria screening points at bus stations along international borders and working with cross-border bus companies to provide messages about malaria prevention;
- Developing treatment and prevention guidelines for MMPs as well as a simplified version for use by VHVs/ICMVs;
- Assessing the efficacy of impregnated clothes and repellents among MMPs in rubber plantations;
- Conducting IRS in outbreak areas, providing forest prevention kits and education to migrant workers and repellents to soldiers;
- Working with immigration officers and police to explain public health messages, advocating for collaboration with key decision-makers and employers of migrants by explaining the cost-benefit of having healthy workers;
- Training of trainers in IEC, BCC and community mobilization skills tailored to MMPs;
- Updating and standardizing monitoring and evaluation tools to incorporate MMP indicators and improving monitoring of MMP interventions;
- Strengthening cross-border information exchange in Myanmar and other neighboring GMS countries based on Mekong Basin Disease Surveillance coordination mechanism and Mekong Malaria Elimination Hub.

It is critical to differentiate between different types of MMPs, based on their key characteristics and risks that would help to determine the most effective strategies to target and reach these populations with the most appropriate elimination interventions. Ongoing challenges include characterizing and defining MMPs; developing an intervention and surveillance strategy, adapted to the country’s conditions; responding to the local needs; and better targeting these hard-to-reach populations by technically sound and sustainable measures within the country.

Thus, better understanding of the various groups of MMPs and the situations which place them at risk of malaria is required, in order to develop targeted behaviour change and outreach interventions for MMPs. There is an urgent need to develop appropriate and accessible malaria services for MMPs in different settings in the context of malaria elimination. In addition, in the context of universal coverage and access to basic health services, these remote and often marginalized populations (socially, economically or geographically) should be able to have an easy access to adequate and affordable health care (22).
7.4 Capacity building

The area of human resources and capacity development, which can seriously interfere with malaria elimination, is one of the leading constraints preventing the effective implementation of national malaria control/elimination programmes. It is important to have not only adequate numbers but also appropriately knowledgeable/skilled and properly supervised health staff, deployed equitably across the country.

Having faced this challenge, special attention should be paid to the training of professional and managerial staff of the public and specialized health services in malaria elimination. Adequate training should be provided to meet the progressive needs of the programmes for new staff, and regular refresher courses for all staff in service at all levels. To address these needs, a creative and innovative approach to capacity development should be promoted at national and sub-national levels. National training programmes should be supported and coordinated to:

- Make the inventory of various categories of health staff needed and relevant posts to be filled, and on this basis to decide on the number and categories of relevant personnel to be trained or re-trained;

- Establish or maintain a group of trainers with the necessary malaria expertise to assist in organization of training activities in relation to malaria elimination at national level;

- Improve knowledge and enhance skills of different categories of the public and specialized health personnel involved in malaria elimination and prevention of its re-establishment with particular attention to malaria surveillance. Although such trainings can take place in the country, some senior staff may require additional training abroad, and this may apply not only to malaria programme personnel but also to selected staff of the general health services;

- Ensure that training programmes and their contents are constantly adapted to and appropriate for the existing elimination strategy. Trainings should be “task-oriented” and “problem-solving”, and basic training is supplemented by regular supervision and refresher training courses. It is essential to remember that although the training must be appropriate to the functions to be assumed by trainee, it should be broad enough to enable the trainee to adjust to situations arising from circumstances;

- Develop a systematic and objective assessment of performance of the training and proper feedback for purposes of its improvement;

- Ensure that the training increases the motivation of health staff to maintain their skills and competence, and remain in service; and

- Secure adequate financial support for capacity building.

There is a desperate need for strengthening the entomological component of the national malaria programme. Since vector control is an essential tool to reduce and halt transmission of malaria, it is highly advisable that special training courses will be organized for existing and new entomological staff, and entomologists will play a greater role in the decision on malaria elimination and prevention of its re-establishment of malaria (23).

Substantial effort should be directed towards development and publications of national guidelines and instruction materials to address malaria elimination issues. The country may consider organizing joint inter-country trainings with neighboring countries with similar training needs.
7.5 Community-based interventions

Community engagement should be seen as equally important as leadership from the national government. The success of the malaria elimination programme will depend not only on the scope and quality of the various activities implemented, but also to a great extent on cooperation of the community in a broad sense: from a community member to different institutions, both governmental and private. Therefore, publicity and transparency of the programme are of great importance. Community involvement is key in any attempt to eliminate malaria. It is envisaged that the community will be involved in the mobilization of local resources and implementation of community-based interventions.

- It is critical to understand how a community perceives malaria and what kind of preventive practices are currently in place at community level. Health staff and VHVs/ICVMs deployed at the grassroots level are the first contact points to educate and raise awareness of malaria signs/symptoms, cure and preventive practices. In the context of malaria elimination, the roles and responsibilities of VHVs should be adapted to the country's particular conditions and respond to local needs. There should be a national strategy and approaches on involvement and empowerment of communities, as well as improving their linkages with local health staff and partnership with private sector to ensure the sustainability of malaria preventive activities.

- In the context of the national plan for malaria elimination, NMCP will map all the current IEC/BCC strategies and revise them, if necessary, to align with existing strategies on case management, disease prevention and surveillance for malaria elimination. Specifically, strategies on community mobilization should be incorporated with an overall aim to deliver quality malaria-related information on treatment and prevention at the community level.

- To promote behavior change related to health seeking and personal protection, NMCP will develop and disseminate IEC-related materials/messages to the public, and a multi-media strategy to deploy messages via radio, television will be broadly utilized. The messages should target the most at-risk and underserved populations. Different IEC/BCC materials/messages should be harmonized across different ethnic minorities and mobile/migrant populations. To improve coordination, NMCP will convene an annual meeting to share with all partners involved progress on IEC/BCC activities, identify best practices and challenges in implementation, update key messages and develop new IEC/BCC materials/messages in the context of malaria elimination. NMCP will include key IEC/BCC messages into training modules and learning materials to be used for training purpose of public health staff, private health providers, VHVs/ICMVs.

- NMCP along with general health staff and VHVs/ICMVs should work with community leaders to mobilize communities and increase awareness about malaria prevention. Community sensitization and training workshops should be organized by involving important community actors including community healthcare workers, private sectors providers, police/military, religious leaders, village chiefs, village health support groups, teachers and other stakeholders to strengthen the linkages between the key actors and quality malaria service providers.

- NMCP will conduct knowledge, attitudes, practices, and beliefs (KAPB) surveys to evaluate the impact of IEC/BCC strategies and to assess compatibility of the practices, customs and beliefs of various social groups and minorities with existing prevention approaches. Based on results, IEC/BCC strategies and related materials can be updated.
7.6 Inter-sectoral collaboration and advocacy

Inter-sectoral collaboration is a key factor for success for the shift from malaria control to elimination. Despite lack of adequate funding, irresponsibility, poor infrastructure and lack of skilled staff - which are usually the key challenges in inter-sectoral collaboration - there are opportunities to strengthen inter-sectoral collaboration as some kind of collaboration for malaria control does already exist in Myanmar.

Since the Ministry of Health and Sports is not always powerful enough to motivate other ministries or the corporate sector for collaboration, in order to be effective inter-sectoral action has to be supported by high-level political leaders. Existing collaborative mechanisms within and between the formal and informal sectors, and channels of communication among policy-makers, local administration, public health personnel and partners should be further strengthened to promote information sharing and joint planning for malaria elimination as well as to ensure that additional funds are earmarked for malaria elimination. There should be an effective mechanism to ensure inter-sectoral collaboration between relevant governmental sectors, other agencies and partners at various levels. The following mechanisms can be considered to fully capitalize on the potential of inter-sectoral approach to malaria elimination:

**Joint appraisal and consensus building**
A lot of the information is available in different databases and from different sources, and the required data could be easily extracted from those sources. However, there will be a need for rapid appraisal to map the key determinants for malaria, identifying the common interests of different sectors, the expected impact etc. The collection of this information would provide a first opportunity for inter-sectoral dialogue.

**Policy formulation and implementation**
It includes staff of the different sectors involved in policy formulation, delivering multiple intervention packages and assessing the inter-linkages and potential synergies of the different sectors.

**Joint evaluation and learning**
Malaria is complex, and so is effective inter-sectoral action on malaria. There is a need for regular evaluation and continuous learning, addressing not only “if an action takes place”, but also “why the action works or why it does not”.

**Monitoring and accountability**
It includes monitoring on malaria and sectoral outcomes, as it is important to hold sectors accountable by measuring impact and providing feedback.

The health sector has to work jointly with other departments such as planning, land development, trade and industry, environment, water and irrigation, infrastructure, work and transport, food and agriculture, education, security, culture and community development, especially at peripheral levels. Each sector should review its current activities to identify those that could be modified or added to have a malaria-reducing effect, as well as its potential and role in addressing those determinants of malaria where concerted efforts by multiple sectors are required. Each sector will have some comparative advantages with respect to malaria elimination that can be released with no or limited additional costs.

Partners including governmental sectors, national and international non-governmental organizations, the private sector, media, bilateral donors, multilateral agencies and funding institutions based on their mandates should be harnessed for achievement of the malaria elimination goal. An adequate communication/advocacy strategy has to be developed to involve everyone concerned in malaria elimination.
To be most successful, the government must play a leadership role in coordinating and organizing malaria elimination activities in the country, and in engaging their populations in national and local efforts. The government needs to work together with all existing and potential partners that operate in Myanmar, and may consider appointing a focal person to coordinate all partners and harmonize their activities under the endorsed NPME. National, state/region and township administrations should be also engaged, and steering committees at different levels could be an option to oversee the inter-sectoral work directed at malaria elimination. Review meetings should be periodically conducted to present achievements/problems/constraints and indicate future plans to enhance the existing collaboration, and relevant meeting reports have to be produced and widely disseminated among all parties concerned.

NMCP will collaborate with partners to upgrade existing facilities for malaria elimination training to improve their quality and performance as well as to establish and strengthen partnerships with centers of excellence in order to ensure delivery of high quality malaria services. NMCP will utilize current relationships with the WHO, the Asia Pacific Malaria Elimination Network (APMEN), and other technical partners to strengthen programme capabilities.

To advocate for the elimination agenda, NMCP will conduct sensitization meetings for policy makers, members of parliament, and community leaders on malaria elimination, and engage private sector partners and business leaders to support malaria elimination activities across the country. NMCP will also carry out advocacy events such as commemorating World Malaria Day, and utilize other events, including music concerts, educational seminars, radio/television shows, religious ceremonies, in cooperation with other central government agencies including Ministries of Hotels and Tourism, Education, Home Affairs, Religious Affairs and Culture to advocate for widespread support for malaria elimination.

7.7 Cross-border and regional cooperation

Malaria in border areas of GMS countries becomes a major problem that requires special attention because of the intense population movements within as well as across national borders. The movements may be illegal; even if they are not, they may be difficult to track. Furthermore, communication is constrained by different languages. Malaria transmission patterns are often affected by ecological complexity and may be very intense to focus. For obvious reasons, border areas are often the most remote and neglected, and there is little information and control over what happens across the border. If there are malaria control or elimination activities on both sides of borders, their policies, strategies and approaches may be different. Realizing that a substantial number of cases are border malaria, there is a great need for NMCP to focus their activities on vulnerable, often underserved, groups of migrating populations in border areas.

- Border malaria calls for effective co-operation between neighboring countries. However, there are many constraints such as administrative hurdles, political sensitivities in dealing with the most concerned areas, and the remoteness and inaccessibility of most of the problem zones. In the context of malaria elimination, particular emphasis should be given to situations where there is a risk of spread of malaria between neighbouring countries, and all necessary steps should be taken to assist in solving common malaria problems in border areas. The existing mechanisms and approaches being applied should be reviewed and ways for their improvements should be recommended.

- The establishment of a functional mechanism for coordination of malaria elimination activities with neighboring countries, particularly where movements across national boundaries occur, should be facilitated in the country. Particular emphasis should be placed on the assessment of current situations and identification of problems encountered, regular and timely information exchange,
notification of unusual malaria situations as well as development and implementation of joint plans of action for harmonization of malaria elimination activities in border areas. Joint statements on cross-border coordination between Myanmar and neighbouring countries with the designation of country’s focal points and the establishment of an inter-country working group, composed of national counterparts, WHO staff and partners to assist in planning, implementing and evaluating elimination activities in border areas can be considered. WHO along with other partners should be actively involved in providing strategic guidance, technical support, mediating exchange of relevant information and coordinating malaria control and elimination activities in border areas. The existing regional mechanisms should be used to further improve coordination and enhance cooperation between Myanmar and other GMS countries to solve common malaria-related border problems.

7.8 Health system strengthening

During the last 5 years the total health expenditure has increased year by year, reaching USD 610 million in 2015-2016 with almost a nine-fold increase over four years. The public healthcare system in Myanmar is highly structured, following the State/Region-District-Township government hierarchy and based on the principles of primary health care, with medical officers overseeing all health-related activities in their designated areas. The Township Public Health Department (TPHD) is headed by the Township Public Health Officer (TPHO) with two medical officers responsible for Disease Control and Public Health. Generally, the TPHO is responsible for four to five Rural Health Centers (RHCs) and station hospital and four to five Sub-RHCs. Microscopy services are available at Township hospitals and some NGOs run clinics. Microscopists are multi skilled rather than malaria specific. There is also an active national network of auxiliary midwives and community health workers, operating in close collaboration with village health committees, providing out-patient care and preventive measures. There has been a steady growth in the number of basic health facilities and human resources for health in recent years. The number of midwives as the key providers of basic health services in rural areas has almost doubled over a 20-year period. VHV’s are a recent innovation in Myanmar and now form the solid foundation for malaria control at village level and hard-to-reach areas. However, health care services at the grassroots level are still under-resourced, and although some areas are supported by international/local NGOs, most lack the resources to provide effective care. Despite recent improvements, most out-patient care is still obtained from private sector providers. A social security scheme is being implemented by the Ministry of Labour, and insured workers under the scheme are provided free medical treatment plus various benefits in line with international practice.

The National Health Committee (NHC) is a high level inter-ministerial body responsible for health. It takes leadership and gives guidance in implementing health programmes systematically and efficiently with emphasis on sectoral collaboration and community participation. The “Myanmar Health Sector Coordinating Committee (M-HSCC) was established in 2013 and takes a leading role in the coordination of both governmental and non-governmental sectors. The M-HSCC has a Technical Strategy Group (TSG) for malaria, which is led by the Department of Disease Control, with WHO serving as technical secretariat. The mandate of the TSG-Malaria is to provide technical guidance in the development of national strategies, coordination among partners and clarity on major technical and policy issues. The NMCP is a part of the Vector Borne Disease Control (VBDC) Programme, but the majority of staff and resources of the VBDC throughout the country are focused on malaria. The government support allocated for the NMCP in 2016 exceeds USD 2 million by providing human resources, infrastructure and facilities including key malaria medicines and diagnostics free of charge down to the village level.

In order to facilitate an elimination effort in Myanmar, the health system in the country has to be further strengthened in terms of human resources, financing, information systems and governance.
Due to the need for strong malaria surveillance with total coverage of all geographical areas of the country and high quality of operations, human resources must increase at all levels. Some general public health staff may be devoted to malaria to have sufficient time for surveillance and response operations, and respective health personnel should be trained accordingly. In the elimination phase, enforcing the mandatory notification of malaria will be a major challenge in Myanmar where many fever patients seek care in the informal private sector. Financial allocations need to be maintained, despite low burden of malaria. Launching a malaria elimination plan increases the need for leadership and management, and operations have to be managed with rigor and flexibility, supported by robust monitoring and quality control.

7.9 Focused research

The objectives of the research should be closely tied to the particular situation and problems identified within a particular country and intervention strategies being applied. Such research should be relevant to existing control or elimination strategy, addressing not only the efficacy/effectiveness of specific interventions but also social, economic, cultural and behavioral factors that may affect programme activities. The research agenda for malaria elimination has been well defined by the Malaria Eradication Research Agenda consultative groups (MalERA). Regional oversight of research activities at national level is needed to minimize unnecessary duplication and to take full advantage of any opportunities for collaborative research, innovation and synergy.

The following priority research areas for accelerating transition towards malaria elimination in the GMS including Myanmar can be considered:

- what are the optimal vector control approaches and interventions for elimination, especially in high-risk forested areas;
- what are the optimal approaches and interventions for identifying and providing services in support of malaria elimination among MMPs;
- how can malaria foci be identified and responded to in high-risk forested areas;
- what are effective and feasible strategies for ensuring quality case reporting and management in the private sector;
- how community engagement in malaria elimination can be improved;
- in which settings and situations MDA can be recommended in relation to malaria elimination; and
- what are the optimal approaches and interventions to interrupt transmission of and eliminate MDR including artemisinin resistance.
7.10 Malaria in conflict areas

A violent conflict may cause population displacement and destruction of infrastructure, as well as the breakdown of health services, including routine disease control programs, which can lead to outbreaks. Additionally, the lack of clean water supplies, poor sanitation and waste management, overcrowding and poor shelter can increase the risk of communicable diseases including malaria. The increase in malaria morbidity and mortality due to conflicts has been observed in many conflict areas. The increase in malaria incidence in refugees and displaced populations has also been well documented in conflict situations.

In conflicts or in complex emergencies, factors that may contribute to the increase in malaria morbidity and mortality include the breakdown of general health and specialized malaria services, movement of people from low to high transmission areas, and environmental deterioration encouraging vector breeding. Major malaria outbreaks during crises can be prevented by an early application of effective malaria interventions through early detection, adequate diagnosis and appropriate treatment, focal IRS, MDA, massive LLINs distribution among populations at risk and health promotion information campaigns. Prioritizing LLINs distribution to pregnant women and young children during crises in high-transmission areas can be appropriate given that child mortality due to communicable diseases including malaria often increases in conflict settings.

It is important that the crisis response should be collaboratively and rapidly organized by the Ministry of Health and Sports, UN Agencies and the NGO community, and effectively coordinated by the Ministry of Health and Sports. The intervention response must be planned in advance and adequate resources and expertise should be made available to assure the proper containment of possible outbreaks. Research should be advocated to improve malaria control in both normal and emergency circumstances in areas in which displaced populations are present.
8. Measuring Progress and Impact

General principles

The following principles should be taken into account:

- In the transmission-reduction phase, the main focus should be given to establishing adequate epidemiological services and information systems, with an operational research component, capable of planning, monitoring and evaluating control interventions;

- Once an administrative unit entered the elimination phase or even before, the attention should be re-focused to ensuring that an adequate surveillance system is fully operational and properly functional with absolutely total coverage of this administrative unit;

- Monitoring & Evaluation (M&E) is the central component in the elimination phase. Operationally, the main information requirement is to indicate exactly which administrative units have reached the elimination target at a given point in time;

- Different set of outcomes and impact indicators are required depending on the stage on the continuum to malaria elimination;

- Indicators on impact and adequacy of surveillance are central for the verification of interruption of malaria transmission, its elimination and the maintenance of malaria-free status.

Monitoring and evaluation

Monitoring involves the routine tracking of programme performance by record-keeping, regular reporting, surveillance and periodic surveys. The objectives of monitoring are to assess the progress made with programme implementation, ensure accountability, detect problems and constraints, promote evidence-based planning and provide prompt feedback so that adjustments can be made as needed. Monitoring indicators include those for inputs, process and outputs.

Evaluation involves the periodic assessment of changes in targeted outcomes or results that can be attributed to a programme. The objectives of evaluation are to relate a particular outcome or impact directly to a particular intervention after a certain time, determine the value or worth of a particular programme, link any two parts of the monitoring and evaluation framework (inputs, process, outputs, outcomes and impact), measure the effectiveness of the programme and provide reliable information on progress in eliminating malaria that can be used at local, national or international levels.

The national malaria elimination programme should be evaluated at regular intervals for compliance with set targets and stated objectives. Information should be collected through a national information system for malaria surveillance and health management. Parameters should be established to monitor and evaluate all programme areas with a focus on four key issues:

- monitoring the operational aspects of the programme and measuring outcome indicators to ensure that the activities are yielding desired results and moving the programme towards achieving its targets and objectives;

- monitoring changes in impact indicators resulting from the activities implemented;
appropriately interpreting results and making revisions in policies or strategies, when needed, to help ensure progress; and

documenting progress towards malaria elimination. Information on coverage and quality of interventions with mapping out foci of malaria is particularly important.

A malaria elimination database should be established when a decision has been made to go for elimination. Ideally, management and maintenance of the malaria elimination database would be the responsibility of a national committee that is independent of the malaria programme. This database will serve as the national repository of all information related to malaria elimination, including:

- national malaria case register – a single database of all individual case information from identified sources in the whole country. This register allows detailed analysis and synthesis of epidemiological information and trends that help guide the elimination programme over time;

- malaria patient register – a central repository of all malaria patient records;

- laboratory register – a single database, linked to the patient register, which contains all pertinent information regarding malaria diagnosis of the patient. Comparison of these two registers allows cross-checking for completeness of case data; and

- entomological monitoring/vector control records – a central repository of information related to entomological monitoring and application of chosen vector control interventions.

**Implementation and coordination mechanism**

At present, M&E is a fundamental component of the National Strategic Plan for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020. Through M&E, programme impact, outcome, output and input indicators are measured to provide the basis for accountability and informed decision making at both programme and policy level.

Most malaria data collection is paper-based at health facility level. Internet and computers are available at State/Region level and also in some townships. Health Information System (HIS) data is generally entered into a computerized system at State/Region level (and sometimes Township level) into an Excel/Access database. At State/Region and Central level data is stored on compact discs (CDs) and in Cloud Storage. All programmatic and financial data are maintained for eight years for review and audit purposes. The relevant SOP provides clear instructions on data management including storage.

NMCP takes overall responsibility for ensuring that data is analyzed and interpreted appropriately and the results are used effectively to ensure that any necessary action is taken promptly to maximize programme performance and impact. Both three monthly and annual reports will be shared with WHO and other implementing partners.

Although malaria control and elimination is primarily the responsibility of the country itself, several international implementing partners complement national efforts to strengthen M&E activities. The National Malaria Elimination Committee (NMEC) has been formed in November 2015 to oversee elimination with key responsibilities on monitoring progress and coordination of malaria elimination programme.
The M&E Technical Working Group (TWG) is formed under the TSG to provide specific guidance on M&E and ensure coordinated M&E action across partners. The M&E TWG is supposed to meet quarterly and on an ad hoc basis as required and is responsible for:

- Updating and harmonizing data collection forms to be used at all service delivery points (health facilities, laboratory service points, private sector outlets, community settings etc.);

- Strengthening the health information system to capture data from all sources (the public, I/NGO and private sectors), in order to have comprehensive information on the malaria situation. Partner organizations are required to submit data at the Township level on a monthly basis. This data is to be transmitted by the Township to the higher levels for consolidation;

- Organization of quarterly review meetings and annual review and planning meetings together with other partners at Township level. These meetings discuss progress and performance, programmatic and coordination bottlenecks and gaps, data quality and capacity building issues and identify corrective measures where appropriate. The annual planning meetings discuss the annual plan and joint actions, as appropriate. These meetings serve as important platforms for strengthening linkages and networking across public and non-public sectors. Selected peripheral level staff from sub-centres/rural health centres, nurses/midwives and the NGO representatives participate in these meetings. Participants are selected on a rotational basis and efforts are made to ensure that they provide a representative mixture in terms of performance;

- Organization of annual review and planning meetings at central level. The participants include State/Region and Township officers and representatives from partner organizations; and

- Monitoring missions for programme review to be undertaken jointly with partners and external technical agencies.

M&E procedures will also be reviewed as necessary during routine monthly meetings in the periphery with a broad focus covering a range of issues and challenges relating to malaria control/elimination and other health related activities. An assessment of M&E will form an important component of all planned internal and external programme evaluations.

**Recommended indicators to measure impact and adequacy of surveillance**

In the elimination phase progress should be monitored through a minimal set of impact and outcome indicators, which should be routinely tracked by NMCP. A recommended core set of indicators to measure the progress towards interrupting transmission of indigenous malaria is listed in Table 9.

The full set of outcome and impact indicators that can be used to measure progress in the transmission reduction and elimination phases are presented in the documents entitled “Strategy for Malaria Elimination in the GMS 2015-2030” (7) and “National Monitoring & Evaluation Plan of NSP 2016-2020” of Myanmar (24) that were officially endorsed in 2015 and 2017, respectively. Since an annual surveillance report as good epidemiological practice provides a synthesis of all available information on malaria and its elimination and is required for the future verification/certification process of malaria elimination, such reports should be prepared on annual basis.
### Table 9: A recommended set of proposed indicators in the elimination phase

<table>
<thead>
<tr>
<th>Indicator</th>
<th>Target or norm</th>
<th>Purpose</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Impact Indicators</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of confirmed malaria cases disaggregated by classification status</td>
<td></td>
<td>To measure the progress towards malaria elimination</td>
</tr>
<tr>
<td>(indigenous versus introduced versus imported versus induced versus</td>
<td></td>
<td></td>
</tr>
<tr>
<td>relapsing) per administrative unit per year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Number of foci by classification status (active versus non-active</td>
<td></td>
<td>To measure the progress towards malaria elimination</td>
</tr>
<tr>
<td>residual versus cleared) per administrative unit per year</td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Outcomes indicators: quality, coverage, timeliness and completeness of</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>surveillance</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of foci fully investigated and classified with the “malaria foci</td>
<td>100%</td>
<td>To measure the level of diagnostic surveillance activity/ABER per</td>
</tr>
<tr>
<td>investigation form”</td>
<td></td>
<td>administrative unit</td>
</tr>
<tr>
<td>% of confirmed cases that are fully investigated and classified with the</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>“malaria case investigation form”</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of people examined for malaria by microscopy and/or RDTs per year:</td>
<td>100%</td>
<td>To measure quality of malaria diagnostic services provided per</td>
</tr>
<tr>
<td>· For units where active and non-active residual foci are reported, the</td>
<td></td>
<td>administrative unit</td>
</tr>
<tr>
<td>target of ABER should be well above 5% of the population at risk, and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>· For units where only cleared foci are reported but conditions for</td>
<td></td>
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</tr>
<tr>
<td>malaria transmission exist, the indicative target of ABER should be</td>
<td></td>
<td></td>
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<tr>
<td>between 1% and 3% of the population at risk</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of health facilities/services within public/private/</td>
<td>100%</td>
<td>To measure timeliness of reporting/notification per administrative</td>
</tr>
<tr>
<td>community-based sectors that actively and fully participate in the</td>
<td></td>
<td>unit</td>
</tr>
<tr>
<td>malaria diagnostic quality assurance programme with:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>· At least 10 slides randomly selected each month (5 reported as low</td>
<td></td>
<td></td>
</tr>
<tr>
<td>density and 5 reported as negative), and</td>
<td></td>
<td></td>
</tr>
<tr>
<td>· Completing the blinded proficiency panel in the reference laboratories</td>
<td></td>
<td></td>
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<tr>
<td>each year, and</td>
<td></td>
<td></td>
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<tr>
<td>· 100% positive cases confirmed by RDTs cross-checked by quality-assured</td>
<td></td>
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<tr>
<td>microscopy or even by PCR-based diagnostics in the reference laboratories</td>
<td></td>
<td></td>
</tr>
<tr>
<td>each year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of health facilities/services within public/private/</td>
<td>100%</td>
<td>To measure completeness of reporting per administrative unit</td>
</tr>
<tr>
<td>community-based sectors where reporting and notification of positive</td>
<td></td>
<td></td>
</tr>
<tr>
<td>diagnosis to the malaria programme is done on the same day (24 hours)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>% of health facilities/services within public/private/</td>
<td>100%</td>
<td></td>
</tr>
<tr>
<td>community-based sectors that report completely and timely on the number</td>
<td></td>
<td></td>
</tr>
<tr>
<td>of patients examined by microscopy and/or RDTs and positive for</td>
<td></td>
<td></td>
</tr>
<tr>
<td>malaria to national malaria programme</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
9. Cost of Implementing the Plan

Successful malaria elimination campaign requires adequate planning and budgeting, campaigning (which requires sufficient lead time) and the necessary resource mobilization. It is crucial for any country aiming for elimination to ensure that adequate financial support is available from beginning to end. A continuous flow of financial inputs from different governmental sources and partners is critical to the success of the malaria elimination plan in Myanmar. There is some risk that the funding agencies would not be able to provide and/or sustain the level of inputs to see a visible programme impact: delays in disbursements can rapidly lead to malaria resurgences, where gains made over 5 years can be lost in 5 months or even less.

Myanmar is eligible for the GF funding but the level of counterpart financing has to increase. By launching the national malaria elimination programme, the government should consider it as a high financial priority in its development plans or normal budgetary allocations. Once the country becomes malaria-free, the costs shift towards general health services, and greater flexibility is needed, as the epidemiology changes. With such changes, government funding is likely to be more efficient. Therefore, national commitment, so crucial for the achievement and maintenance of elimination, will be gauged by the extent to which domestic investments are increased, and this becomes important in leveraging donor support.

In May 2015, the GTS 2016-2030 was adopted by the World Health Assembly. The GTS provides a comprehensive framework to guide countries in their efforts to accelerate progress towards malaria elimination. The cost of implementing the GTS was estimated at about USD 101.8 billion over 15 years. Based on a cost estimate for implementing the GTS 2016-2030 at the global level, malaria elimination strategy in the GMS 2015-2030 and the NSP for Intensified Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020 in Myanmar, and bearing in mind that the country in 2015 accounted for about 56% of all reported cases in the GMS, it is expected that the total cost of eliminating malaria in the country would range from USD 1 323 to 1 403 million over next 15 years (see Table 10).

Starting from 2026, as a result of a substantial reduction in the number of cases of malaria across the country, it is anticipated that the cost of case management, disease prevention and cross-cutting interventions would be somewhat reduced. However, the cost of surveillance activities - which is actually a core function of elimination programme - should be gradually increased, and be kept at a sufficient level until the national elimination goal is achieved.

Sufficient financial provisions should be made for monitoring and evaluating the progress made towards malaria elimination by 2030 to ensure the set milestones/targets and stated objectives/goals are met. During the elimination phase, financial allocations should be maintained, despite a low burden. Adequate financial resources should be also available for effective vigilance activities after attainment of malaria-free status, because adequate surveillance to prevent the re-establishment of local transmission can be relatively costly in Myanmar assuming a high degree of vulnerability and receptivity.

It is expected that implementing the NPME 2016-2030 would bring substantial benefits in terms of saving lives and averting the socio-economic losses provoked by the disease than the total cost and investments made to execute this elimination plan.
Table 10: Estimated cost of the National Plan for Malaria Elimination in Myanmar, 2016-2030

<table>
<thead>
<tr>
<th>Key and cross-cutting interventions</th>
<th>2016-2020 (USD in million)</th>
<th>2021-2025 (USD in million)</th>
<th>2026-2030 (USD in million)</th>
<th>Total cost, 2016-2030 (USD in million)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case management</td>
<td>85</td>
<td>70 - 80</td>
<td>60 - 70</td>
<td>215 - 235</td>
</tr>
<tr>
<td>Disease prevention</td>
<td>95</td>
<td>90 - 100</td>
<td>80 - 90</td>
<td>265 - 285</td>
</tr>
<tr>
<td>Malaria surveillance</td>
<td>32</td>
<td>50 - 60</td>
<td>50 - 60</td>
<td>132 - 152</td>
</tr>
<tr>
<td>Cross-cutting interventions</td>
<td>251</td>
<td>250 - 260</td>
<td>210 - 220</td>
<td>711 - 731</td>
</tr>
<tr>
<td>Total cost (USD in million)</td>
<td>463</td>
<td>460 - 500</td>
<td>400 - 440</td>
<td>1,323 - 1,403</td>
</tr>
</tbody>
</table>
10. Governance and coordination

Myanmar has established a strong and proactive NMEC responsible for monitoring progress and coordination of elimination activities. The NMEC has the Vice President as Patron, Minister for Health as Chairperson, two Deputy Ministers for Health as Vice-chairs and the Director General of the Department of Public Health (DOPH) as Secretary and the Deputy Director General (Disease Control) as joint Secretary. Members include the Deputy Ministers of 16 Ministries and government authority offices and Chairpersons of National NGOs. Altogether there are 35 members in the committee. The NMEC has a Working Group and an Executive Working Group. Both have the Deputy Minister of Health and the Advisor of the President’s Office as Patrons, are chaired by the Director General of DOPH and have the Director (Disease Control) as Secretary and two Deputy Directors (Malaria) as joint Secretaries.

The Working Group has 60 members, that includes Deputy DGs of all Ministries, all implementing partners of malaria, WHO as technical partner, all donors and all TSG members. Its role is to collaborate with national and international NGOs for development of elimination planning activities and implementation; assist in securing the aid and support; provide assistance and technical support for the implementation of operational research; and provide continuous guidance to achieve malaria elimination targets. The Executive Working Group has 25 members, mainly from NMCP, State/Regional Public Health Department plus representatives of Kachin, Kayin, Kayin-ni, Mon and Shan Health Committees. Its roles are to: implement tasks associated with malaria elimination according to the policies laid down by the NMEC; lead and develop long-term and short-term plans and projects for malaria elimination; provide continuous monitoring and evaluation and reporting on implementation of activities; implement the staff capacity development plan; manage and supervise the systematic and effective utilization of funds received from the government and International donors for the implementation of malaria elimination activities; supervise the enforcement of malaria elimination laws and legislations; provide technical guidance, monitoring and supervision in the implementation of operational research for malaria elimination; collaborate among local, international and regional organizations, health related sectors of both public and private, CBOs and the voluntary organizations to enhance the implementation of programme activities; and assist in obtaining technical and financial support as required.

NMCP should take the leading role in malaria elimination providing all the necessary support to general health and specialized programme staff based at State/Region, District and Township levels. The decentralization of implementation to States/Regions, Districts and Townships will be in alignment with the National Health Sector Strategy that ensures NMCP is directly responsible for providing funds and human resources for malaria elimination activities in the future.
The proposed NPME will provide strategic guidance and technical support for those who are involved in planning and implementing the programme aimed at elimination, and monitoring and evaluating the progress towards malaria elimination in the country. The NPME will serve as a technical guide for States/Regions in rolling out specific interventions for eliminating malaria.

After launching of the NPME 2016-2030, a nation-wide planning exercise and orientation workshop should be carried out with participation of all States and Regions to agree jointly on milestones/targets as well as specific/cross-cutting interventions, training needs and administrative/financial provisions that should be defined in detail for each State/Region. Along with the planning exercise, a national orientation workshop should be conducted for State/Region senior managerial and health staff to inform on organization and management of the programme and agree upon their engagement in execution of the programme in their respective administrative units.

Particular attention should be given to those States/Regions that are already in the elimination phase, and where it is rational and necessary to initiate surveillance and other elimination activities without any delay. A substantial effort should be considered to increase human capacity for malaria elimination and train, motivate and sustain health staff of different categories and VHVs throughout the country, with special focus on areas eligible for elimination.

Since surveillance and M&E will be a key component of measuring the progress towards elimination, national reporting and information systems for disease surveillance and health management should be strengthened at central, state/region and township levels by validation/assessment of existing systems at all levels before States/Regions become eligible to enter the elimination phase.

The NMEC with its two Working Groups that is responsible for overall coordination and guidance of elimination activities should periodically review the programme to ensure that it remains on track and that the level of inputs required to see the desired programme impact is provided and sustained, since there is always some risk that financial provisions of the government and funding agencies could not be sufficient.

A mechanism for periodic external reviews of the programme to assess the progress against milestones and targets, identify possible gaps and advise on actions to solve these problems should be built-in.
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12. Regional framework for prevention of reintroduction and certification of malaria elimination 2014-2020, WHO Regional Office for Europe, Copenhagen, 2014;
22. Meeting Report on the Technical Consultation on improving access to malaria control services for migrants and mobile population in the context of the emergency response to artemisinin resistance in the GMS, 22-23 May 2014, WHO Regional Office for the Western Pacific, Ha Noi, Viet Nam, 2014;
Annex 1 - Country profile

Myanmar, previously known as Burma, is the largest country in mainland South-East Asia with a total land area of 676,578 square kilometers. It stretches 2,200 kilometers from north to south and 925 kilometers from east to west at its widest point. It is bounded on the north and north-east by the People’s Republic of China, on the east and south-east by the Lao People’s Democratic Republic and the Kingdom of Thailand, on the west and south by the Bay of Bengal and Andaman Sea, on the west by the People’s Republic of Bangladesh and the Republic of India (See Figure 1). Myanmar’s capital city is Nay Pyi Taw and its largest commercial city is Yangon.

The country is divided administratively into Nay Pyi Taw Territory and 14 States and Regions, and comprises 74 Districts, 330 Townships, 398 Towns, 32 Sub-townships, 3,065 Wards, 13,619 Village Tracts and 64,134 Villages. The first level administrative area is Region in the central parts of the country, and State in the periphery. The Townships and Villages are the core planning and implementation units.

Myanmar falls into three well marked natural geographical divisions: the western hills, the central belt and the Shan plateau on the east, with a continuation of this high land in Tanintharyi to the south. Three parallel chains of mountain ranges from north to south divide the country into three river systems: Ayeyarwady, Sittaung and Thanlwin. Myanmar has a tropical climate with three distinct seasons: rainy, cold and hot. The rainy season comes with the southwest monsoon, lasting from mid-May to mid-October, followed by the cold season from mid-October to mid-February. The hot season precedes the rainy season and lasts from mid-February to mid-May.

Myanmar has undergone a remarkable political transformation in the last 5 years, with its leadership voluntarily transitioning from an isolated military regime to a quasi-civilian government intent on re-engaging with the international community.

Figure 1: Administrative regions, population density and topography, Republic of the Union of Myanmar
Annex 2 - Malaria Epidemiology

In Myanmar, out of 37 species of Anopheles so far recorded throughout the country, six, namely *An. minimus*, *An. dirus*, *An. annularis*, *An. sundaicus*, *An. culicifacies* and *An. philippinensis* have been found to be infected with malaria parasite based on entomological and parasitological evidences. In addition to the above, it is suspected that *An. sinensis* may also play a secondary role in malaria transmission. *An. maculatus* is also a suspected secondary vector in the hilly and foothill areas of the country. *An. aconitus* could also play a secondary role depending on the man/cattle ratio of a particular area. *An. jeyporiensis* is to be regarded as possible vector wherever it is present in abundance.

The primary vectors *An. dirus* complex (both forest and well-breeding) and *An. minimus* complex are both generally anthropophilic. Both primary vectors can bite the whole night. The peak biting time is found at 6:00pm -12:00 midnight. The early biters, *An. minimus*, are generally nulliparous mosquitoes emerging from nearby slow running streams. In Myanmar, there may be more than one or two vectors in an ecological zone. For example, in Tanintharyi Region, malaria transmission is due to the combined infective bites of *An. dirus*, *An. minimus* and *An. sundaicus*. The proportion of infective bites among these three vectors may vary from Township to Township depending on the climatic and environmental conditions. Altitude also plays a major role due to the temperature getting cooler as the altitude above sea level increases. For example, in Shan State areas, 1000 meters above sea level will have very little *An. dirus*, and *An. minimus* may be the main vector responsible for malaria transmission. The vector density fluctuates with annual rainfall patterns. In some areas vector breeding sites may be flushed out with rainfall during the monsoons with higher density being reported post monsoon. The (peak) transmission season in Myanmar generally lies between March and December, although this varies according to rainfall, temperature and other factors. The characteristics of the vectors explain the geographical distribution of malaria in Myanmar.

The forest environment, which is closely linked to hilly terrain, provides the most conducive ecology for malaria transmission. Deforestation reduces malaria risk, when completed, but the process of deforestation is often associated with heavy exposure. Plantations may lead to re-emergence or emergence of malaria. Malaria transmission is, at most, sporadic in cultivated plain areas and is usually absent in urban areas. Some malaria transmission occurs in coastal areas, especially if the environment has been disturbed by, for example, aquaculture. Re-emergence of malaria may be related to new ecological niches for important vectors, such as *An. minimus* breeding in shady wells in Sagaing Region, and arise from introduction of infection by migrant workers. The current geographical pattern reflects that most of the transmission occurs in forested foothill zones below 1000 meters’ altitude. Higher altitudes are usually too cold for malaria transmission, but the upper limit is highly variable and has possibly tended to move upwards in recent years. Many of these highland areas are close to international borders.

Most malaria cases and deaths probably occur among people residing in villages near or in the forests. These people are usually national races (ethnic minority groups) living from subsistence agriculture supplemented by forest activities, such as cutting bamboo or rattan or production of charcoal. Generally, residence within 1 km distance from the forest means that malaria transmission occurs in the village at least during part of the year, with all age groups being at risk. If the village is located at somewhat greater distance from the forest, the risk is usually confined to adult men, who enter the forest periodically for agriculture, forest products gathering, hunting etc. These men usually go in groups and stay in the forest for several days in makeshift shelters that offer no protection from mosquito bites.
The other major risk group is migrants, who are often induced by economic opportunities such as logging or mining in forested areas or road/dam construction and maintenance and agricultural works such as rubber, palm oil plantation in malarious areas. Displacement caused by dam construction may also lead to exposure. These population movements may be organized, in which case it is relatively easy to organize prevention and curative services. However, often migrant groups are small, spontaneous and even clandestine and illegal, and mostly inaccessible to health services which makes it difficult to protect them. Malaria risk also occurs in plantations, which offer forest-like environments such as rubber trees and palm oil trees. In such situations, it is usually relatively easy to organize control.

Annex 3 - Recent trends, current situation and challenges

Malaria remains a leading cause of morbidity and mortality in the Republic of the Union of Myanmar. Considerable progress has been made over the past 10 years in reducing the burden. However, the disease is still a priority public health problem in the country. Of 52 million population residing in the country, 22.5 million (43%) reside in endemic areas, whereas 21.4 million (41%) live in areas with receptivity and vulnerability risk of malaria. Malaria occurs mainly in or near forests, but also in some coastal areas and plantations. Because of these environmental determinants, the malaria burden is particularly high among national races in remote areas and migrants, who seek economic opportunities in rural economic frontier areas, and in economic development activities such as forestry, mining, plantations and road building. The proportion of the population living within high and moderate risk areas has fallen substantially especially since 2007. However, high risk areas are the ones from where it is most difficult to obtain reliable information. Further, it should be noted that within these high risk areas there are villages with little or no transmission, and similarly within low risk areas there are villages with high transmission, hence there is a need to undertake micro-stratification for more effective targeting of anti-malaria interventions.

There are two major species of Plasmodium; *P. falciparum* and *P. vivax* with occasional reports of *P. malariae* and *P. ovale*. *P. falciparum* accounts for around 64% of cases at present.

The annual incidence rate of malaria has fallen steadily since 1990, with a small upsurge from 1999 to 2003 and in 2010 and 2011. Despite the obvious encouraging trend in reduction of the malaria burden, the existing data needs to be interpreted cautiously because of insufficient information on cases that are self-treated or treated in the private sector, and some high malaria transmission areas are still inaccessible for all or parts of the year. A total of 182616 malaria cases was reported in 2015. Over the last 4 years Annual Falciparum Incidence (AFI) has been declining each year from 5.46 per 1000 population at risk in 2012 to 2.66 in 2015. The total number of hospital inpatients recorded as malaria steadily declined, from 62813 in 2005 to 43602 in 2010, 18362 in 2013 and further dropped to 7478 in 2015, while the number of severe malaria cases decreased from over 9000 between 2005 and 2008 to 660 in 2015. The decline in hospitalized cases provides strong evidence that the national level malaria burden has decreased. Reported malaria deaths peaked in 1991 (>5000) and then fell steadily; 1261 in 2007, 788 in 2010 and only 37 in 2015 (see Figure 2).

Malaria is becoming an increasingly focal disease. In 2015, out of 291 Townships which were endemic, 120 Townships had API<1 per 1000 population at risk compared to 45 Townships in 2006. In 2015, 6 States/Regions out of Nay Pyi Taw territory and 14 States/Regions together accounted for 75% of confirmed *P. falciparum* cases (Rakhine, Sagaing, Chin, Kayin, Shan and Ayeyarwady). Rakhine and Sagaing accounted for 19% and 15% respectively.
The causes of outbreaks in Myanmar are usually multi-factorial, but population migration is recorded as the most frequent cause. Outbreaks may erupt when malaria is introduced by migrant workers, while in other areas non-immune migrants may develop outbreaks of malaria, when moving to endemic areas. The number of outbreaks has decreased in recent years. Ecological surveillance and community based surveillance were emphasized together with case detection, management and preventive measures - mainly Indoor Residual Spraying (IRS) - in development projects. If malaria is reduced further across the country more frequent outbreaks can be expected in the future.

Overall, analysis of the age distribution of reported cases indicates a modest overrepresentation of young adults among reported malaria cases. At all ages below 75 years, males are reported with malaria more than females, and they accounted for some 65% of total confirmed cases. The predominance of adult males among malaria cases is a reflection of the high risk of malaria among them due to occupations (e.g., mining, forest related activities, construction, rubber tapping, etc.) that expose them to malaria. A review of several studies on malaria during pregnancy in Myanmar revealed that the prevalence of pregnant women with clinically suspected malaria was relatively low, contributing about 1-2% to the total burden of outpatients and inpatients.

Artemisinin resistance probably emerged at the border between Myanmar and Thailand in 2001, but was not clearly recognized until 2008. Since 2009, data from Myanmar has consistently shown delayed parasite clearance times among a significant proportion of patients treated with each of three ACTs (AL, ASMQ and DHA-PIP). All three nevertheless remain effective, giving high cure rates except in the case of ASMQ in the Myanmar-Thailand border region. K13 mutants have been identified in Myanmar, including recently in the west of the country. Analysis suggests that these mutants arose independently rather than spread from Cambodia.
Annex 4 - National malaria strategic plan, 2016-2020

The present national strategy in Myanmar is in line with the Strategy for Malaria Elimination in Greater Mekong Sub-region (2015-2030), the GTS for Malaria 2016-2030, and takes into account lessons learned from successful implementation of malaria control efforts in Myanmar during the past decade. The NSP for Intensifying Malaria Control and Accelerating Progress towards Malaria Elimination 2016-2020 represents the first phase of a 15-year strategy to eliminate malaria in Myanmar. The first five years of the strategy set out to eliminate malaria in less endemic areas, while accelerating control efforts in more endemic areas to reduce cases to a low level. Post 2020, it is expected that the proportion of areas targeted for elimination phase will expand progressively. *P. falciparum* will be eliminated by 2025 and by 2030 Myanmar will be malaria free.

The Department of Public Health (DOPH) is responsible for providing health care services to the entire population in the country. The National Malaria Control Programme is implemented by the VBDC Programme, which is part of the Department of Public Health of the Ministry of Health and Sports. At central level, the VBDC programme is mandated to formulate plans, policies, standards and norms related to malaria, provide training, conduct operational research, control of outbreaks, and provide consultative and advisory services to implementing agencies. At state/region level, VBDC is responsible for the control of malaria, under the supervision of the State/Regional Health Director. The Medical Officers lead the State and Regional level VBDC teams which consist of field, laboratory and entomological sections. These teams have responsibilities for supervision and monitoring of implementation at lower levels.

A Malaria Technical and Advisory Group (TAG) was established by the Department of Health in collaboration with WHO in 2002. The TAG has evolved into the Technical and Strategy Group (TSG) - Malaria in 2005. Its mandate includes: providing technical guidance in the development of national strategies; formulating policies regarding case management, disease prevention and malaria surveillance, quality assurance of microscopy, monitoring and evaluation and recommend them for approval by MOH; coordinating partners concerned; and providing clarity on major technical and policy issues. TSGs are also in the position to meet to discuss, review and endorse certain proposals, reports and other documents; carry out the assignments given to them and provide broad oversight of the implementation of grants and projects as required, such as Global Fund grants.
Annex 5 - A projected “malaria shrinking” in Myanmar, 2015-2030

- Transmission reduction
- Elimination
- Prevention of re-establishment
Annex 6 - Township-wise malaria data based on API in Myanmar, 2015

Transmission reduction
Elimination
Prevention of re-establishment
Annex 7 - Township-wise malaria data on AFI in Myanmar, 2015