NATIONAL STRATEGIC PLAN FOR PREVENTION OF RE-INTRODUCTION OF MALARIA IN SRI LANKA

2018 - 2022

Anti Malaria Campaign
Ministry of Health
Sri Lanka

National Strategic Plan for Prevention of Re-introduction of Malaria in Sri Lanka 2018-2022

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Acronyms Used

ABER	Annual Blood Examination Rate
ACD	Active Case Detection
ACTs	Artemisinin Combination Therapy
AMC	Anti Malaria Campaign
AMC HQ	Anti Malaria Campaign Headquarters
BCC	Behaviour Change Communication
CRC	Case Review Committee
DDT	Dichlorodiphenyltrichloroethane
DHIS2	District Heath Information Software
DOTS	Directly Observed Treatment Short Course
ECA	External Competency Assessment
ETR	Education, training and research
GFATM	Global Fund to Fight AIDS, Tuberculosis and Malaria
GMP	Global Malaria Programme
GNI	Gross National Income
G6PD	Glucose-6-phosphate dehydrogenase
GoSL	Government of Sri Lanka
GPS	Global Positioning System
GTS	Global Technical Strategy
HEOs	Health Entomological Officers
ICT	Information and Communications Technology
IEC	Information, Education and Communication
IOM	International Organization on Migration
IVM	Integrated Vector Management
LAN	Local Area Network
LLINs	Long Lasting Insecticidal Nets
NSP	National Strategic Plan
M&E	Monitoring and Evaluation
MDG	Millennium Development Goal
MoH	Ministry of Health
MLT	Malaria Laboratory Technologists
NCA	National Competency Assessment
NCD	Non Communicable Diseases
NGO	Non Governmental Oraganization
NMS	National Malaria Strategy
PCD	Passive Case Detection
PCR	Polymerase chain reaction
PHFOs	Public Health Field Officers
PHIs	Public Health Inspectors
PHLT	Public Health Laboratory Techniques
PoR	Prevention of Re-introduction
RDTs	Rapid diagnostic tests
RMOs	Regional Malaria Officers
SAARC	South Asian Association for Regional Cooperation

SEA	South East Asia
SMOs	Spray Machine Operators
SOPs	Standard Operating Procedures
SLR	Sri Lankan Rupee
TB	Tuberculosis
TSG	Technical Support Group
UHC	Universal Health Coverage
UN	United Nations
UNHCR	United Nations High Commission for Refugees
WHO	World Health Organization

Forward

Sri Lanka was certified as a Malaria Free country by the World Health Organization in 2016, becoming the second country in the South East Asia region to achieve this status. This was a remarkable achievement, considering that Sri Lanka is a country in the tropical belt with the Anopheles mosquitoes still present in the country.

Since post - certification, Sri Lanka is in the Prevention of Re-introduction phase. This entails a financial transition as the support from donor agencies are coming to an end and a technical transition as to sustain the malaria free status, the country has to focus more strengthening surveillance activities to prevent a re-introduction of malaria in to the country.

Understanding the hight risk of re-introduction the country is facing, due to increased travel between malaria endemic countries and due to the presence of the malaria vector in certain areas, a new strategic direction was required to guide the activities of the-Malaria Campaign.

The National Strategic Plan for the prevention and re-introduction of malaria in Sri Lanka 2018-2020 (NSP) guided by 10 strategic priorities is expected to provide the necessary direction in planning and financing the annual activities to the Ministry of Health, to the technical staff at the Anti-Malaria Campaign headquarters, our regional staff and all stakeholders. I also hope will provide the guidance for research and development activities to strengthen the evidence base to sustain the malaria free status in Sri Lanka

Dr. H D B Hearth
Director, Anti-Malaria Campaign

Acknowledgment

The National Strategic Plan for the Prevention of Malaria Re-introduction of Malaria in Sri Lanka from 2018 – 2022 was prepared by the Anti-Malaria Campaign (AMC), Ministry of Health, Nutrition and Indigenous Medicine Sri Lanka by extensive consultation with the Ministry of Health, the Anti – Malaria Campaign, Regional Malaria Officers, academia and funding agencies.

The AMC is grateful to Prof. Rajitha Wickremasinghe for providing his expertise and preparing the preliminary strategic plan and leading the discussions to finalize the NSP. We are also thankful to Dr. Muzrif Munas and Ms. Tikiri Rambukwella for coordinating the compiling of evidence and data for the development of the NSP. We appreciate the contributions and feedback provided by the members of the Technical Support Group, and technical staff at the Anti Malaria Campaign, Dr. Dewanee Ranaweera, Dr. Manjula Danansuriya, Dr. Manonath Marasinghe, Dr. Jeevatharan Hamsananthy, Dr. Priyani Dharmawardana, Dr. Priyanganie De Silva, Dr. Dasanthi Somaratne, Ms. Kumudu Gunasekara, the parasitologist at AMC, Ms. Mihirini Hewavitharana and Ms. Jeewanie Harischandra, the entomologists at AMC and all the regional malaria officers.

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Endorsed by :

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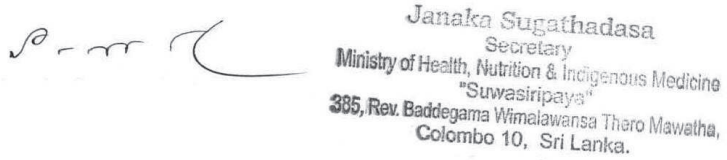

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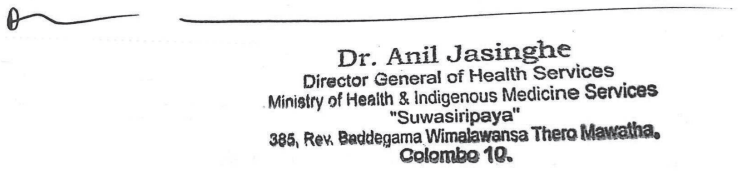

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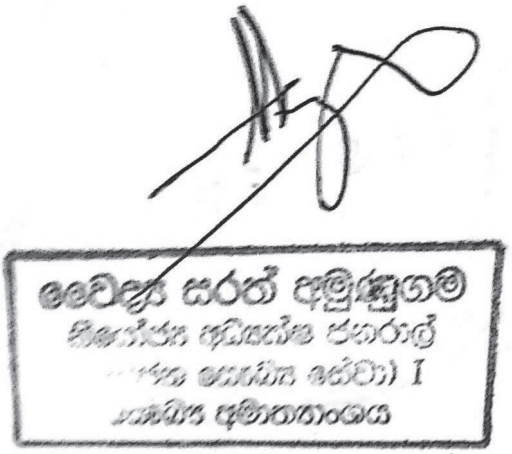

Executive Summary

The National Strategic Plan (NSP) for prevention of re-introduction of malaria in Sri Lanka 2018-2022 is primarily targeted to sustaining a malaria-free Sri Lanka post-WHO certification. The country received malaria-free certification from WHO in September 2016, becoming only the second country in the WHO South East Asia region to be declared malaria-free.Sri Lanka has shown remarkable success in sustaining malaria-free status for over 5 years despite the challenges of high receptivity in a tropical country and the increased vulnerability afforded by increased foreign travel among Sri Lankans to malaria endemic countries and tourists and visitors, including foreign labour, from malaria endemic countries.

The NSP supports advocating for continued commitment against the disease and provides justification for sustained investment for the prevention of re-introduction of malaria in Sri Lanka. The NSP provides a framework for the programme to work within the existing structures and modification of others.

The National Malaria Strategy (NMS) draws on the evolved consensus of stakeholders from the health sector of governmental, private sector NGOs, and International Organizations at central, provincial and district levels. It assembles an evidence-based plan of action derived from the Ministry of Health, and WHO Global Malaria Programme (GMP) and Southeast Asia Regional Malaria control guidelines and recommendations.

The strategic priority is to prevent its re-introduction and re-establishment of malaria in Sri Lanka through imported malaria cases using the following strategic approaches are proposed:

1) Continuous assessment and mapping of receptivity and vulnerability of re-introduction / re-establishment of transmission by stratification, regular monitoring and implementing mitigating measures.
2) Maintaining intensified surveillance for early detection and effective treatment of malaria cases and ensuring mandatory reporting of cases in both the public and private sectors.
3) Maintaining knowledge and skills of health staff.
4) Ensuring availability of quality diagnostic facilities to diagnose and treat malaria cases.
5) Ensuring quality and adequate coverage of interventions to prevent re-introduction/re-establishment of malaria.
6) Optimising entomological surveillance and response for integrated vector management relevant for PoR.
7) Strengthening outbreak preparedness, and ensuring adequate prevention and rapid response to potential malaria outbreaksituations.
8) Advocacy for political and financial commitment to ensure sustaining malaria-free status.
9) Sustaining critical partnerships.
10) Maintaining a high level of awareness of malaria and the risk of its re-introduction among politicians, clinicians and high risk groups.

While acknowledging the fact that the strategies adopted for this planning cycle are not entirely new in comparison to the elimination and prevention of re-introduction phases prior to certification, the mix, priorities and implementation approaches are different. Likewise, the targets and methods employed to achieve them are different.

The principal shift of activities is away from routine and exhaustive entomological surveillance and vector control to one of focused targeting of activities to measure vulnerability in order that it may be coupled with receptivity for appropriate action. The shift is also away from maintaining a generally high Annual Blood Examination Rate (ABER) to identifying and screening of high risk groups. The third major focus is to minimize further the time to diagnose of imported malaria cases.

The National Strategic Plan 2018-2022 is presented in a disaster management context portraying the principle of risk reduction in the domains of prevention, mitigation and preparedness. For response, the short- and long-term strategies have been outlined. The entire strategy and activities will be implemented under the overarching cross cutting areas of quality assurance, monitoring and evaluation and operational research. The strategies for each of the domains are based on the Global Technical Strategy for Malaria 2016-2030 of the WHO Global Malaria Programme.

This NSP outlines broad activities and projected costs for the period 2014-2018. The activities have been broadly classified as

- ✓ Universal access to malaria diagnosis and treatment,
- ✓ Surveillance,
- ✓ Malaria prevention,
- ✓ Quality assurance,
- ✓ Monitoring and evaluation,
- ✓ Information, education and communication (IEC), and advocacy
- ✓ Partnerships,
- ✓ Capacity building,
- ✓ Programme management,
- ✓ Technical assistance, and
- ✓ Operational research.

1. Introduction

The National Strategic Plan (NSP) for prevention of re-introduction of malaria in Sri Lanka 2018-2022 is primarily targeted to sustaining a malaria-free Sri Lanka post-WHO certification. Sri Lanka has shown remarkable success in sustaining malaria-free status for over 5 years. The country received malaria-free certification from WHO in September 2016, becoming only the second country in the WHO South East Asia region to be declared malaria-free. The Anti Malaria Campaign (AMC) is now undergoing two important changes. First, the country is facing a financial transition as it nears the end of Global Fund support for malaria. The current round of funding will end December 2018, and a final transition grant is under consideration for 2019-2021. This drop in external financing will require that new government resources be mobilized to cover essential programme areas.

Second, the country's malaria strategy is evolving from a joint elimination and prevention of re-introduction (PoR) phase to a PoR era post-WHO certification. This technical transition which requires changes in programmatic strategy and activities is reflected in this NSP. Although the strategies remain the same, the mix, priorities and implementation approaches are different.

Sri Lanka has been able to prevent re-introduction of indigenous malaria for over 5 years since November 2012, a remarkable feat considering the challenges of high receptivity in a tropical country and the increased vulnerability afforded by increased foreign travel among Sri Lankans to malaria endemic countries and tourists and visitors, including foreign labour, from malaria endemic countries. Although in the previous WHO recommendations, two programme re-orientations were recommended from malaria pre-elimination to prevention of malaria re-introduction, no formal re-orientation of Sri Lanka's malaria control programme took place due to the rapidity of the transition. Two re-orientation programmes were conducted in November 2017 – one on entomological surveillance and vector control and one on programme re-orientation. The recommendations of both these re-orientation programmes have been taken into account in developing this NSP.

This NSP is based on the AMC maintaining its current structure to provide overall technical guidance and other assistance with the decentralised structure in place for the implementation of the National Malaria Strategic Plan through the Provincial Health Authorities via the Regional Malaria Officers and the Medical Officers of Health. Given the past experiences of failures of early integration of disease control programmes to the general public health services of the country (eg: leprosy), and the early withdrawal of financial support for continuation of disease elimination (eg: malaria in the 1960's), the AMC is of the view that this arrangement that is suggested will ensure sufficient political, financial and administrative support, focus, and technical skills, expertise and commitment to ensure that Sri Lanka remains malaria-free with a small burden of disease in a rapidly changing environment of communicable disease transmission in a limited resource setting.

This NSPpresents a roadmap to sustain the malaria-free status of Sri Lanka focusing on intensified surveillance and response, outbreak preparedness, prevention, early diagnosis and treatment with radical cure. Itbuilds on the achievements of previous strategic plans and supports advocating for continued commitment against the disease and provides justification for sustained investment and a framework for the programme to work within the existing structures. It defines specific milestones towards achieving that goal. This NSP outlines broad activities and projected costs for the period 2018-2022.

2. Planning and partnerships for joint strategic planning

With WHO certification of Sri Lanka being malaria-free in September 2016 and with the culmination of the current Global Fund grant in December 2018, the Technical Support Group (TSG) for Prevention of Malaria Re-introduction, under the chair of the Director General of Health Services, recommended that the National Malaria Strategic Plan needs to be revised taking into cognisance the need to re-structure the AMC, re-organise its activities, and to plan for alternate funding mechanisms. A series of meetings with key staff members of the Anti Malaria Campaign Headquarters (AMC HQ) and Regional Malaria Officers (RMOs), and TSG members were conducted to identify strategic approaches for the next five years. Based on these discussions, a draft strategic plan and action plan were developed. The preliminary draft was circulated and discussed among staff of the AMC and RMOs. Their comments were incorporated and the revised draft NSP was presented at a multi-stakeholder meeting. The NSP was further revised based on the comments and recommendations made by stakeholders.

3. Situation analysis

3.1 Review of the performance of the previous strategic plan

The objectives of the National Strategic Plan 2014-2018 for malaria were preventing the re-introduction of malaria to Sri Lanka, maintaining zero malaria deaths and the country obtaining malaria-free certification from WHO, all of which were achieved up to December 2017.

Political leadership and financial commitment have been provided by the Ministry of Health during the last planning cycle. Most strategies and activities in the NSP 2014-2018 were carried out as planned. Financial support was provided by the Global Fund and technical support was provided by WHO. The country encountered a major challenge and a threat to prevention of malaria re-introduction with detection of *An.stephensi,* a major vector of urban malaria in many parts of India, in the Mannar island off the north west coast of the country in December 2016. As this vector species has not been reported in the country in the past, it is believed to have invaded the country in the recent past. Subsequently, the vector was reported in all districts of the Northern Province breeding in wells and large water storage containers. Prompt control activities were initiated with the application of chemical larvicides and larvivorous fish with the aim of eliminating the vector and/or limiting the spread of the species to other regions. It has proven to be difficult species to contain as it is resistant to insecticides currently used by the AMC.

This plan builds on the achievements of the previous plan with a focus to sustain a malaria-free Sri Lanka.

3.2 Malaria programme performance review

One malaria programme performance review was conducted in 2015 and three programme reviews were conducted in 2016 (two prior to preparation of documents for malaria-free certification and one for the assessment of the certification application). The three reviews prior to certification were conducted by an external reviewer who visited the country and advised on needed documentation and the way forward for the certification process. The malaria-free certification assessment by WHO comprised internationally recognized experts on malaria. The external review team that assessed the certification application commended the remarkable success of the Malaria Control Programme;

however, several technical and operational issues were outlined that needed to be addressed for sustaining malaria-free status. Some of the issues raised such as re-orienting the programme have already been addressed through the two workshops held in November 2017. A pressing issue that was highlighted was the waning priority given to malaria control and the decreasing level of interest and awareness amongst clinicians, administrators and health care providers that is a threat to prevention of malaria re-introduction in to the country. This NSP 2018-2022 has addressed the recommendations made during the assessment of the application Sri Lanka made for malaria-free certification.

The Transition Readiness Assessment conducted in 2016/2017 identified some key risk areas. The major concern was maintaining budget allocation for malaria PoR with the potential loss of political will for sustaining funding for PoR in the context of zero cases. This has implications on access to emergency funds in the event of an outbreak.

3.3 Country profile

Sri Lanka is a tropical country having a land area of approximately 65,610 square kilometres, and an estimated population of approximately 21 million (based on the census of 2012) (Dept. of Census & Statistics census, 2012). It has a central mountainous region surrounded by plains stretching to coastal areas. The mean temperature varies between 26^0C–28^0C in the low country, and between 14^0C-24^0C in the central hill country. For administrative purposes, the country is divided into 9 provinces, 26 districts and 321 Divisional Secretary areas. The smallest health administrative unit comprises a Divisional Secretary Area. The smallest administrative health unit of the Ministry of Health (MoH) is the Medical Officer of Health area which roughly corresponds to a Divisional Secretariat area; preventive health care in a health unit is provided by the Medical Officer of Health (MOH) of the area and the Primary Health Care team.

Approximately 23% of the country's population inhabits urban areas. In 2013, the country had a high population density of 327 persons per km^2. Life expectancy is around 75 years and the literacy rate is 96.9%. Sri Lanka had a meagre economic growth rate of about 3.9% per year during the period 1981–1991 during which time there was an ongoing separatist war in the North and East of the country and an insurgency in the south; a significantly higher growth rate of approximately 5-6% is currently recorded.

With the cessation of the separatist war in 2009, a massive development drive was undertaken by successive governments extending throughout the country. There has also been a surge in the influx of tourists from various countries. In addition, with the initiation of massive development projects in various parts of the country there has been an influx of a large number of foreign workers, mainly from India and China, who are a potential threat for the re-introduction of malaria in Sri Lanka. A large number of Sri Lankans are also travelling to malaria endemic countries especially to Africa for various purposes including business (most imported malaria cases reported since October 2012 have been among Sri Lankans who had acquired the disease overseas, the rest being among foreigners who were visiting the country but had acquired the disease overseas).

Sri Lanka is a lower middle income country with a per capita Gross National Income (GNI) of USD 3,780 in 2016. The economy of the country is mainly agricultural with industries becoming a major contributor to the country's economy in the recent past. Sri Lanka's traditional exports of tea, rubber

and as well as other exports, garments, tourism and inward remittances of Sri Lankans working overseas have significantly contributed to the economy in the last 30-35 years.

The road network in the country is reasonably well developed and organized with all areas being largely accessible.

Sri Lanka achieved the Millennium Development Goal (MDG) related to malaria. This plan has been developed with the aim of achieving the Sustainable Development Goal of good health and wellbeing to which Sri Lanka is firmly committed to.This NSP has been developed emphasising Sri Lanka's commitment to universal health coverage (UHC) by providing free diagnosis and treatment of malaria even to foreigners at government hospitals including persons who have arrived both by legal and illegal means. Sri Lankan citizens have enjoyed access to the free health care system for many decades. This NSP has also considered the primary health care reforms that are being formulated and implemented.

3.4 Burden of disease

Sri Lanka is transiting epidemiologically and demographically. The population is rapidly ageing and non-communicable diseases are the major causes of morbidity and mortality. The burden of infectious diseases has been drastically reduced over time due to strategic investments in public health. The immunization coverage is over 98%.

The country targeted eight diseases for elimination; malaria-free certification has already been achieved. Successive governments have committed to the elimination of these diseases. The life expectancy at birth exceeds 75 years. In 2012, the estimated crude birth rate was 17.5 births per 1000 population and the estimated crude death rate was 6 per 1000 population. In 2012, the estimated infant and neonatal mortality rates were 9.7 and 6.4 per 1000 live births, respectively. The estimated maternal mortality ratio was 22.3 per 100,000 live births andthe estimated under 5 mortality rate in 2012 was 12.1 per 1000 live births in 2012.

Malnutrition still continues to be a major public health problem with approximately 16 percent of births being of low birth weight babies in 2016. The Family Health Bureau of the Ministry of Health has reported that 20.5 percent, 15.1 percent, and 17.3 percent of children under 5 in 2012 were underweight (based on weight-for-age), wasted (based on weight-for-height) and stunted (based on height-for-age), respectively, despite many years of targeted nutritional interventions (Demographic and Health Survey, 2016).Based on the 2016 Demographic and Health Survey, 98.8 percent of deliveries were attended by skilled personnel and almost 94 percent of all births took place in a government institution. In 2016, the contraceptive prevalence among married females was 65 percent.

In 2013,traumatic injuries were the leading cause of hospitalization in government hospitals accounting for 18 percent of morbidity. Neoplasms (1.6% in 2012), diseases of the circulatory system (5.3% in 2012) and diseases of the respiratory system (10.1% in 2012) have shown an increasing trend in the recent past.

Certain infections and parasitic diseases have being decreasing in the recent past (8.2% of total hospitalizations in 2012). Among the infectious diseases, the highest morbidity and mortality burden is due to Dengue Fever. Dengue is endemic in the country and has been progressively increasing in

incidence in recent years; in 2017, there was a massive epidemic with more than 180,000 cases reported and more than 400 deaths. Often, AMC staff are called upon for dengue control work.

Ischaemic heart disease (14.7%), neoplasms (11.2%) and cerebrovascular disease (8.6%) comprised over 35% of all hospital deaths in the public sector in 2013. Deaths due to infectious diseases are few. The last death due to malaria was reported in 2008.

3.5 Health sector profile

Health represents approximately 2% of the annual government budget amounting to SLR 160 billion in 2017 (approximately USD 1.075 billion) through the Ministry of Health, Nutrition and Indigenous Medicine. In addition, funds are provided by the Provincial Councils through the Ministry of Local Government and Provincial Councils. For 2018, the estimated budget allocation through the Ministry of Health, Nutrition and Indigenous Medicine is SLR 177 billion). In 2013, the National Health Accounts estimated health expenditure was 3.2% of GDP (SLR 281 billion).

Health care is delivered through government and private providers. Health care is provided free of charge at all government institutions for all systems of medicine. Less than 6% of the population has health insurance (Sri Lanka National Health Accounts 2013). Almost 85% of inpatient care is provided by government hospitals; approximately 50% of outpatient care is provided by the private sector. The government healthcare network is extensive with households having access to a health facility within 3-5 kilometers. All government hospitals have trained clinicians. A hierarchical referral system exists in the public sector.

Private hospitals are generally found in cities and larger towns. In addition, there are many consultation chambers of private practitioners. Doctors working in government hospitals are permitted to engage in private practice after working hours. Fifty percent of outpatients are seen in the private sector. Private sector hospitals and laboratories are required to register with the regulatory authority of the Ministry of Health.

In the public sector, the Department of Health Services, represented by both the central and provincial health care services is responsible for the provision of the entire range of promotive, preventive, curative and rehabilitative healthcare services. Almost 85% of inpatient care is provided by the extensive network of public sector hospitals. Specialist care is provided in government hospitals. There is approximately 1 doctor for 1200 persons.

Currently, there are about 325 health units in the country, referred to as Medical Officer of Health areas that provide grass roots level public health services. The Medical Officer of Health is in charge of the Primary Health Care team comprising Public Health Midwives, Public Health Inspectors, Public Health Nursing Sisters, and Supervising Public Health Midwives and Inspectors. The Primary Health Care team is supported by other staff.

With devolution of powers in 1989, the health sector was devolved. Currently each province has a Provincial Health Authority under the Chief Minister and the Governor of the Province. A few large hospitals in provinces are managed by the central line Ministry of Health.

Preventive health services are organized through the general health services of the country and through vertical programmes under the Ministry of Health. Where preventive services are provided through the general health services, technical guidance is provided by specialized units within the Ministry of Health, such as the Anti Malaria Campaign and its Regional Offices being some of them.

3.6 Malaria profile

3.6.1 Malaria situation in the country

Malaria has been endemic in Sri Lanka for many centuries and several major epidemics have been historically experienced in Sri Lanka (Figure 1). The most devastating of these was in 1934–1935 during which approximately 1.5 million individuals contracted the disease and 80,000 deaths due to malaria were reported affecting even traditionally non-malarious areas in the wet and intermediate zones of the country. There have also been epidemics of malaria recorded in 1967-69, 1986-87 and in 1990-92.

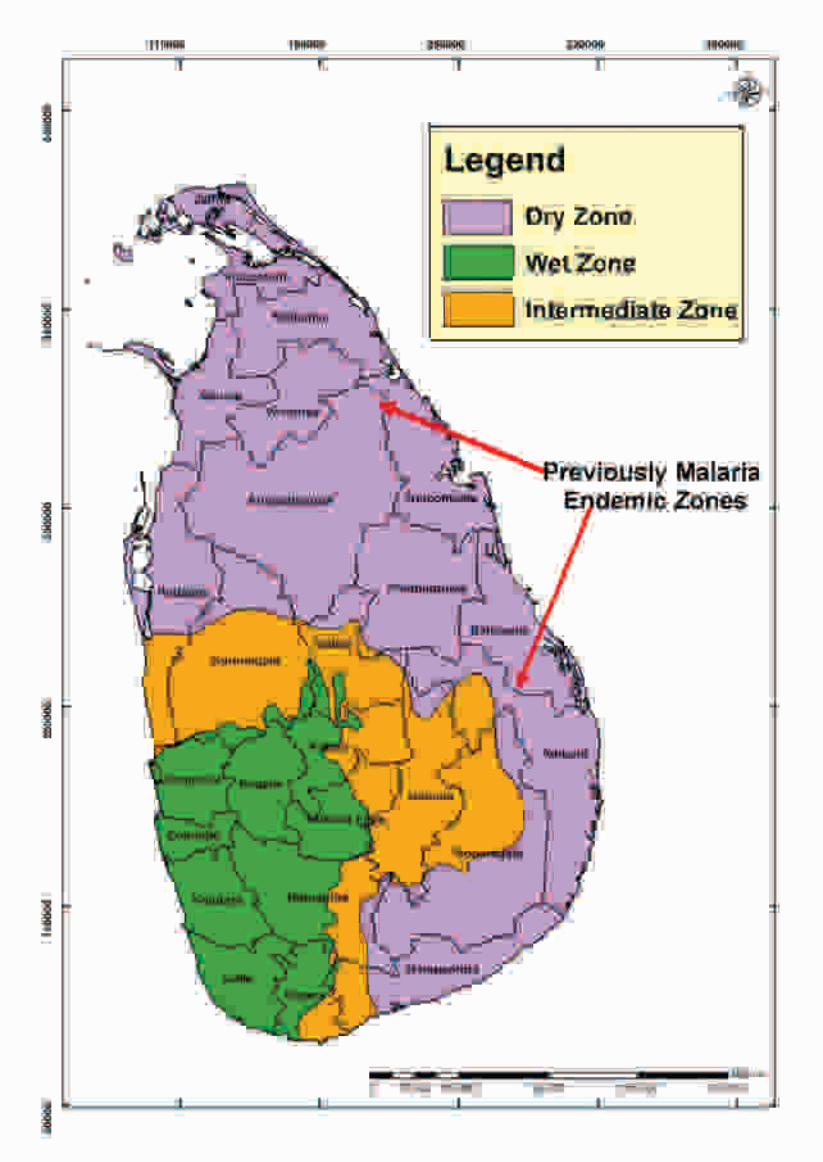

Figure 1. Map of Sri Lanka showing the different climatic zones and previously malaria endemic zones

For many centuries, malaria was traditionally prevalent in the dry zone of the country in the plains, North and East of the central mountains and stretching from the South-East to the North-West of the island. The almost 30-year separatist war in the north and east of the country that ended in 2009 had a major impact on the incidence of malaria in the affected areas.

Sri Lanka successfully eliminated malaria with the last indigenous case being reported in October 2012 and was certified malaria-free by the World Health Organization in September 2016. Since 2013, less than 100 imported cases have been reported in the country annually. The majority of the cases have been adult males (Table 1).

Table 1. Distribution of imported malaria cases reported in Sri Lanka by age and sex 2013-2017

Year	Sex		Age group			Total
	Male	Female	<5years	5-15years	>15 year	
2013	80	15	1	5	89	95
2014	45	4	3	1	45	49
2015	34	2	0	1	35	36
2016	38	3	0	0	41	41
2017	53	4	0	0	57	57
Total	250	28	4	7	267	278

Most of the imported cases reported since 2013 have been among Sri Lankans who had acquired the infection while travelling overseas for various purposes. About 33% of reported cases were detected among foreigners, some of whom have come to Sri Lanka on work and some as illegal migrants. Most of the infections originated from India (Table 2).

Table 2. Origin of imported malaria cases reported in Sri Lanka 2013-2017

Country	**Year**				
	2013	**2014**	**2015**	**2016**	**2017**
Asia	**58 (61.1)**	**31 (63.3)**	**17 (47.2)**	**18 (43.9)**	**21(36.8)**
India	38 (40.0)	23 (46.9)	14 (38.9)	14 (34.1)	21(36.8)
Indonesia	0(0.0)	1 (2.0)	0 (0.0)	1 (2.4)	0 (0.0)
Myanmar	3 (3.2)	1 (2.0)	0 (0.0)	0 (0.0)	0 (0.0)
Pakistan	17 (17.9)	6 (12.2)	3 (8.3)	0 (0.0)	0 (0.0)
China	0(0.0)	(0.0)	0 (0.0)	2 (4.9)	0 (0.0)
Malaysia	0(0.0)	0 (0.0)	0 (0.0)	1 (2.4)	0 (0.0)
Africa	**34 (35.8)**	**18 (36.7)**	**18 (50.0)**	**22(53.7)**	**33 (57.9)**
Angola	1 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Burkina Faso	0(0.0)	1 (2.0)	0 (0.0)	0 (0.0)	0 (0.0)
Cameroon	2 (2.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
CAR	0(0.0)	0 (0.0)	4 (11.1)	3 (7.3)	1 (1.8)
Congo	0 (0.0)	1 (2.0)	0 (0.0)	1 (2.4)	0 (0.0)
Eq. Guinea	1 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Gabon	0 (0.0)	1 (2.0)	0 (0.0)	0 (0.0)	0 (0.0)
Ghana	4 (4.2)	1 (2.0)	1 (2.8)	0 (0.0)	1 (1.8)
Grande Comore	1 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Guinea	1 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)	2 (3.5)
Ivory Coast	0 (0.0)	0 (0.0)	1 (2.8)	0 (0.0)	0 (0.0)
Kenya	3 (3.2)	0 (0.0)	0 (0.0)	1 (2.4)	0 (0.0)
Liberia	2 (2.1)	0 (0.0)	2 (5.6)	1 (2.4)	1 (1.8)

Country	Year				
	2013	2014	2015	2016	2017
Madagascar	0 (0.0)	1 (2.0)	1 (2.8)	1 (2.4)	10 (17.5)
Malawi	0 (0.0)	1 (2.0)	0 (0.0)	1 (2.4)	0 (0.0)
Mali	1 (1.1)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Mozambique	2 (2.1)	1 (2.0)	2 (5.6)	6(14.6)	3 (5.3)
Nigeria	1 (1.1)	4 (8.2)	2 (5.6)	0 (0.0)	0 (0.0)
Rwanda	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	3 (5.3)
Sierra Leone	10 (10.5)	3 (6.1)	0 (0.0)	0 (0.0)	1 (1.8)
South Africa	0 (0.0)	0 (0.0)	1 (2.8)	0 (0.0)	2 (3.5)
Sudan	2 (2.1)	3 (6.1)	3 (8.4)	1(2.4)	3 (5.3)
Tanzania	1 (1.1)	0 (0.0)	1 (2.8)	1(2.4)	1 (1.8)
Togo	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)
Uganda	2 (2.1)	1 (2.0)	0 (0.0)	6(14.6)	3 (5.3)
Zambia	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.8)
Other	**3 (3.2)**	**0 (0.0)**	**1 (2.8)**	**1(2.4)**	**3(5.3)**
Thailand	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1 (1.8)
Guyana	1 (1.1)	0 (0.0)	(0.0)	0 (0.0)	0 (0.0)
Haiti	2 (2.1)	0 (0.0)	(0.0)	0 (0.0)	0 (0.0)
Saudi Arabia	0 (0.0)	0 (0.0)	1 (2.8)	0 (0.0)	1(1.8)
Papua New Gunia	0 (0.0)	0 (0.0)	0 (0.0)	0 (0.0)	1(1.8)
Solomon Islands	0 (0.0)	0 (0.0)	(0.0)	1(2.4)	0 (0.0)
Total	95 (100.0)	49 (100.0)	36 (100.0)	41(100)	57 (100)

The government of Sri Lanka (GoSL) is promoting tourism as a high priority economic initiative and data reveal that the number of tourists arriving in the country has been steadily increasing in the last few years registering over 2 million arrivals in 2017 with highest numbers reported from India and China. There is also a large influx of foreign labour coming in to the country to work in mega development projects. Some of these workers are from malaria endemic countries while some workers from China have been in Africa prior to coming to Sri Lanka. Based on analyses of imported malaria cases since 2013, the risk groups identified among Sri Lankans include Sri Lankan armed forces and police personnel engaged in UN peace keeping missions in malaria endemic countries, migrant fishermen and gem traders who travel to Africa, pilgrims and traders who travel to India and other travelers to malaria endemic countries. Among foreigners, the most important risk groups are workers who have come to Sri Lanka on temporary visas and tourists.

Unlike in the past, most of the malaria cases have been reported from the Western Province of Sri Lanka, an area which remainsnon-endemic for malaria (Figure 2). In the past, malaria was a rural disease of the poor and was endemic in the dry zone of the country extending to almost two thirds of the country where the receptivity is high (Figure 1). Recent entomological surveillance data show that the principal vector, *An.culicifacies,* and secondary vectors of malaria in Sri Lanka in the past are widely prevalent in all these areas, indicating that there is a potential high risk of outbreaks in these areas (Figures 3-4). Additionally, *An.stephensi,* a known vector of urban malaria in India and in some other countries, was detected and reported for the first time in Sri Lanka in the Mannar island in December 2016. This vector has been found breeding in large water storage containers and in wells. Since then, this potential vector has been reported in the other districts of the Northern Province. *An.stephensi* has shown to be a difficult vector to contain and is resistant to the currently

used insecticides in Sri Lanka. Intensified action to control its spread has been initiated. It is still not certain from where and when the species invaded the country but most likely through fishing boats given the locations of its detection. The emergence of this vector in Sri Lanka is a potential threat to sustaining malaria-free status as this is an urban vector, which if it spreads to the urban areas of the Western province from where most of the cases are currently being reported could have disastrous effects.

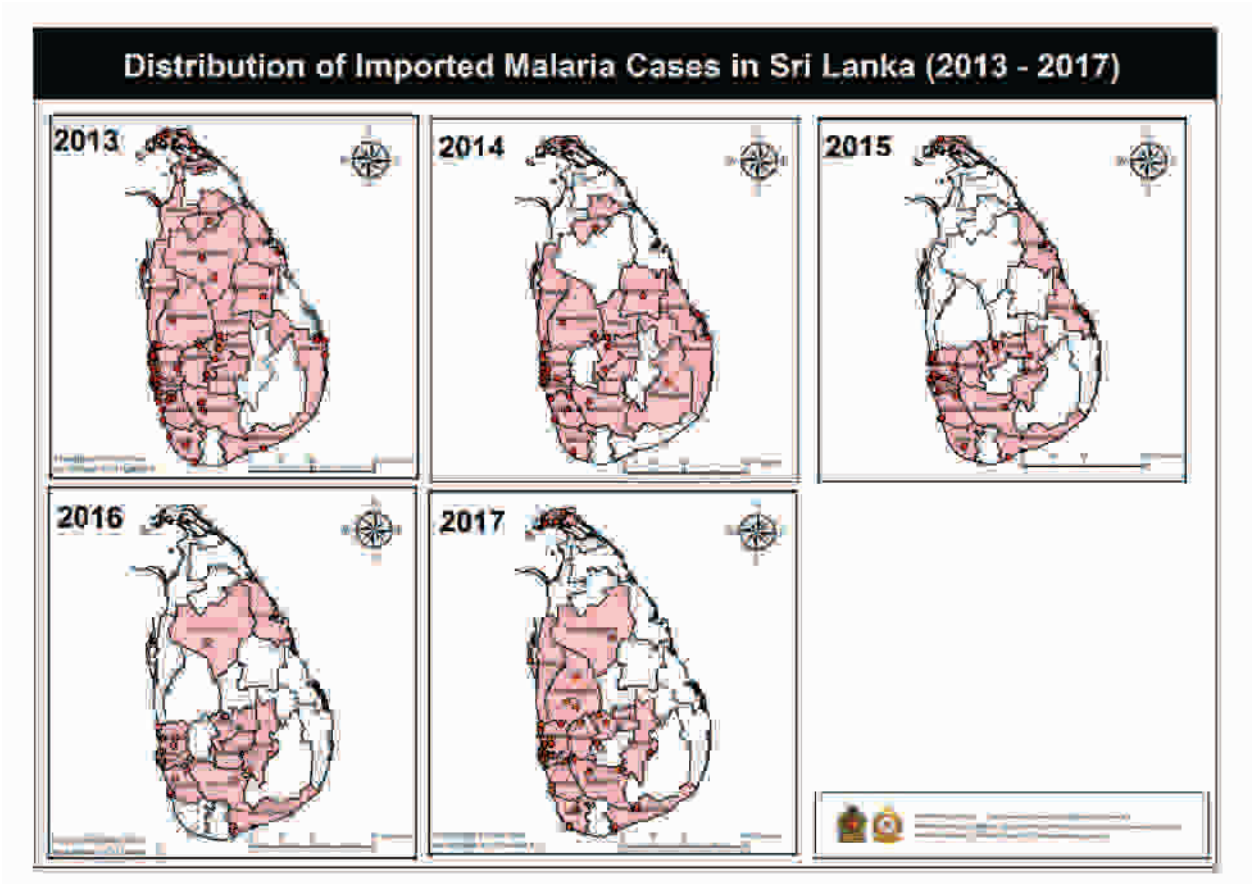

Figure 2. Distribution of imported malaria cases 2013-2017

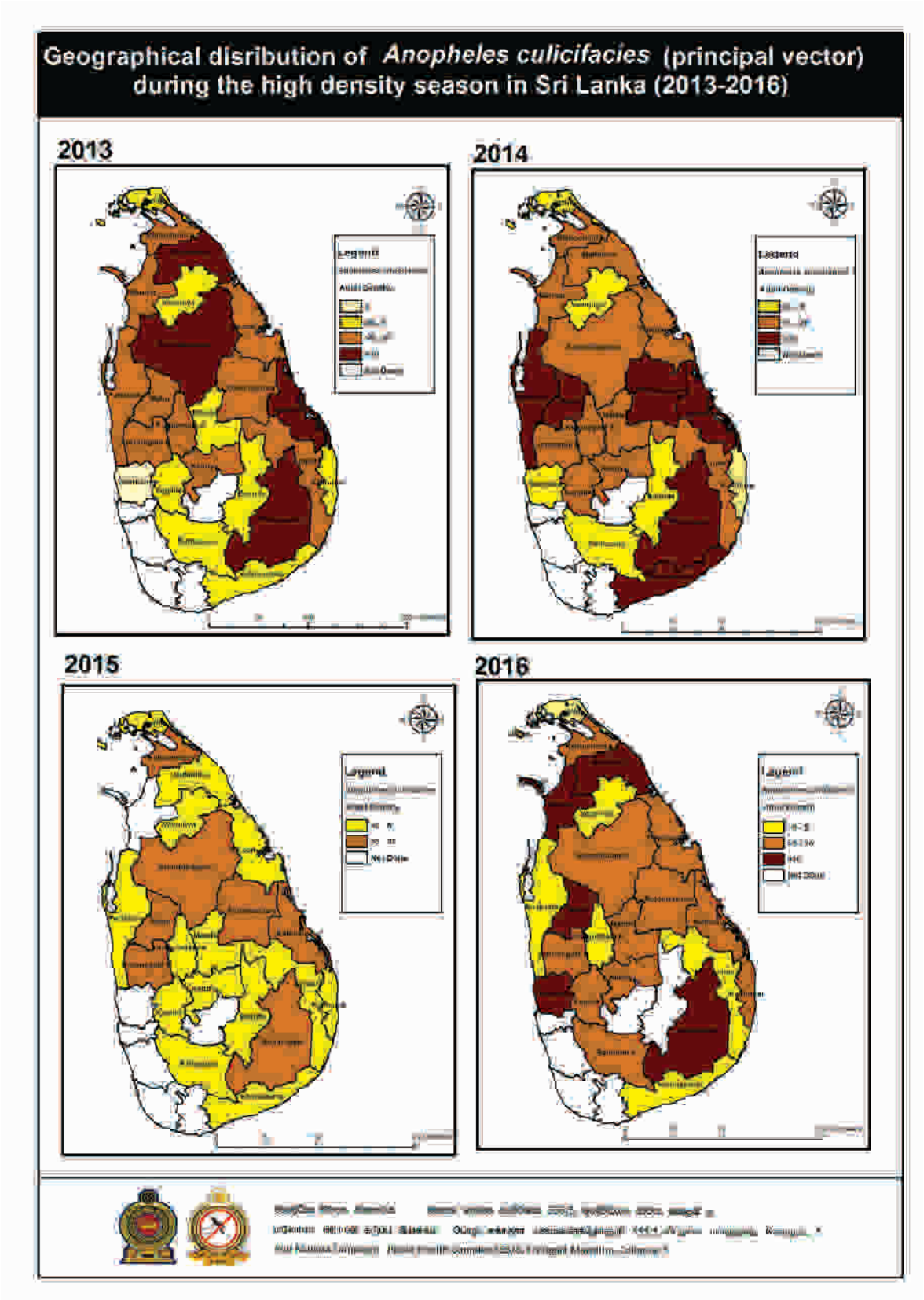

Figure 3. Adult *Anopheles culicifacies* density Sri Lanka in 2013

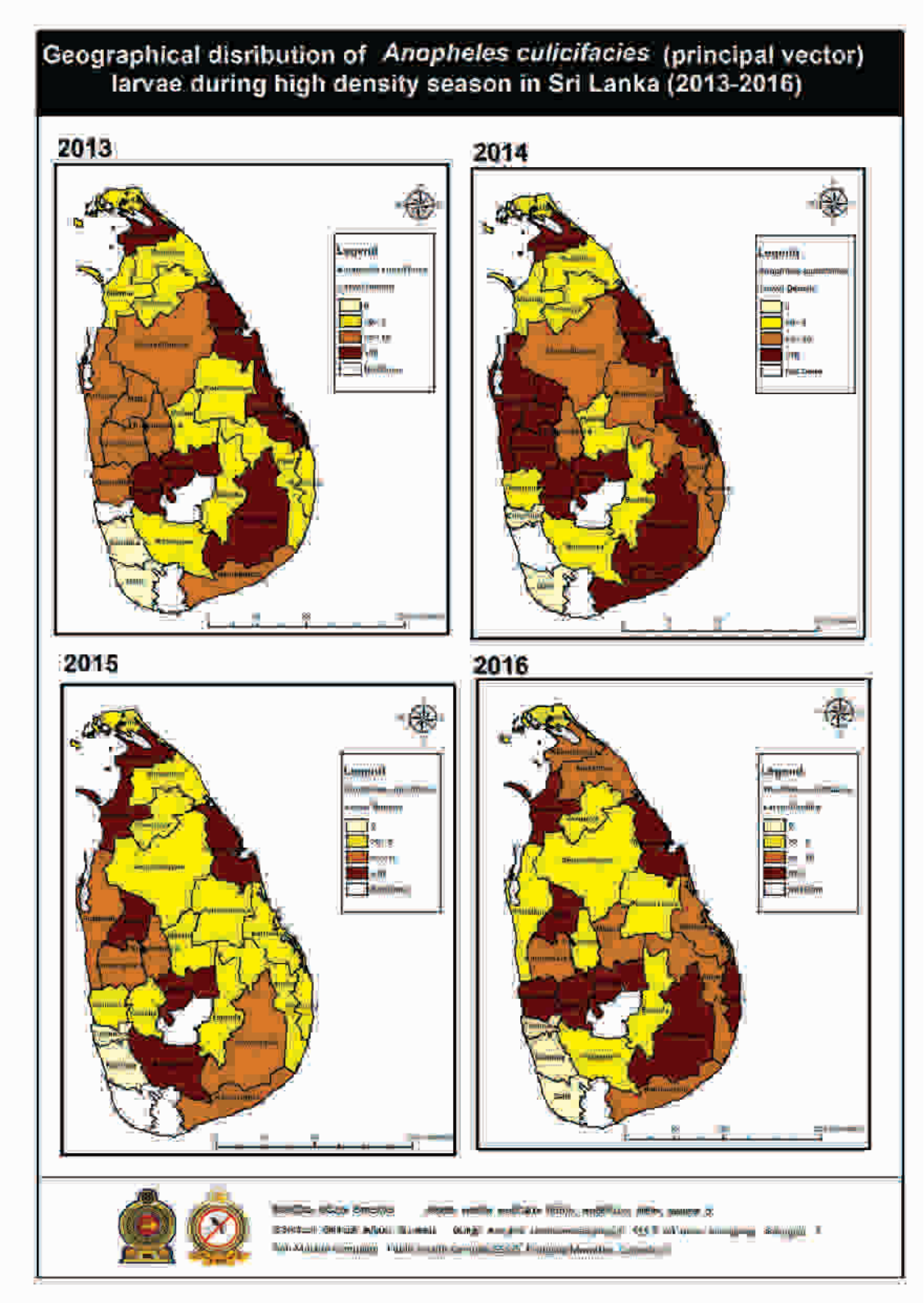

Figure 4. *Anopheles culicifacies* larval density in Sri Lanka 2013-2016

The detection of *An.stephensi* in the country has a major impact on entomological surveillance activities carried out by the AMC. While the ultimate goal is to eliminate the potential vector, the immediate objective is to contain the invasion of the vector within the Northern Province. While intensified control activities (use of chemical larviciding and introduction of larvivorous fish into wells) are being carried out in the Northern Province, intensified surveillance is carried out in all parts

of the country, especially in transport hubs in urban areas, to determine if the vector has already spread to other areas. Up until now, there is no evidence of invasion of *An.stephensi* beyond the Northern Province. The control measures used in the Northern Province thus far have shown to be effective in reducing the number of breeding sites.

With the decline in the number of cases of malaria being reported during the elimination and prevention of re-introduction phases, malaria has become a "forgotten" disease among health care providers. Most clinicians do not obtain a travel history from patients with fever and they do not consider malaria in the differential diagnosis of fever. In addition, the prevalence of dengue in epidemic proportions makes doctors suspect dengue as the main cause of the fever which then delays a diagnosis of malaria enhancing the potential for local transmission. The decline in the number of cases has also resulted in public health laboratory technicians losing their skills in detecting malaria parasites on microscopy. Maintaining a quality assured laboratory service which is mainly based on microscopy has been a major challenge.

During the malaria elimination and prevention of re-introduction phases, intensified surveillance and response was the mainstay of the national malaria programme and will continue to do so in the future. Malaria cases are being detected by passive case detection (PCD) and active case detection (ACD). PCD services are provided in government hospitals at base hospital level and above and in some Divisional Hospitals through dedicated public health laboratory technicians attached to the AMC. In addition, Rapid diagnostic tests (RDTs) are available in government hospitals for use during off-working hours and during holidays. In the private sector, some diagnostic laboratories and hospitals, based mainly in urban settings, provide malaria testing services by RDT or microscopy. ACD is carried out by teams of the AMC and includes both proactive and reactive ACD. Reactive ACD which includes neighbourhood screening of the population resident within 1 km radius of the residence of the case and in areas where the patient has stayed overnight in Sri Lanka within 2 weeks of onset of symptoms, and contact tracing, where other co-travelers of the imported malaria case (eg: pilgrims, businessmen, etc) are traced, tested for malaria and followed up, has been shown to be an efficient method to detect malaria cases early which otherwise may be missed that may lead to local outbreaks. An effective response was carried out for all reported imported malaria cases since 2013 which prevented further local transmission.

Proactive case detection (mobile malaria clinics, screening of ante-natal mothers, etc) is now more focused concentrating on areas of high vulnerability. These include areas close to ports of entry, areas in which vulnerable populations reside including foreign workers, areas in which foreign workers reside, and in areas which are frequented by tourists.

The relatively large number of cases detected by the private sector has implications on AMCs strategic approaches. The private health care sector, particularly in large cities, currently plays a significant role in the diagnosis and treatment of imported malaria under the guidance of the AMC. The performance of general practitioners in general in diagnosing malaria has been relatively poor. A focal point to deal with the private sector has been established. All private sector institutions notify the AMC when a case is detected as only AMC has antimalarial medicines.

The AMC is committed to providing quality assured services. Antimalarial medicines, RDTs, long lasting insecticidal nets (LLINs) and insecticides procured will be WHO pre-qualified products,

whenever available, as is done currently. In addition, quality assured diagnostic services will be provided including microscopy. The AMC is the sole importer of Artemisinin Combination Therapy (ACTs) and most of the other antimalarial medicines.

The summary of the situation analysis is given in Table 3.

Table 3. Situation analysis

Strengths	Weaknesses	Opportunities	Threats
✓ Dedicated infrastructure ✓ Trained human resources ✓ Zero indigenous cases and malaria-free certification from WHO ✓ Well defined strategy ✓ Availability of Standard Operating Procedures and guidelines for prevention of malaria re-introduction ✓ Political commitment ✓ GFATM funding till end 2018 ✓ Well organized health system with wide coverage ✓ Effective partnerships and inter-sectoral collaboration ✓ Good collaboration with WHO and development partners ✓ Technical support from independent experts ✓ Improved social and living conditions ✓ Availability of reports of external reviews of the programme ✓ Support from provincial health authorities ✓ Established accreditation scheme for microscopists ✓ Availability of a hot line ✓ Availability of rapid response teams in centre and in the region	✓ Waning priority by the health authorities and staff for malaria ✓ Vacant positions (PHLTT, HEOO, SMOO, PHFOO, PHII) ✓ Ageing infrastructure (vehicles, equipment, buildings etc.) ✓ Retirement of experienced technical staff in the near future ✓ RMO's still to be appointed to the Kalutara, Galle, Matara and Nuwara Eliya districts ✓ Provincial budget restrictions ✓ Lack of a web based surveillance system ✓ Regular transfer of trained personnel ✓ Health workers forgetting the disease ✓ Delayed diagnosis of imported malaria cases ✓ Infrastructure lacking for proposed new RMO offices ✓ Difficulty in procurement of drugs and insecticides in small volumes ✓ Inability to engage all practitioners in the private sector ✓ Poor public awareness on malaria ✓ Inadequate capacity building of health workers in both the government and private sectors ✓ No proper system in place for disposing expired insecticides.	✓ Building on existing partnerships ✓ Engagement of private sector through private sector regulatory council ✓ Increase in the allocation for health ✓ Possible funding from GFATM ✓ Technical support from WHO ✓ Task shifting of highly skilled staff ✓ Use of IT facilities such as internet ✓ Advisories for travelers ✓ Risk mapping using GIS ✓ Possibility of collaborating with other programmes (synergies across programs) ✓ New drugs /patient friendly dosages are being developed ✓ Digital epidemiology modeling tools are becoming available ✓ New vector control tools / devices are being developed	✓ Appearance of *An. stephensi* in Northern Province ✓ Increase in the number of foreign workers from malaria endemic countries ✓ Increase in travel to and from malaria endemic countries ✓ Zero disease burden leading to reduced visibility and attention ✓ Difficulties in procuring small quantities of good quality drugs and insecticide buffer stocks ✓ Competing priorities (dengue) ✓ Diverting resources (for control of other diseases) ✓ Waning skills of doctors and other staff ✓ Introduction of drug resistant strains and hrp2 deletion strains ✓ Decreased funding (both local and international) ✓ Development of resistance due to widespread use of insecticides for control of other diseases. ✓ Poorly organised private sector health care system ✓ Public resistance for community based interventions

Strengths	Weaknesses	Opportunities	Threats
	✓ Limited number of risk groups identified. ✓ No updated policy for insecticide use and monitoring resistance ✓ Limited availability of a 24-hour diagnostic service ✓ Deficiencies in supply chain management of drugs and supplies in both the government and private sectors. ✓ Restricted access to screen certain risk groups ✓ Waning motivation of health staff ✓ Absence of a mechanism to cover expenditure if a resurgence of malaria occurs ✓ Lack of functional cross border/neighbouring country collaboration. ✓ Waning vector control related skills among staff.		✓ Lack of a registry and a streamlined mechanism to track and screening programme for formal and informal foreign workers ✓ Endemic malaria in neighbouring countries and the region ✓ Introduction of insecticide resistant vector mosquito species ✓ Prevalence of *Anopheline* vectors in most parts of the country ✓ Regular reporting of imported cases ✓ Illegal migrants ✓ Illegal trade – difficult to elicit a proper travel history ✓ Community interest / engagement / NGO or CBO support- no longer availablefor an eliminated disease.

3.6.2. Anti-Malaria Campaign and malaria control, elimination and prevention of re-introduction in Sri Lanka

The need for an effective response to malaria was recognised prior to independence in 1948. Organized malaria control activities commenced in 1911 with the establishment of the Anti Malaria Campaign in Kurunegala when Sri Lanka was still a British colony. Subsequently, several more units of the Anti Malaria Campaign were established in other highly malarious regions of the country. A major achievement was the dramatic reduction in the country wide malaria incidence after the introduction of dichlorodiphenyltrichloroethane (DDT) in 1946. In 1958, the Government of the newly independent Ceylon launched a malaria eradication programme, in keeping with the WHO recommendations at that time.

Remarkable gains were achieved during the “Attack Phase” of the eradication programme, and near eradication status was reached in 1963 (with 17 reported cases of which 11 were imported cases). However, during the subsequent “Consolidation Phase” a major setback was experienced which culminated in a massive malaria epidemic in1967–1969. Several factors were thought to contribute to the failure; persistence of several undetected foci of malaria transmission, extensive intra-country population movements particularly related to gemmining, and complacency of many malaria control personnel rank high among these. It has also been reported that adequate financial support was not

forthcoming from the government at the time when the incidence was extremely low. The programme continued on eradication principles for several years and subsequently re-oriented as a control programme which included many elements of the earlier eradication programme.

Operationally, the AMC functioned as a vertical programme with a centralized structure until 1989. In 1989, the programme was transformed into a decentralized campaign implemented by 9 provincial health authorities under the technical guidance of the National Anti Malaria Campaign Directorate. The AMC Directorate is under the purview of the Line Ministry of Health (Figure 11) whereas the Provincial Programmes are managed by the Provincial Health Authorities under the Provincial Councils. Regional Malaria Officers are the focal persons responsible for prevention of malaria re-introduction in the provinces and districts. They report administratively to the Provincial and Regional Directors of Health Services, but receive technical guidance from the Directorate of the AMC.

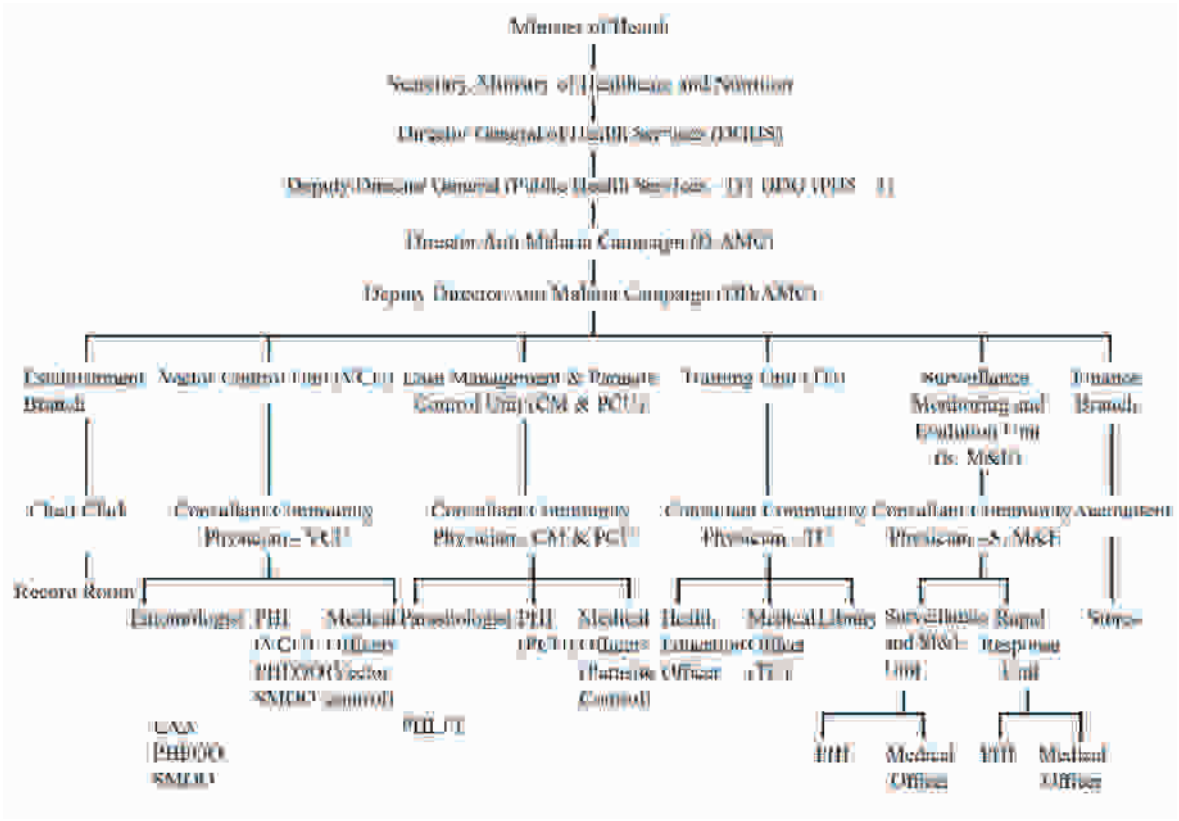

Figure 5. Organogram of the AMC HQ

In 2009, Sri Lanka embarked on a phased malaria pre-elimination programme after the end of the separatist war in the Northern and Eastern Provinces of the country and, in 2011, launched the malaria elimination programme. The last case of indigenous malaria was reported in October 2012, well ahead of the targeted date of end 2014. The success of the elimination programme is largely due to the sustained action that was possible due to the existing structure of the AMC and the evidence based approach adopted.

Steps to re-organise and re-structure the AMC have already been initiated. Two workshops were conducted in November 2017 to recommend re-organising the entomological surveillance and vector control, and prevention of re-introduction activities. The AMC proposes to continue with the current structure where the HQ provides technical guidance and support while the devolved structure through

the Provincial Health Authorities provides the implementation arm given the receptivity and vulnerability for re-introduction of malaria in the country and the recent emergence of *An.stephensi*, a major vector of urban malaria in neighbouring India,in the Northern Province. The early integration of the vertical Anti Leprosy Campaign with the general public health services of the country has been a failure due to lack of focus and accountability. Efforts to integrate TB control with the general health services in 2013-2014 were also a failure.
Given this experience and the resurgence of malaria in the late 1960's after near elimination, the structure of the AMC should continue as it is to build on the gains of being malaria-free since October 2012.

3.6.3 Lessons learned

Despite the successful elimination of malaria in Sri Lanka and the being malaria free since November 2012, many challenges have been faced by the AMC during the elimination and prevention of re-introduction phase. A major threat to prevention of re-introduction of malaria is the disease becoming a "forgotten disease" by clinicians and health care personnel. Furthermore, the generation of doctors graduating from now onwards, would have not encountered malaria cases during their training, and hence knowledge and expertise on malaria among clinicians will wane. The AMC has adopted several strategies to inform clinicians about the threat of re-introduction of malaria to the country which have shown to be useful. The updates provided to clinicians and liaising with professional organisations and academic bodies to reach a large number of professionals will have to be continued using novel modes of communications.

A major problem in the prevention of re-introduction phase has been in defining the risk population and vulnerable groups specially because there is a rapid turnover of migrant labour and travellers which requires a continuous re-defining of the groups. It has been a learning exercise for the AMC as guidelines for PoR are scant. New risk groups are being identified continuously. Contacting individuals and groups has become a tedious time and resource consuming task.

The emergence of a potential new vector, *An.stephensi,* has raised many challenges. The response initiated by the AMC was a test of its responsiveness. The immediate and targeted response was due to the existing structure of the AMC which facilitated rapid action. The emergence of this vector species and the many challenges such as malaria cases being reported from traditionally non-malarious areas re-iterates the need for a focused programme with dedicated staff and infrastructure.

The most productive and cost effective surveillance method has been passive case detection; PCD services are distributed throughout the country and will have to continue until global malaria eradication is achieved. A major challenge has been to maintain the diagnostic skills of staff for which the AMC conducts training programmes on an almost continuous basis. The AMC currently has 9 level 1 PHLTs.

A few programmatic management issues have been identified. Most of these are due to administrative reasons as the AMC being a government institution has to follow government rules and regulations. AMC has also been able to reduce dependency of donor funding in the last few months and has been able to access local funding through the Ministry of Health and Provincial Health authorities. Currently, more days of entomological surveillance are funded by the Provincial Health authorities.

The number of staff members supported by donor funding has also been trimmed. The Ministry of Health and Provincial Health authorities are confident of bridging donor funding gaps.

Sri Lanka has demonstrated that interruption of indigenous malaria transmission can be sustained in a tropical setting provided that complacency is avoided and by ensuring a programme structure and organisation that does not dilute the focus of PoR activities, two key elements that were lacking in the previous near-elimination effort in the 1960s. The key elements that were responsible for the successful prevention of re-introduction of malaria for 5 years should be continued unabated.

3.6.4 The way forward

Case and *entomological surveillance,* and response for malaria will continue to be the major strategy in the PoR phase. It has been estimated in 2016 that a five-year resurgence could cost an estimated SLR 25 billion (USD 169 million).Given the estimated gains in investing in prevention of re-introduction of malaria, the AMC, the Ministry of Health and GoSL are convinced and committed to sustain malaria-free status. The required effort and resource investment for continuation of a rigorous surveillance and response system is entirely justified. Ports of entry to the country, both sea and airports, building construction sites such as the accelerated building of highways, free-trade zones, new sea ports and industrial parks and other imported-labour intensive activities will need to be the focus of enhanced surveillance for malaria.

Entomological surveillance will play a crucial role in monitoring receptivity and the distribution of *An.stephensi.* The web based surveillance system to be introduced will incorporate receptivity and vulnerability data to generate timely updated risk maps.

Sustaining awareness of malaria and available services among medical practitioners and other health sector staff through in-service training, and continued collaboration with medical educators and professional medical associations and colleges would be a priority. A high quality,accredited, malaria diagnostic service which is currently in place needs to strengthened and continued.

Advocacy: The focus on prevention of malaria re-introduction at the highest levels of government should be continued to ensure strong political and financial commitment especially as Sri Lanka is trying to wane off donor assistance for malaria. Dedicated funding for prevention of re-introduction of malaria should be provided at central level through the Ministry of Health and through Provincial Health Authorities at the regional level.

The re-organising and restructuring of the AMC has been initiated. This process will evolve over time based on the needs of the country and the organisational changes in the Ministry of Health. As the most number of cases are being reported from the Western province and the growing threat of the spread of *An.stephensi*, the AMC proposes to establish Regional Malaria Offices in the districts that do not have Regional Offices (Colombo, Gampaha, Kalutara, Galle, Matara and Nuwara Eliya). The proposed programme re-organisation includes sharing of human resources and information between different disease control programmes and task shifting of existing staff.

One among the many factors, which are widely believed to have contributed to the decline of malaria in Sri Lanka during the past few decades, is the deployment of evidence-based control operations on the basis of an extensive national research effort on malaria. Such a strong research and technical basis would well serve to sustain the prevention of re-introduction of malaria programme.

Another major task ahead is to develop innovative methods of keeping the interest of all stakeholders including policy makers, administrators, clinicians and health care personnel, and even the vulnerable risk groups. This will have to be achieved in a setting where GoSL will have to finance funding gaps resulting due to waning donor funding.

The Way Forward

- Case surveillance and Response
  - Detect and provide effective treatment to imported cases early
  - Investigate and classify cases
  - Identify vulnerable populations
- Entomological surveillance to identify high risk areas
  - Identify highly receptive areas
  - Respond rapidly to potential threats
- Raise awareness of medical practitioners regarding prevention of re-introduction of malaria and available services, and influence the undergraduate and postgraduate medical curricula accordingly
- Raise awareness among vulnerable/risk groups on malaria
- Ensure quality diagnostic and treatment services
- Sustain political commitment and adequate funding
- Foster and build partnerships
- Ensure a focused AMC dedicated for prevention of re-introduction of malaria
- Invest in research for prevention of re-introduction of malaria

4. Evidence based strategic planning

4.1 Strategic priorities

With no reports of indigenous transmission of malaria in Sri Lanka since October 2012 and as the vectors responsible for malaria transmission is present in the country, the strategic priority is to prevent its re-introduction and re-establishment of malaria in through imported malaria cases. Based on this principle, the following strategic approaches are proposed:

1) Continuous assessment and mapping of receptivity and vulnerability of re-introduction / re-establishment of transmission by stratification, regular monitoring and implementing mitigating measures.
2) Maintaining intensified surveillance for early detection and effective treatment of malaria cases and ensuring mandatory reporting of cases in both the public and private sectors.
3) Maintaining knowledge and skills of health staff.
4) Ensuring availability of quality diagnostic facilities to diagnose and treat malaria cases.
5) Ensuring quality and adequate coverage of activities to prevent re-introduction/re-establishment of malaria.

6) Optimising entomological surveillance and response for integrated vector management relevant for PoR.

7) Strengthening outbreak preparedness, and ensuring adequate prevention and rapid response to potential malaria outbreaksituations.

8) Advocacy for political and financial commitment to ensure sustaining malaria-free status.

9) Sustaining critical partnerships.

10) Maintaining a high level of awareness of malaria and the risk of its re-introduction among politicians, clinicians and high risk groups.

Detecting malaria cases early and their effective treatment and management through intensified surveillance will be the mainstay of PoR activities. As much as there is a need to identify vulnerable populations, most cases, as seen currently, are likely to present in clinical care settings. Provision of quality diagnosis should be made available in all primary care settings in both the public and private sectors. As evidence suggests that time to diagnosis is long due to malaria being a "forgotten and unfamiliar disease", raising awareness among practitioners and motivating them to refer fever cases for blood smear/RDT examination is extremely important. This will be done through advocacy, training and continuing medical education programmes through incorporating modules on malaria in training programmes of health professionals and through professional medical associations. In addition, vigilance will be intensified through ACD among identified vulnerable groups.

The quality assured diagnostic service accreditation system will be strengthened to have least Level 1 proficient Public Health Laboratory Technician in each district/region.

The emergence of *An.stephensi* has been a major challenge for the AMC. The distribution and spread of the vector will have to be monitored country-wide through entomological surveillance and appropriate vector control instituted wherever the vector species is found with the goal of elimination the vector.

Vigilance and outbreak response will be key to prevention of re-introduction. Standard Operating Procedures (SOPs) have been developed and dedicated rapid response teams have been identified. Mock exercises will be conducted annually to keep the teams alert.

Advocacy will be a major strategy as Sri Lanka transits from donor funding. The resulting funding gaps will have to be matched by increased government funding.

4.2 Maintaining expertise and capacity in the health system to sustain malaria-free status

Although the country has achieved malaria-free status, it is important that capacity be built in areas that are deemed inadequate. It is equally important to retain the expertise and capacity in the post-certification era to sustain malaria-free status and to respond to any untoward situation. With the restructuring and re-organising of functions of staff, additional training for staff will be required. Staff will need to keep abreast of global malaria control, elimination and prevention of re-introduction activities for which regular re-fresher training programmes will be required; these will also help to keep malaria on the radar.

5. Strategic Framework (2018-2022)

The broad aim of the health policy of Sri Lanka is to increase life expectancy and improve quality of life, by control of preventable diseases and by health promotion activities. The country boasts of a unique health care and education system where all healthcare and education including higher education can be obtained free of charge. This has resulted in some of the country's health & education indices becoming the best among developing nations having low per capita incomes.

Given below are the vision, mission and the objectives of the Ministry of Health.

5.1Ministry of Health

Vision
A Healthier Nation that contributes to its economic, social, mental and spiritual development

Mission
To contribute to social and economic development of Sri Lanka by achieving the highest attainable health status through promotive, preventive, curative and rehabilitative services of high quality made available and accessible to people of Sri Lanka.

Objectives
- To empower the community for maintaining and promoting their health
- To improve comprehensive health services delivery actions
- To strengthen stewardship management functions
- To improve the management of human resources in the health sector

The main objective of the Health Development Master Plan of improving health status and reducing inequalities will be achieved by implementing the following strategic objectives. These are

Specific Objectives
1. To provide technical advice in policy formulation, planning and programming on promotion of health through Advocacy, Behaviour Change Communication (BCC), Social Marketing and Community Mobilisation.
2. To support various health programmes conducted by the Department of health services and other health related sectors through advocacy, behaviour change communication and social mobilization for health actions.
3. To promote, support and undertake planning, implementing, monitoring and evaluation of health promotion programmes in different settings.
4. To promote health care consciousness among the masses through mass media.
5. To assist and develop Information, Education and Communication (IEC) and BCC materials required for health promotion and behaviour change communication
6. To develop the capacities of manpower, both within and outside the department of health services in order to act as health promoters and change agents through advocacy, behaviour change communication and social mobilization.

7. To educate and empower the public on health issues, to enable them to increase control over and promote individual and community health.
8. To coordinate with health related governmental, non-governmental and international agencies and organization in promoting health of people.
9. To develop managerial capacities of health and health related sectors to manage health promotiveprogrammes
10. To monitor and evaluate health promotive programmes and facilitate monitoring and evaluation of them at different levels.
11. To support and undertake research related to behaviour change of the community and social mobilisation.

5.2 Prevention of re-introduction and re-establishment of malaria in Sri Lanka 2018 – 2022

The vision, mission and the objectives of the Anti Malaria Campaign of the Ministry of Health, which is the principal organization responsible for prevention of re-introduction of malariais given below.

Vision
A malaria-free Sri Lanka

Mission
Plan and implement a comprehensive programme to sustain intensive surveillance, comprehensive case management, outbreak preparedness, and rapid response for prevention of re-introduction and re-establishment of malaria in Sri Lanka.

Goal

To maintain malaria-free status

Objectives of the Anti Malaria Campaign
1. To prevent re-introduction and re-establishment of malaria in Sri Lanka
2. To maintain zero mortality due to malaria in Sri Lanka

5.3 Guiding principles

The National Malaria Strategy is based on the following guiding principles:

- Using locally appropriate, evidence based,environmentally friendly policies and strategies conforming to recommendations of WHO's Global Malaria Programme and the SEA Regional strategy for prevention of re-introduction of malaria and taking into account the health system in the country.
- Equity
- Universal access to quality malaria diagnosis, treatment and prevention
- Emphasis on coverage of vulnerable populations
- Value for money
- Good governance

- Being sensitive to rights of people
- Being gender responsive
- Multi-sectoral collaboration
- Community participation

Strategies

In order to achieve the above objectives, the following strategies will be adopted:

1. Universal access to malaria diagnosis and treatment,
2. Surveillance and response,
3. Malaria prevention,
4. Information, education and communication, and advocacy, and
5. Fostering partnerships

Under the overarching cross cutting themes of

1. Quality assurance,
2. Monitoring and evaluation,
3. Capacity building,
4. Improved programme management, and
5. Research and innovation through operational research

Specific activities

The following specific activities will be carried out.

Objective 1: To prevent re-introduction and re-establishment of malaria in Sri Lanka.

i. Continuous assessment and mapping of receptivity and vulnerability of re-introduction / re-establishment of transmission by stratification, regular monitoring and implementing mitigating measures.

ii. Maintain intensified case and entomological surveillance.

iii. Ensure universal access to quality assured malaria diagnostic and treatment services free of charge.

iv. Liaise with the private sector to provide regulated quality diagnostic and treatment services.

v. Detect all infections early and treat all patients with quality assured antimalarial medicines based on national treatment guidelines to ensure radical cure and to prevent secondary transmission.

vi. Ensure all suspected cases are tested for malaria (microscopy/RDT).

vii. Establish web based real time surveillance system.

viii. Provide regular information to health care providers on early detection of imported malaria cases.

ix. Immediate notification of all patients strongly suspected of having malaria.

x. Investigate all cases and foci (including reactive parasitological surveillance and entomological surveillance) within 48 hours of notification.

xi. Respond to all cases within 3 days of notification according to the approved scope of work.

xii. Conduct entomological surveillance in accordance with the new national guidelines.

xiii. Implement vector control measures as required ensuring usage of quality vector control products in an effective manner guided by updated entomological surveillance information.

xiv. Ensure quality assurance in malaria diagnostic services.

xv. Re-orient public and private health sector staff towards PoR.

xvi. Maintain functional rapid response teams for quick and effective response to a secondary case or focus.

xvii. Maintain adequate buffer stocks of quality LLINs, insecticides, diagnostics and antimalarial medicines.

xviii. ACD among vulnerable populations.

xix. Protect vulnerable populations/risk groups.

xx. Foster and maintain relevant partnerships (private sector, other sectors, international agencies, etc)

xxi. Harness political and financial support for PoR.

xxii. Formulate a communications strategy for PoR to increase awareness among stakeholders (community, travelers, health care providers, migrant populations).

xxiii. Educate the community, especially travelers with pre travel health advice and on the importance of sustaining malaria-free status.

xxiv. Provide chemoprophylaxis to travelers.

xxv. Regular review and re-orientation of the national malaria programme for PoR

xxvi. Review and update national guidelines and SOPs for PoR.

xxvii. Develop manuals and guidelines for RMOs and other staff.

xxviii. Maintain a well-trained and competent human resources at the centre and the district level.

xxix. Provide guidelines on PoR for inclusion in all medical and relevant allied health sciences undergraduate and appropriate postgraduate training programmes.

xxx. Follow up of malaria cases

xxxi. Review all cases and inform policy changes.

xxxii. Establish real time supply chain management system for malaria commodities

Objective 2: To maintain zero mortality due to malaria.

i. Provide universal access to malaria diagnostic and treatment services free of charge.

ii. Detect all infections early and to treat all patients with quality assured antimalarials based on national treatment guidelines to prevent complications in both public and private health sectors.

iii. Ensure all suspected cases are tested for malaria (microscopy or RDT).

iv. Ensure all malaria cases are admitted to hospitals and managed.

v. Make available antimalarial medicines (including second line and injectable medicines) to diagnostic and treatment facilities when needed in a timely manner.

vi. Inform clinicians on management of malaria (both uncomplicated and severe).

vii. Carry out a medical audit of cases when recommended by the Case Review Committee.

6. Strategic Plan

6.1 Preamble

The strategies in the National Malaria Strategic Plan 2018-2022 were developed taking into account the guiding principles and the success of Sri Lanka preventing the re-introduction of malaria in to the country in line with the Global Technical Strategy for Malaria 2016-2030 of the WHO and the Regional Strategy for Malaria of the WHO South East Asia Region. While acknowledging the fact that the strategies adopted for this planning cycle are not entirely new in comparison to the elimination and prevention of re-introduction phases prior to certification, the mix, priorities and implementation approaches are different. Likewise, the targets and methods employed to achieve them are different.

The principal shift of activities is away from routine and exhaustive entomological surveillance and vector control to one of focused targeting of activities to measure vulnerability in order that it may be coupled with receptivity for appropriate action. The shift is also away from maintaining a generally high ABER to identifying and screening of high risk groups. Another third major focus is to minimize further the time to diagnose of imported malaria cases.

The National Malaria Strategic Plan 2018-2022 is presented in a disaster management context as shown in Figure 2. It portrays the principle of risk reduction in the domains of prevention, mitigation and preparedness. For response, the short- and long-term strategies have been outlined. The entire strategy and activities will be implemented under the overarching cross cutting areas of quality assurance, monitoring and evaluation and operations research. The strategies for each of the domains are based on the Global Technical Strategy for Malaria 2016-2030 of the WHO Global Malaria Programme.

Risk Reduction			Re-introduction/ Re- establishment	Response	
Prevention	**Mitigation**	**Preparedness**		**Short-term**	**Long-term**
1. Surveillance (ACD, PCD)	**1. Early diagnosis and prompt treatment**	**1. Rapid response teams**		**1. Surveillance**	**1. Surveillance**
1.1 Parasitological screening	1.1 Therapeutic efficacy monitoring	**2. Develop SOPs**		1.1 Case and foci investigation	1.1 Monitoring of foci
1.2 Case and foci investigation	**2. vector control as required**	**3. Buffer stocks (diagnostics, antimalarial drugs, LLINs, insecticides)**		1.2 Entomological investigation	1.1.1 Entomological surveillance
1.3 Entomological surveillance	**3. Risk maps, Forecasting**	**4. Administrative structures in place**		1.3 ACD, PCD and treatment	1.1.2 ACD, PCD and treatment
1.4 Malaria information system		**5. Training (all levels in all important areas)**		**2. vector control as required**	**2. Vector control as required**
2. Case Management		**6. Insecticide resistance monitoring**		**3. Alerts**	
3. Chemoprophylaxis		**7. Capacity building**		**4. Mobilization of resources**	
4. Advocacy		**8. Infrastructure**		**5. Communication**	
4.1 Policy makers		**9. Mechanism to access emergency funds**			
4.2 Health care providers					
5. IEC/BCC					
6. Partnerships					
7. Limited vector control					
8. Monitoring receptivity and vulnerability					
Quality Assurance					
Operational Research					
Monitoring and Evaluation					

Figure 6. National Malaria Strategic Plan at a glance

The WHO Global Technical Strategy 2016-2030 is based on 3 pillars and 2 supporting elements (Figure 3). This strategy includes aspects of malaria control, elimination and prevention of re-introduction. The three pillars are

1. Ensure universal access to malaria prevention, diagnosis and treatment
2. Accelerate efforts towards elimination and attainment of malaria-free status, and
3. Transform malaria surveillance in to a core intervention.

The two supporting elements are

1. Harnessing innovation and expanding research, and
2. Strengthening the enabling environment.

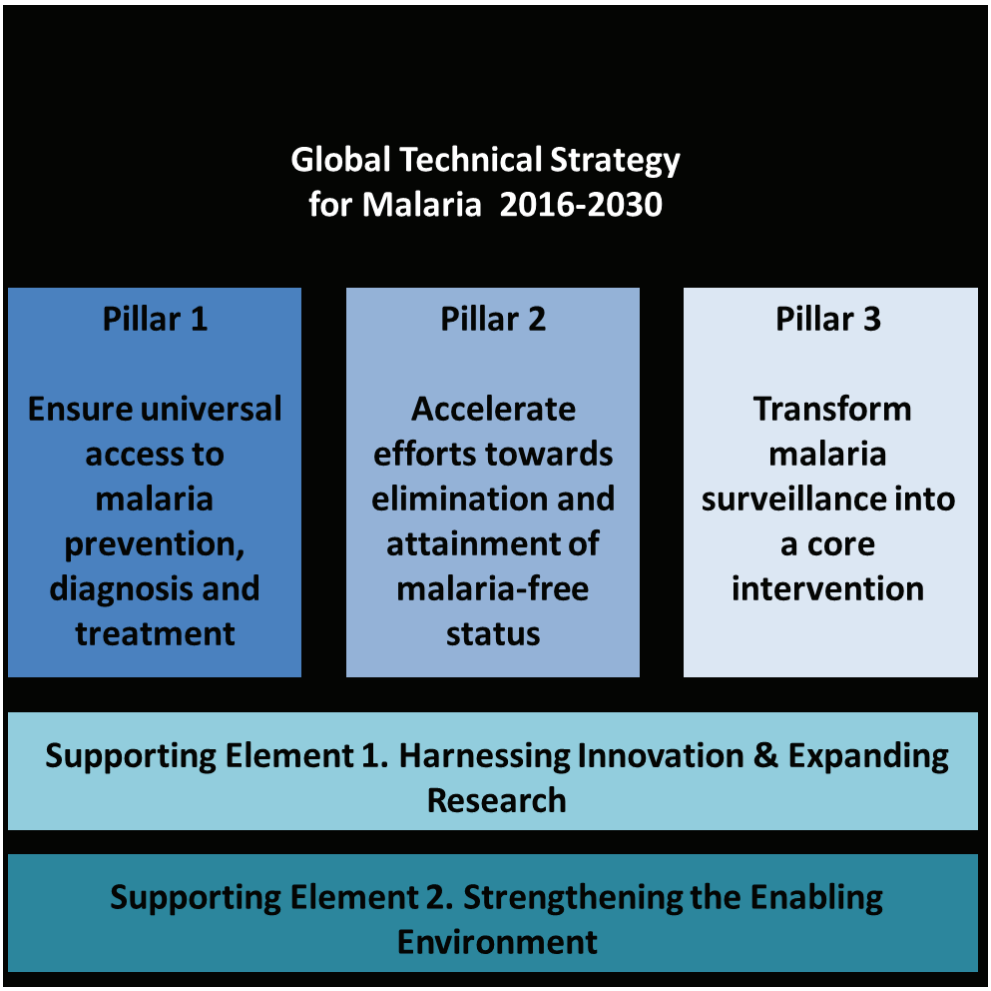

Figure 7. Global Technical Startegy for Malaria 2016-2030

This strategic plan was developed based on the 3 pillars and 2 supporting elements of the Global Technical Strategy 2016-2030 (GTS) as they apply to prevention of re-introduction. Although pillar 2 of the strategy may not be directly applicable to Sri Lanka as Sri Lanka has already been certified as malaria-free, this pillar has been modified as to remain malaria-free; prevention of re-establishment of malaria is a target of the GTS.

6.2 Universal access to malaria diagnosis and treatment

Universal access to diagnosis and treatment will be provided by the extensive network of health care institutions of the Ministry of Health and through other health care providers (private sector and hospitals of Sri Lanka Police and the armed forces). All suspected malaria cases have to be notified to the AMC immediately for which a hotline is available. Microscopy services will be provided in government health care institutions where PHLTs and MLTs are available. RDTs will be available in Base Hospitals and above and in some Divisional Hospitals and Primary Medical Care Units based on the vulnerability of the population. Private sector health care services will provide diagnostic services. The private health care sector will be issued guidelines on RDTs to be used and the AMC will train their laboratory technicians on microscopy.

Complete and radical treatment of all malaria cases will be guided by the AMC based on the National Treatment Guidelines. Patients with *P.vivax* and *P.ovale* will be tested for G6PD deficiency prior to administering radical cure with a 14-day course of primaquine. Antimalarial medicines will be procured only by the AMC to ensure availability of effective quality assured antimalarials throughout the country. First line treatment will be available at major hospitals, AMC HQ and in all RMO offices; second line treatment will be available at AMC HQ and RMO offices. As soon as a malaria case is notified, AMC HQ and/or RMOs will visit the patient in the hospital and confirm the diagnosis by microscopy. Suspicious cases will be subjected for PCR confirmation.

All confirmed cases will be admitted to hospital for a minimum of three days for appropriate treatment under DOTS. On discharge from hospital, all patients will be followed up by staff of the AMC HQ/RMOs on days 3, 7, 14, 21, 28 and 42 days and, thereafter, for *Plasmodium vivax* and *Plasmodium ovale* cases, monthly upto one year. During the period of follow up, therapeutic efficacy testing will be carried out on all reported cases using a modified WHO protocol. In the case of *P.vivax* and *P.ovale* infections, patients would be monitored for compliance of radical treatment.At each follow up visit, presence of fever and other symptoms of malaria will be obtained and a blood smear will be taken for microscopy to confirm parasite clearance. All positive smears and follow up smears are archived.

6.3 Surveillance

Surveillance will be the key intervention in the PoR phase. Parasitological surveillance will be conducted to detect cases early for prompt treatment in order to prevent complications due to malaria and onward transmission of malaria within the country. Both passive (PCD) and active (ACD) case detection will be conducted.

6.3.1 Passive case detection

In government hospitals, passive case detection will be conducted where PHLTs and MLTs are stationed. There are 182 hospitals with PHLTs and MLTs testing for malaria. Microscopy will be the main method used for PCD in these hospitals. RDTs will be used for PCD in Base Hospitals and above and in some divisional hospitals and other institutions based on need; RDTs are used when PHLTs and MLTs are not available and during non-working hours and in emergencies in institutions where PHLTs and MLTs are available. RDTs will be kept in the custody of a responsible officer providing access to them 24 hours a day. Regular updates to clinicians on the availability of such facilities will be provided. The AMC has provided guidelines on screening for malaria.

In the private sector, a number of hospitals in the major cities provide this service. Where the facility is available, most use different types of RDTs. Some institutions also provide microscopy services. The AMC will provide guidelines of quality assured RDTs for use in the private sector through the Private Health Regulatory Council of the Ministry of Health. The AMC will also provide regular training of laboratory technicians in the private sector through courses conducted throughout the year.

Hospitals of Sri Lanka Police and the Armed Forces use RDTs. Specific instructions will be provided to these hospitals as regards which RDTs to use. There is close collaboration between the AMC and these hospitals.

All hospitals have to notify the AMC whenever a malaria infection is detected.

6.3.2 Active case detection

Active case detection will be conducted in two ways:

1) Proactive case detection
2) Reactive case detection

1) Proactive case detection will focus on identified risk groups. Risk group screening sessions will be conducted among vulnerable populations and in areas with high vulnerability and high receptivity. Vulnerable groups include returning refugees, foreign labour, Sri Lankan armed forces returning from overseas peace keeping missions, foreign refugees, persons travelling on business to malaria endemic areas, fishermen and gem traders visiting Africa, pilgrims to India and Myanmar, and other groups that would be identified in the future. Possible integration with other disease programmes (TB screeningprogrammes, NCD screening programmes) for malaria screening will be sought to increase intervention coverage.

It is estimated that approximately 8 such screening programmes per month will be conducted in each RMO region. In addition, risk group screening programmes will be conducted by the AMC headquarters in the Colombo, Gampaha, Kalutara and Galle districts until Regional Malaria Officers to these districts are appointed and dedicated teams are established. The number of programmes conducted will depend on the number of cases reported and the variety of vulnerable groups resident in the areas. Support of field health staff and community/civil society organizations will be obtained in identifying and locating the risk groups.

2) Reactive case detection will be conducted as part of case investigation whenever a case is reported. Persons resident within a one kilometer area of the patient's residence or places visited by the patient will be screened for malaria according to the approved scope of work when a malaria case is detected to determine if any local transmission is occurring. A second reactive screening will be done approximately three weeks after the first to determine if there is ongoing local transmission after accounting for the incubation period of malaria.

   Contact tracing will be part of reactive ACD where contacts of malaria cases who have travelled with them will be identified and followed up. This will include contacts of pilgrims, armed forces, refugees, business contacts and other vulnerable groups who have traveled to malaria endemic countries. The activities will be coordinated and conducted by AMC headquarters and the Regional Malaria Offices.

   It is expected that about 400 screening programmes will have to be conducted a year assuming that about 100 imported malaria cases will be reported in year. The number of days reactive screening programmes will be conducted will depend on the population density of the areas in which patients are resident.

   Guidelines for surveillance will be developed to define scope of screening programmes including strategies to be used for surveillance.

6.3.3 Case detection

In addition to malaria being detected by ACD and PCD, a number of imported malaria cases have been detected accidentally on blood picture examination by Haematologists when patients have been referred to them for blood picture examination while investigating for thrombocytopenia. Many malaria patients presenting with fever have been tested for dengue infections overlooking malaria as dengue is a major public health problem in all parts of the country; thrombocytopenia is also a common feature of dengue infection. Haemotologists will be regularly reminded to look for malaria parasites during routine blood smear examination through their professional College and visits to haematology laboratories by AMC staff. In addition, when AMC personnel visit the

peripheral institutions to update doctors on the malaria situation and the need to refer for malaria testing, Haematologists will also be updated.

6.3.4 Case management

All malaria cases will be treated according to National Malaria Treatment Guidelines after diagnosis is confirmed by microscopy or PCR testing. Quality assured antimalarials, when available will be procured by the AMC

Clinicians "forgetting or being unfamiliar with malaria" with malaria elimination leading to delays in diagnosis and treatment resulting in severe malaria have been reported previously (ref). Clinicians will be regularly updated on the need to ask for a travel history in patients presenting with fever, to consider malaria in the differential diagnosis of fevers and the importance of testing for malaria. The training sessions (both group and individual) will be organized through the professional associations and colleges such as the Sri Lanka Medical Association and regional clinical societies and combined awareness raising programmes with other health programmes (TB, Filarisis, etc). Both doctors in the public and private sectors will be targeted. Updates will be provided jointly by the AMC and the concerned association. In addition to the need for testing fever patients for malaria, clinicians will be updated on features and diagnosis of severe malaria, need for immediate notification, when and whom to contact in case a malaria case is detected, and where to obtain treatment and advice, and treatment guidelines.

As at present, the dedicated 24-hour hotline that is available will be continued to provide assistance to health care providers. The hotline is also used for notification of cases. As soon as a case is suspected and notified, the AMC will inform the relevant officer (from HQ or the RMO) who would visit the patient and confirm the diagnosis and initiate treatment based on the scope of work guidelines of the AMC. Free treatment will be provided by the AMC for all confirmed malaria cases including foreigners who have been granted special permission for free treatment of malaria.

AMC will procure second line antimalarial medicines based on recommendations of the Global Malaria Programme (GMP). Second line anti-malarial medicines will be stocked at AMC HQ and all Regional Malaria Offices. They can be dispatched to any part of the country within two hours of a request if needed.

The National Treatment Guidelines will be reviewed every two years and updated if required. The drug resistance patterns, the recommendations of the GMP and response to reported cases and from where infection is likely to have been contracted will be taken into consideration when updating national treatment guidelines. Any changes will be notified to all health care providers through circulars.

During the elimination phase and in the prevention of re-introduction phase after the last indigenous case was reported in October 2012, the AMC faced two major challenges in estimating the quantities of medicines to be purchased and the procurement of small quantities of antimalarial medicines. The amount of antimalarial medicines to be procured will be decided in consultation with the Technical Support Group; an adequate amount of buffer stocks will be maintained to

cover any unexpected outbreaks of transmission. The AMC will explore mechanisms to procure small quantities of antimalarial medicines through various mechanisms.

Two officers of the AMC and a clinician will be trained on management of severe malaria at Mahidol University, Bangkok, Thailand annually. The training will be a 5-day programme on management of malaria including severe malaria. This will ensure that adequately trained staff on management of severe malaria is available in the AMC at any point in time as medical officers are transferred every four years.

6.3.5 Case and foci investigation

Investigation of all cases will be commenced within 2 days and completed within 7 days of notification. Case investigation will include obtaining a detailed history of the illness (including a detailed travel history) and names and addresses of contacts, visiting areas where the patients had visited or stayed within the past 2 weeks from the onset of symptoms and obtaining information on potential spread of the infection in these areas. Reactive parasitological surveillance will be carried out within a 1 km radius of the patient's residence or any place the patient had stayed overnight within the past two weeks and among contacts who had travelled with the patient. Entomological surveillance will be carried out in the same areas to determine the presence of vectors and potential for onward transmission. The details of methods and techniques used for entomological surveillance are given under entomological surveillance. The results will be collated and submitted to AMC HQ for consideration by the Case Review Committee for classification of the case.

If a focus is detected it will be investigated as per guidelines that were recently updated (ref). Foci will be monitored on a regular basis for three years after the last case of local transmission was reported. Foci will be classified annually depending on the data obtained from monitoring by the Case Review Committee (CRC).

6.3.6 Entomological surveillance

The AMC has relied heavily on entomological surveillance for targeting interventions in malaria control and elimination. A workshop was held from 9th to 11th November 2017 to discuss strategies for entomological surveillance in PoR. Based on the recommendations of the workshop, no routine surveillance will be conducted in areas of low vulnerability in low and moderately receptive areas and in moderately vulnerable areas with low receptivity (Figure 4). Routine entomological surveillance will be conducted once in three months in low vulnerable areas with high receptivity, in moderately vulnerable areas with moderate and high receptivity and in high vulnerable areas with low and moderate receptivity. In areas with high vulnerability and high receptive areas, extended routine surveillance will be carried out. The types of surveillance activities and the number of days of surveillance are indicated in figure 4.

Based on a recommendation from the PoR training workshop, taking into consideration practices employed in the Maldives and the Sri Lankan experience with dengue transmission and *Aedes* mosquito breeding, boats will be regularly checked by entomology teams for vector breeding especially for both *An.stephensi and Aedes* mosquito breeding.

		Receptivity		
		Low	**Moderate**	**High**
Vulnerability	**Low**	No routine sentinel surveillance Spot checks Proactive (LS 1-3 days) Reactive (all – 3-7 days)	No routine sentinel surveillance Spot checks Proactive (LS 1-3 days) Reactive (all – 3-7 days)	Routine sentinel surveillance (Quarterly – 5 days) Spot checks Proactive (LS 1-3 days) Reactive (all – 3-7 days)
	Moderate	No routine sentinel surveillance Spot checks Proactive (LS 1-3 days) Reactive (all – 3-7 days)	Routine sentinel surveillance (Quarterly – 5 days) Spot checks Proactive (LS 1-3 days) Reactive (all – 3-7 days)	Routine sentinel surveillance (Quarterly – 5 days) Spot checks Proactive (LS, CBHC – 1 - 3 days) Reactive (all – 3-7 days)
	High	Routine sentinel surveillance (Quarterly – 5 days) Spot checks Proactive (LS 1-3 days) Reactive (all – 3-7 days)	Routine sentinel surveillance (Quarterly – 5 days) Spot checks Proactive (LS, HLC, CBHC – 3-5 days) Reactive (all – 3-7 days)	Extended Routine surveillance (Monthly 7-10 days) Full night landing Collections Spot checks Proactive (LS, HLC, CBHC 3-5 days) Reactive (all – 3-7 days)

LS refers to larval surveys; CBHC refers to cattle baited hut collections; HLC refers to human landing catches.

Figure 8. Plan for entomological surveillance in POR

6.3.7 Risk mapping

Sri Lanka has a large amount of entomological data obtained through extensive surveys carried out throughout the country during the past years. Staff including Entomologists at AMC HQ and Regional Malaria Officers have been trained in GIS and risk mapping. However, refresher training programmes are needed. Risk maps based on receptivity assessed by entomological surveillance at sentinel sites have been generated but needs refinement. Discussions during the workshops held in Colombo on entomological surveillance (9th – 11th November, 2017) and training on PoR (13th – 17th November, 2017) highlighted the need for better coverage of entomological surveillance and updating risk maps. It was decided that more spot checks comprising larval surveys be carried out to better represent the ecological diversity of the country than using routine sentinel site surveillance data for risk mapping. The activities to be carried out are outlined in Figure 4.

The AMC proposes to conduct an unique vulnerability survey in 2019. The aim is to identify areas in which vulnerable populations reside, foreign workers are stationed, and tourists frequent. This will enable the AMC to identify areas of high vulnerability and incorporate these findings along with receptivity data to generate risk maps. Once the initial vulnerability survey is conducted, updates will be obtained annually and the risk maps will be updated. Support of the field health staff (PHI & PHM) will be obtained in mapping vulnerable groups and updating existing maps.

It was also decided that 3-year data that is already available with the AMC be used to generate risk maps which would be updated with additional data that would be fed into the system with enhanced

spot surveys. The number of routine entomological surveillance days that would be reduced in the restructured plan will be used for additional spot surveys.

Risk maps will be developed extrapolating findings based on spot surveys and routine entomological surveillance findings and modeling climatic data including rainfall and humidity. GPS coordinates will be obtained to map spot findings. For this purpose, GPS monitors will be required. In addition, staff will be trained on data capture and entry into a web-based surveillance system using the DHIS2 platform.

6.3.8 Monitoring *An.stephensi* prevalence

The detection of *An.stephensi* in the Mannar island in December 2016 and its further spread to Vavuniya, Kilinochchi, Mullaitivu and the Jaffna peninsula poses a serious threat to PoR in the light of returning refugees from South India being re-settled in the Northern Province. Immediate control measures using larvicides, insect growth regulators, fogging with insecticides and closing/covering wells and water containing receptacles were implemented. Though the mosquito has shown resistance to currently used pyrethroids and other insecticides, the operations in Vavuniya was highly successful with no further detection of *An.stephensi.* In Mannar island too the results have been encouraging. Hence, the objective of the AMC is to destroy and eliminate *An.stephensi* with close monitoring of its spread to other parts of the country. Additional spot surveys will be conducted mainly in urban areas in the vicinity of transport hubs in different parts of the country to detect the presence of *An.stephensi.* Additionally, boats anchored in fisheries harbours will be inspected at regular intervals as part of the surveillance activities for *An.stephensi.* The entomological surveillance activities in relation to *An.stephensi* will be in addition to the surveillance plan described earlier.

6.4 Malaria prevention

6.4.1 Vector control

The major vector of malaria in Sri Lanka, *An.culicifacies,* and secondary vectors such as *An.subpictus* have been regularly reported in many parts of the country where malaria was endemic in the past. Based on the recommendations of the workshops held in Colombo in November 2017 and WHO guidelines given in the Global Vector Control Response 2017-2030, Integrated Vector Management will be limited to areas of moderate and high vulnerability (Figure 5). Integrated Vector Management (IVM) is a rational decision-making process for the optimal use of resources for vector control.The approach seeks to improve the efficacy, cost-effectiveness, ecological soundness and sustainability of disease-vector control. Larval source management (chemical larviciding including use of insect growth regulators and introduction of larvivorous fish) will be done in all areas of moderate and high vulnerability. In all areas where *An. stephensi* is found, regardless of vulnerability, conduct search and destroy, integrated vector management, and eliminate the vector activities. In addition, appropriate vector control measures will be carried out in highly vulnerable and highly receptive areas and in certain situations at the discretion of

Regional Malaria Officers with prior approval from an advisory committee that will be established to facilitate rational decision making on the chemical vector control methods (Figure 5). Adult control measures will include indoor residual spraying and use of long lasting insecticidal nets (LLINs). LLINs will be used in specific situations that demand long term protection. These would also be implemented in areas where there is evidence of local transmission. The choice of insecticide to be used would be informed by insecticide resistance monitoring data and WHO guidelines on vector control. Guidelines for vector control will be updated for PoR and a vector control training package will be formulated with regular training for VC teams.

		Receptivity		
		Low	**Moderate**	**High**
Vulnerability	**Low**	Entomological Surveillance – spot checks; **No Vector Control**	Entomological Surveillance – spot checks; **No Vector Control**	Entomological Surveillance-Sentinel; Spot checks: **No Vector Control**
	Moderate	Entomological Surveillance – spot checks; **LSM, where applicable**	Entomological Surveillance – Sentinel; spot checks; **LSM, where applicable**	Entomological Surveillance-Sentinel; Spot checks: **LSM, where applicable**
	High	Entomological Surveillance-Sentinel; Spot checks; **LSM, where applicable**	Entomological Surveillance-Sentinel; Spot checks; **LSM, where applicable**	Entomological Surveillance-Sentinel; Spot checks: **Appropriate Vector Control**

LSM refers to larval source management

Figure 9. Plan for vector control activities in PoR

With the favoured breeding sites of *An.stephensi* being wells and water retaining receptacles including water storage tanks, housing guidelines and legislature to cover all existing water tanks will be required. The AMC will collaborate with water storage tank production companies, local government bodies and public health inspectors to prevent mosquito breeding in water tanks. In addition, wells that are currently used will be suitably closed with assistance from local government bodies and community participation. Abandoned wells that are not being used will be filled or appropriate control method adopted with the assistance local government authorities or suitable environmental management methods will be used.

6.4.1.1 Insecticide resistance monitoring

The aims insecticide resistance monitoring are:

- to detect reversion to susceptibility,
- to continue monitoring the susceptibility status of the vectors to the insecticides currently in use or recommended as part of vector control response even in the absence of malaria infections in the country, and

- to detect insecticide susceptibility status of new generation insecticides such as neonicotinamides through CDC bottle assays.
- to provide data for global insecticide resistance monitoring

The workshop held in Colombo in November recommended that AMC perform insecticide susceptibility tests on major malaria vector species at least once per year using insecticides being used by the programme and that were shown to be resistant in the 2013 to 2016 surveys. Based on this recommendation insecticide resistance will be monitored annually in areas where chemical vector control is applied and in areas where there is confirmed resistance to malathion, cypermethrin, permethrin, deltamethrin, lambdacyhalothrin and DDT, propoxur using adults of *An culicifacies*where present and *An subpictus*when *An.culicifacies* is not available.Insecticide resistance monitoring will be carried out at least in one site in each region once a year targeting areas in irrigated agricultural system (e.g. rice fields) and newly established development projects.

In addition, susceptibility of *An culicifacies, An subpictus* and *An stephensi* larvae to temephos and pyriproxyfen will be conducted annually depending on the availability of larvae.

6.4.1.2 Entomology and vector control programme re-orientation

As the programme focuses on an integrated vector management programme and with the detection of *An.stephensi* in the country, the entomology programme has to be re-oriented. The plan developed by an expert in 2017 will be implemented (ref). The AMC recognises the need to develop an insecticide policy given the use of insecticides in agriculture and in dengue control. The AMC will facilitate and assist the development of a national insecticide strategy, an insecticide resistance management policy and a national vector control strategic plan.

In addition, with introduction of new vector control measures in urban areas that require treatment of water storage containers, special advocacy and social mobilization programmes will be conducted for empowerment of communities. Programmes will also be targeted to politicians and administrators.

For filling abandoned wells and mosquito proofing water storage vessels, collaboration within the health sector and with other sectors will be established. Measures will be taken for the optimal use of resources, integration of non-chemical and chemical vector control measures, planning, monitoring and decision-making; e.g. inter-sectoral collaboration with Ministries of labor, environment, public works department, water and irrigation. Within the health sector, information will be shared with other vector borne disease control units such as the National dengue control unit. Attempts will be made to synchronise AMC vector surveillance and control activities, and pooled insecticide procurement with the National Dengue Control Unit.

A culture of evidence-based decision making guided by operational research and entomological and epidemiological surveillance and evaluation will be developed. Research findings will be presented and discussed at review meetings and scientific symposia.

Staff engaged in entomology and vector control work will be provided regular in-service training on monitoring *An.stephensi* and new approaches to IVM.

6.4.2 Chemoprophylaxis

The AMC recommends chemoprophylaxis to travelers visiting malaria endemic countries. The AMC provides chemoprophylaxis free to travelers to malaria endemic country. Currently, the strategy is to provide chloroquine to travelers visiting countries where *P.vivax* is predominant and mefloquine for travelers to countries where *P.falciparum* infections are predominant. The strategy is also guided by travel advisories of the WHO; the strategy is reviewed every six months.

The AMC will recommend chemoprophylaxis to travelers to malaria endemic countries. Based on the current strategy, Chloroquine and Mefloquine will be provided to travelers free of charge. As at present, the medicines for chemoprophylaxis will be available at points of departure, AMC HQ and AMC Regional Offices.

6.5 Quality assurance

Quality Assurance is an overarching activity that will be spread across all activities of AMC's prevention of re-introduction programme. In the case of products which have been pre-qualified by WHO, only those products will be procured. Selected products (diagnostics, antimalarial medicines, LLINs, insecticides) will be tested for quality and effectiveness locally at the AMC if facilities are available or at an internationally recognized laboratory. Testing of LLINs and insecticides will be carried out in the country by entomological teams. In addition, the following special quality assurance programmes will be conducted.

6.5.1 Microscopy

A WHO recognized external competency assessment (ECA) programme for PHLTs was started in 2017. Twenty four selected PHLTs were specially assessed by experts and graded on completion of the ECA. Currently, there are 9 WHO certified Level 1 PHLTs in the programme. The AMC aspires to have at least one Level 1 PHLT in each region. The Level 1 PHLT's will crosscheck slides in the region and assist in training programmes. The ECA will be conducted every two years. The programmes will be held in 2018, 2020 and 2022.

Steps to establish a National Competency Assessment (NCA) system were taken with a basic NCA being conducted last year. This will be formalized in line with the ECAs conducted by the WHO adopting a similar methodology.

A proficiency testing system is in place for assessment of performance of malaria diagnostic laboratories where PHLTs are attached. PHLTs requiring further improvement are given a refresher in-service training. This activity will be continued during the next five years.

All malaria cases will be confirmed by microscopy. Where the results of RDTs and/or microscopy are not clear, quality assured PCR will be used to confirm the diagnosis.

All positive slides will be cross checked at AMC HQ by a Level 1 PHLT and feedback will be provided to the case management unit at the AMC HQ and regions within 24 hours of receiving the blood smears. In addition, a cross checking system has been established and is been implemented in all regions. A sample of negative slides are selected by the RMO or a Senior PHLT from all places where diagnostic services are provided on a monthly basis and the quality of the slide including its preparation and staining, and the results are crosschecked in the regions and at AMC HQ. Based on the results of the assessment, feedback is provided to the PHLTs and advice is given on how to improve the quality of the slides. The performance of PHLTs is continuously monitored. This will be carried out in the next five years. Two experienced PHLTs will be required to carry out cross checking of slides up to end 2021. The AMC has recently got a batch.

In institutions where RDTs are kept, staff will be trained in testing for malaria. Key staff will be identified by the head of the institution and the AMC will provide a hands-on training on performing the test. This activity will be done once a year. SOPs are available for performing and interpreting RDTs. RDTs will be sent for lot quality testing to a centre of excellence.

6.6 Monitoring and Evaluation

Monitoring and evaluation will be a key component enveloping all activities conducted by the AMC. For this purpose indicators relevant to PoR will be identified and targets set. M&E activities will be overseen by an M&E officer or suitably qualified person. M&E activities will be included to cover all activities of the AMC.

6.6.1 Supervision

Supervision is an essential activity to ensure that quality services are provided according to the National Malaria Strategic Plan in order to take necessary corrective actions in case the NSP is not being executed as planned. For this purpose, at least 4 days of supervisory visits will be made to the regions every month by the AMC HQ staff. Each RMO will make will make supervisory visits to institutions in the region at least four days a month to ensure that activities are being conducted

according to the NSP. During each supervisory visit, surveillance activities (carried out in public and private health institutions), diagnosis, treatment, data recording, maintaining of registers, entomological surveillance and other administrative procedures will be reviewed.

6.6.2 Monthly Review Meetings

The success of the malaria elimination and prevention of re-introduction programme of the AMC, to a great extent, was due to the coordinated action taken country-wide which was facilitated through monthly review meetings of RMOs. These monthly two-day meetings will be continued during the period of this plan to review reported cases, the response mounted, any lapses that may have occurred and any lessons learned. At these meetings, other stakeholders are invited to discuss related matters as and when required. Two RMO meetings will be held in the periphery once in 6 months coupled with a supervisory exercise using all RMOs (as supervisory teams) to visit all relevant health institutions and sentinel sites in the region. MOHs of the region will also participate in these meetings.

6.6.3 Semi-annual Entomology Review Meetings

Semi-annual entomology reviews have been useful to review entomology work and to track spread of *An.stephensi.* These meetings will be held during this planning cycle.

6.6.4 Mid-term external review

A mid-term external review is planned to be conducted in 2020 to review the programmatic changes and fiscal adjustments made in the PoR phase. This review comprising 3-5 external experts and 2-3 local experts will also review the steps taken by the AMC to meet challenges faced by possible cessation of GF funding.

6.6.5 Routine monitoring and evaluation

A dedicated M&E officer, in collaboration with AMC staff, will monitor the programme and report monthly to the Director, AMC. For this purpose, formats and other collecting instruments have already been developed.

6.6.6 Oversight

The Technical Support Group (TSG) for PoR, comprising experts in the field and MoH officials appointed by the Director General of Health Services will provide oversight into all PoR activities. This committee reviews the malaria situation and provides technical guidance on addressing challenges. The terms of reference of the TSG were modified and the membership renewed in 2017.

The Case Review Committee (CRC), a subcommittee of the TSG, reviews activities carried out when a case is reported and classifies all cases whether imported or indigenous. The CRC meets once a month and reviews technical details of the case and the response. The committee identifies any lapses in the response and advises accordingly. The terms of reference of the subcommittee have been developed. The CRC would continue meeting on a monthly basis during the period of this plan.

6.7 Information, education and communication (IEC) and advocacy

IEC and advocacy will be targeted to different categories of persons via different approaches using different strategies. The AMC will continue to liaise with the Ministry of education to upgrade the module on malaria in secondary schools. The material was revised by the AMC in collaboration with the National Institute of Education in 2016.

6.7.1 Advocacy for vulnerable/risk populations

Advocacy for the general public will be based mass media approaches in collaboration with the media. Group advocacy/awareness sessions will be conducted for high risk vulnerable groups such as pilgrims and occupational groups such as those engaged in the gem trade and migrant fishermen who frequently travel overseas. In addition, groups including travel agents operating in the country will be advised on malaria chemoprophylaxis for their clients visiting malaria endemic countries and how and from where to get the medicines through regular meetings. The armed forces and Sri Lanka Police will be advised on malaria chemoprophylaxis for their officers and staff who serve on UN peace keeping missions in malaria endemic countries on a regular basis. Individual one-on-one sessions will be conducted when travelers come to get chemoprophylaxis medicines which will be available at AMC HQ and Regional Malaria Offices.

Travelers will be targeted specifically at ports of departure/entry. Message boards in all three languages on malaria prevention when traveling to malaria endemic countries will be displayed on the road to the two international airports in the country. Displays will be posted in the departure lounges of the two international airports in the country highlighting the need to take malaria chemoprophylaxis and from where the medicines can be obtained. Displays will be required and needs to be developed. In addition, viewing material will be developed and displayed in electronic notice boards in the airports. In the arrivals lounge, messages will be displayed to remind travelers to malaria endemic countries to get tested for malaria if they develop fever.

Public awareness will also be created through the electronic and print media. Materials for these programmes need to be developed which will serve as an investment for the future. The materials to be developed include short documentaries, video clips, posters and hand bills which will also be used in group and one-to-one communication sessions. Advocacy will focus on malaria

prevention, the need to tell the doctor that the person has travelled overseas and to get tested for malaria if they develop fever after returning from a malaria endemic country.

IEC materials for treatment for patients attending hospitals advising them to divulge a travel history to the attending health care provider if they have traveled overseas. Posters will be developed and displayed.

6.7.2 Advocacy for agencies employing foreign labour and travel agents

With the expansion of manufacturing and development work, many companies and institutions are hiring foreign labour, some of whom are from malaria endemic countries while some have traveled to malaria endemic countries in the recent past. Most of these workers are scattered throughout the country. One-to-one briefings will be held with the management of these companies and institutions by AMC HQ and RMOs highlighting the importance for testing the workers for malaria to prevent re-introduction of malaria in to the country. Testing will be conducted by the AMC free of charge on a voluntary basis. Companies and institutions employing foreign labour will be requested to inform the AMC of current recruits and new recruits of foreigners as soon as they arrive in the country. Travel agents who send pilgrims to malaria endemic countries will also be targeted. It is envisaged that 2-3 such meetings will be held every month in the regions and about 5 meetings a month by AMC HQ coupled with proactive screening programmes.

6.7.3 Advocacy for health care personnel

Advocacy for health care personnel, as done in the past, will focus on the need for considering malaria in the differential diagnosis of fever patients and the need to test all fever patients for malaria. This will be done via regular awareness raising programmes and partnering with academic colleges and professional associations. Regular meetings and updates of the academic colleges and professional associations will be used to highlight the importance of PoR in Sri Lanka, the cooperation needed of the clinicians to keep Sri Lanka malaria-free, and new trends in the management of malaria. These activities will be conducted in all areas on a regular basis as doctors are transferred frequently. Innovative strategies such as funding some components of this programme will be required to penetrate the membership of the colleges and associations.

All doctors joining the Department of Health Services to train as intern medical officers will be given lecture on Prevention of Re-introduction of Malaria in Sri Lanka during their orientation programme as currently done. The need to ask for a travel history, the need to consider malaria in the differential diagnosis of fever patients, and what to do and whom to inform if a case is detected is highlighted.

The AMC plans to develop modules on malaria for medical and allied health undergraduate programmes and post-graduate clinical training programmes. An education subcommittee will be

established; the subcommittee will meet regularly to discuss the contents and develop the module in 2018. All newly recruited public health staff will follow a module on malaria during their orientation.

A hotline is already operational for notification of cases and to provide advice to health care personnel.

6.7.4 Advocacy for policy makers and administrators

In order to harness political commitment and financial support from the government, high level advocacy will be conducted targeting key politicians, finance ministry officials, officials of the Ministry of Health and Provincial Health Authorities. One-to-one discussions with Provincial Directors, Regional Directors and Provincial Secretaries have been shown to be effective. These one-to-one discussions will be continued.

In addition to the one-to-one discussion, two two-day programmes will be organized for Ministry officials, Provincial and Regional Directors of Health.

6.8 Developing partnerships and engaging in multi-sectoral activities

Effective partnerships have been instrumental in keeping Sri Lanka malaria-free for the last 5 years. Innovative programmes conducted in collaboration with the Sri Lanka Army and other armed forces were instrumental in eliminating malaria from Sri Lanka. With partnerships, there is a sense of ownership of the programme by all partners and sharing of resources thereby enhancing the uptake and effectiveness of interventions. The AMC proposes to strengthen these partnerships further. The important partnerships that will be considered include:

- ✓ The armed forces and Sri Lanka Police which send officers and their staff to serve on UN peace keeping missions.
- ✓ Technical agencies such as WHO
- ✓ International Organization on Migration (IOM) and United Nations High Commission for Refugees (UNHCR) to conduct voluntary screening programmes for travelers.
- ✓ Occupational groups such as persons engaged in the gem trade, migrant fishermen, traders, etc.
- ✓ Department of Immigration and Emigration
- ✓ Ministry of Foreign Affairs
- ✓ Travel agents who organize pilgrimages and other travels.
- ✓ Media
- ✓ Board of Investment and Ministry of Labour to track foreign workers entering the country.
- ✓ Sri Lanka Port Authority
- ✓ Companies engaged in large mega-development projects in the country that bring in foreign labour.

- ✓ Ministries and departments dealing with deployment of foreign workers
- ✓ Ministry of Foreign Employment, foreign employment agencies and companies having branches in other malaria endemic countries.
- ✓ Ministry of Transport and Aviation
- ✓ District and Divisional secretariats

In addition, intra-, inter- and multi-sectoral activities central and regional levels will be conducted engaging the following:

- ✓ Other disease control programmes within the Department of Health Services.
- ✓ The private sector including the private health care sector directorate.
- ✓ Ministry of Finance to secure additional funding for PoR on termination of the GF grant.
- ✓ Ministry of Labour to identify foreign labour entering the country and to develop a screening programme including malaria for such workers.
- ✓ Ministries of Religious Affairs
- ✓ Academic and research institutions
- ✓ Other ministries including local government and provincial councils especially to contain and eliminate the potential vector, *An. stephensi,*that has recently been detected in the country.

Synergies across health programmes will be used as sustainable and cost effective measures: for example, a component of a common testing package for foreign labour groups will be proposed and the development of an inbound health assessment package will be facilitated.

Partnerships will be developed between and the academia, research institutions, industry, and other sectors as and when required.

Regular meetings with partners will be held to review activities and see ways as to how the partnership can be enhanced further. These meetings will be held annually in all the regions and at central level as well.

6.8.1 Engagement and regulation of the private health care sector

In PoR of malaria, each and every imported malaria infection has to be detected early, notified to the AMC, and effectively treated wherever the patient seeks care whether it is in the public sector, the private sector, or in health care institutions of the armed forces. Hence, the private sector where a large proportion of cases is detected is an important source of surveillance data in a PoR setting.

Partnerships have already been established with private sector health care providers to obtain routine surveillance data that these institutions are bound to provide the AMC. There is a dedicated

contact person at the AMC who liaises with private sector institutions and a hotline to provide necessary information. Staff of private sector institutions are provided with training on malaria diagnosis and treatment. More training programmes for laboratory technicians on malaria diagnosis including microscopy will be conducted by the AMC. RDTs are given to the private sector free of charge if the institutions provide returns of their usage. All these activities will be continued from 2018-2022.

The private health care sector is regulated by the private health care sector regulatory authority of the Ministry of Health. The AMC will issue guidelines to the private health care sector through this authority of the Ministry of Health on diagnosis, notification and treatment of malaria cases. A list of quality assured WHO pre-qualified RDTs will be recommended for use in the private sector.

6.8.2 Regional Cooperation

Mechanisms to foster functional regional partnerships through the SAARC secretariat will be pursued to harmonise policies and procurement mechanisms to ensure availability of quality assured antimalarial medicines, LLINs and insecticides. Most imported malaria cases reported in Sri Lanka have been acquired in India. Efforts will be made to share surveillance and other data between India and Sri Lanka to ensure that Sri Lanka remains malaria-free.

Given the rich experience Sri Lanka has acquired through its malaria elimination and prevention of re-introduction programmes and the workshops conducted in November 2017, the AMC proposes to conduct a workshop annually incorporating the concepts of malaria elimination, preparation for malaria-free certification and prevention of re-introduction of malaria for participants within and outside the region in collaboration with WHO. This workshop will include a field component where participants will get knowledge and experiences of sustainable systems that have been put in place.

6.9 Capacity building

The AMC proposes to build on existing gains and establish a robust system that would not only cater to the needs of the current planning cycle but also lay the foundation for many more years as the AMC will have to be engaged in PoR until malaria is eradicated. The National Strategic Plan for prevention of re-introduction of malaria in Sri Lanka 2018-2022 is developed with the aim of building resilient and sustainable systems of health during this transition period strengthening the integrated health system that already exists for sustaibility.

6.9.1 Standard Operating Procedures and guidelines

For this purpose, the AMC will establish Standard Operating Procedures (SOPs) and guidelines to implement routine quality assured services. The SOPs and guidelines that need to be developed/updated and the relevant time lines are given in Table 4.

Table 4. Standard Operating Procedures and guidelines that will be developed/updated

No.	Title	New/ Update	2018	2019	2020	2021	2022	Comment
1.	Scope of work when a malaria case is detected	Update		√		√		Each review and update requires 5 review meetings
2.	Surveillance guidelines	New	√			√ Update		Requires several consultations and a consultant for write up
3.	Manual for Regional Malaria Officers			√				Requires several consultations and a consultant for write up
4.	Malaria microscopy	Update	√					Each review and update requires 5 review meetings
5.	Entomological surveillance	Update		√		√ Update		Each review and update requires 5 review meetings
6.	Vector control	New	√					Each review and update requires 5 review meetings

No.	Title	New/ Update	2018	2019	2020	2021	2022	Comment
7.	Outbreak preparedness and response	Update			√			Each review and update requires 5 review meetings
8.	National Treatment Guidelines	Update	√					Each review and update requires 5 review meetings
9.	Chemoprophylaxis guidelines	New	√			√ Update		Each review and update requires 5 review meetings
10.	Diagnostic quality assurance	New		√			√ Update	Each review and update requires 5 review meetings
11.	Entomological techniques	Update		√				Each review and update requires 5 review meetings
12.	M&E plan	New	√					

6.9.2 Human resources

Maintaining the skills of the human resources is a major challenge in the wake of waning cases in the malaria elimination and prevention of re-introduction phases. The AMC proposes to have in place a reorganized, adequate and well trained work force for prevention of re-introduction to respond to challenges and to handle any situation for the next few years.

Currently, 100 staff members are being supported by the GF. As per the plan of the current funding cycle which ends on 31st December, 2018, this number will be reduced to 88 by end May 2018. All these positions will be terminated as of 31st December, 2018. Additional staff that will be required for project implementation will be under the Director/AMC.

The following activities will be carried out during this planning cycle.

6.9.2.1 Development of a human resources plan

A human resources plan will be developed taking cognizant of the reorganized activities of the AMC in relation to PoR. This plan will identify key positions that need to be created and others that are redundant. It will outline the new roles and responsibilities of different categories of staff taking into consideration task shifting and additional training that will be required for existing staff. A human resources expert will be hired for this purpose.

6.9.2.2 Training

In the past, annual refresher training programmes were conducted to maintain the skills of AMC staff. This has been useful not only to maintain the skills of staff but also to rekindle their enthusiasm and motivation. This is more important at present as Sri Lanka has already obtained malaria-free certification and there is a general waning of interest in malaria. Annual in-service training programmes will be carried out for all categories of staff (Table 5).

Table 5. Training programmes for staff

Staff category	Training programme	2018	2019	2020	2021	2022	Comments
AMC HQ staff and RMOs	RMO Training (including supervision, monitoring and evaluation, case management, POR updates)		✓	✓	✓	✓	One three-day programme for 40 participants each year
	Training programme on entomology techniques		√		√		Three-day programme for 30 participants
	In-service GIS training programme	√					One three-day training programme for 30 participants
	DHIS2 training programme		√				One two-day training programme for 30 participants
	DHIS2 updates			√	√	√	One-day programme for 30 participants
Clinicians, medical officers	Updates on PoR and case management	✓	✓	✓	✓	✓	2 half-day programmes each year in collaboration with

Staff category	Training programme	2018	2019	2020	2021	2022	Comments
and hospital staff							academic colleges and professional associations Rs 125,000 each
	Pre-internship update	✓	✓	✓	✓	✓	2 programmes every year for 500 participants each
Public Health Laboratory Technologists (PHLTs)	In-service training programme	√	√	√	√	√	Two-day training programme 18 programmes in 2018 for 20 participants 15 programmes annually from 2019 onwards for 20 participants each year
	Training of Trainers on Microscopy Teaching skills		√		√		Five-day programme One programme for 20 participants every other year
	Accreditation programme	✓		✓		✓	Five-day programme One programme for 12 participants every other year
Private Sector Laboratory Technologists	Training programme on malaria diagnosis	✓	✓	✓	✓	✓	One-day training programme 10 programmes each having 20 participants to be conducted annually
Public Health Field Officers (PHFOs)	In-service training programme	✓	✓	✓	✓	✓	One-day training programme 28 programmes each having 20 participants to be conducted annually at regional level

Staff category	Training programme	2018	2019	2020	2021	2022	Comments
Public Health Inspectors (PHIs)	In-service training programme	✓	✓	✓	✓	✓	One-day training programme 24 programmes each having 20 participants to be conducted annually at regional level
Health Entomological Officers (HEOs)	In-service training programme	✓	✓	✓	✓	✓	Two three-day programmes for 30 participants conducted annually at AMC HQ
Spray Machine Operators (SMOs)	In-service training programme	✓	✓	✓	✓	✓	One-day training programme 28 programmes each having 20 participants to be conducted annually at regional level
Entomologists, new RMOs and Medical Officers	In-service training programme	✓	✓	✓	✓	✓	one five-day programme for 30 participants conducted annually at AMC HQ
Provincial authorities	Provincial training	✓	✓	✓	✓	✓	Two day programme

Entomologists have been appointed to each district. They are expected to engage in the control of all vector borne disease programmes. An in-service training programme will be conducted for the newly recruited Entomologists, RMOs and Medical Officers.

The AMC proposes to train a core group of personnel equipped with the most recent information on malaria, its control and PoR strategies by sending three medical officers (two medical officers from AMC and a clinician) each year for training in case management and severe malaria to Mahidol University, Bangkok.The AMC will also send one entomologist for training on advanced entomologyand two other officers for training on vector control to the VCRC, Pondicherry, India, annually during this planning cycle. Additional training on mosquito taxonomy for HEOs is needed with the invasion of *An.stephensi* in the country and the need for them to work with all vector borne disease programmes. Quality assurance on microscopy for senior PHLTs is required

to ensure quality assured microscopy during the PoR phase. The details of the international training requirements for the period 2018-2022 are given in Table 6. These personnel will be trainers to other personnel on their return.

Table 6. International training programmes for staff

Training programme	2018	2019	2020	2021	2022	Comments
Training programme on clinical management of malaria	✓	✓	✓	✓	✓	Two medical officers from AMC (one from AMC HQ and one from regions) and one clinician to attend five-day training programme at Mahidol University, Bangkok, Thailand
Entomology training programme	✓	✓	✓	✓	✓	Two weeks training programme at VCRC Pondicherry, India for 2 participants a year
Vector control training programme	✓	✓	✓	✓	✓	Two weeks training programme at VCRC Pondicherry, India for 2 participants a year
Advanced entomology training programme	✓	✓	✓	✓	✓	Two week training at National Institute of Malaria Research, new Delhi, India for one person per year
Training on quality assurance on microscopy	✓		✓		✓	Five-day training programme for 2 persons at ACTMalaria HQ, Manila, Philippines
Training on mosquito taxonomy for HEOs	✓		✓		✓	Two week training at National Institute of Malaria Research, new Delhi, India for two persons per year
DHIS2 training programme	✓					

6.9.2.3 Attendance at international meetings

The AMC will send two persons each year to important international meetings on malaria to gather knowledge on other country's experiences and best practices on PoR and to share Sri Lanka's experiences. This is important for regular updates and to be versed on latest developments in malaria control, elimination and prevention of re-introduction.

6.9.3 Infrastructure development

The AMC proposes to build necessary infrastructure not only for the current planning cycle in this transition phase but focusing on the next ten years as part of building resilient and sustainable systems of health within the existing integrated health system. It is important to establish the

infrastructure necessary for the next ten years at this point in time as, with further passage of time, malaria will be forgotten more and perhaps even obsolete; this is likely to lead to complacency and low priority for funding where a disastrous situation as in the 1960s could emerge giving rise to a potential disaster. At least for now, the achievement of malaria-free certification is still in the minds of policy makers and administrators.

The infrastructure projects that are proposed for this planning cycle are given in Table 7. As many cases are now being reported from districts which were not traditionally malarious where no Regional Offices of AMC exist, staff from other regions and AMC HQ have had to oversee the districts with no Regional Offices thereby greatly increasing the work load of the AMC HQ and other Regional Malaria offices. The receptivity to malaria is still high in the previously malarious areas and the vulnerability in these areas is also increasing with large scale development projects employing foreign labour and increased tourism taking place in these areas. The AMC staff in the regional offices which are not under the management of AMC HQ but under the Provincial Health Authorities are increasingly engaged in dengue control work as well. Given this background, the AMC proposes that this status quo be maintained until such time that structural changes are made within the health system. The AMC proposes to establish 6 new regional offices in Colombo, Gampaha, Kalutara, Galle, Matara and Nuwara Eliya districts. The Ministry of Health has already advertised some of these positions and recruited two Regional Malaria Officers. Offices have to be established and required furniture, vehicles and other equipment have to be procured. In addition to six vehicles for the new institutions, another 9 vehicles are required for some RMO regions which have vehicles almost 30 years old and require frequent repairs.

Table 7. Proposed infrastructure development projects

Project	Year	Comment
Establish 6 new RMO offices (Colombo, Gampaha, Kalutara, Galle, Nuwara Eliya, Matara)	2018-2019	Require office space, furniture, vehicles and other office and laboratory equipment. Personnel provided by Ministry of Health
Establish 3 new regional entomology laboratories (Jaffna, Mannar, Galle)	2019	To monitor new threat of *An. stephensi* Office space, furniture, equipment.
Establish a centre for entomology and vector control training	2019-2020	To be shared by all vector borne disease control programmes
Establish microscopic diagnostic facility in 25 hospitals above base hospital level	2019	Work benches, microscopes, consumables
Fish tanks	2019	Three tank complexes in each district in different sites

Procurement of new editions of digitized maps	2018	(Rs 800,000 – for all layers 92 sheets)
Upgrading IT facilities at AMC HQ	2019, 2021	
Vehicles for regional offices	2019-2021	15 vehicles are needed for the regional offices (includes 6 for new Regional Offices and 9 for existing regional offices as some RMO offices have vehicles which are over 30 years old)
Minimum IT requirements for a Regional Office	2018, 2021	The list of equipment needed in given in Annex I.
Upgrading IT facilities in Regional Offices	2019-2020	
Refurbishing Regional Offices	2019-2020	
Procurement of microscopes for district and central entomology teams	2020	

With the detection of *An.stephensi*, the AMC proposes to establish three new entomology laboratories in three regional offices (Jaffna, Mannar and Galle). Furniture and other equipment will be procured.

The AMC proposes to establish a centre of excellence for entomological surveillance and vector control in the country. This will include a field station. This centre will be used for training of personnel in all vector control programmes in the country. In addition to a building, required furniture, equipment and vehicles will be procured.

There is a lack of space and equipment for malaria testing in some major government health care institutions located in areas where malaria was not endemic. Given the reporting of imported malaria cases from these areas, the AMC will strengthen malaria diagnostic services in these institutions for which furniture and basic equipment will be procured.

As larvivorius fish have proven to be cost effective vector control strategy, especially for control of *An.stephensi,* the AMC proposes to build fish tanks in RMO offices in the Northern Province and in other regions that do not have fish rearing facilities. The AMC proposes to have fish tanks in at least 2 sites in each region.

The AMC will purchase recent digitized maps from the Survey Department to augment the mapping function of the web based surveillance system that will use the DHIS 2 platform. Information technology infrastructure will be upgraded at AMC HQ and the Regional Malaria Offices. The list of equipment required is given in Annex I.

AMC HQ and Regional Malaria Offices require furniture and refurbishment to equip new offices and to replace old unusable furniture. Necessary furniture will be procured

6.10 Programme management

The AMC HQ and RMO offices have to follow GoSL administrative and financial regulations in implementing the PoR programme. The programme re-orientation also requires new administrative structures to be established and staff to be appointed. The changes will be done according to the Health Master Plan of the Ministry of Health. While the current staff are adequate for routine operations, additional staff will be required in case Sri Lanka is successful in obtaining transition funding from the Global Fund.

The Ministry of Health and Provincial Councils provide office space and pays the salaries of permanent government employees at AMC HQ and the Regional Malaria Offices, respectively. In addition, GoSL provides a grant for capital expenditure to the AMC HQ through the budget vote of the Ministry of Health (SLR 30 million each in 2017 and in 2018); the Regional Offices receive funding through the Ministry of Local Government and Provincial Authorities. The contributions made by GoSL for office space, salaries of staff and supplies provided through the Ministry of Health has not been included in the costing of this NSP as there is no proper documentation of the exact amounts.

The PoR programme will have to be supported for obtaining supplies for parasitological and entomological surveillance and to maintain the respective laboratories to ensure quality services are provided.

Maintenance of laboratory and office equipment will have to done through maintenance agreements with suppliers. This is essential to ensure all equipment are in working order minimizing the risk of malfunction and needing costly repairs which may take some time given the administrative procedures involved.

The AMC also proposes to develop many formats for surveillance, diagnosis and screening, supervision, chemoprophylaxis, and routine reports. Funds will be required for printing of these documents, the national malaria strategic plan, M&E plan, annual action plans, and annual reports of the AMC.

The AMC HQ and the Regional Offices will have to be supported in obtaining office supplies and stationery for routine work. AMC HQ and Regional Offices will also require funds for purchase of fuel to carry out additional work in time as sometimes getting funds from GoSL may take time.

It has been highlighted that there have been some problems in mobilizing funds which has led to delays in spending. Such a situation in an emergency will be catastrophic. A mechanism will be

developed through the Disaster Management Unit of the Ministry of Health to access emergency funds in case the need arises if local outbreaks of malaria occur.

6.10.1 Procurement and supply chain management

Procurement of drugs and other antimalarial commodities is done through the Medical Supplies Division of the Ministry of Health through an open tender procedure. The distribution of the supplies is also done by the Medical Supplies Division through its Regional Medical Supplies Divisions.

The AMC HQ procures WHO pre-qualified RDTs, ACTs and LLINs, and insecticides and other special items directly and distributes these items to the Regional Malaria Offices.

6.11 Operational Research

Operations research will form a key supporting element of the National Malaria Strategic Plan for PoR as recommended in the WHO's Global Technical Strategy for Malaria 2016-2030. Research findings will provide the data for evidence based policy formulation and context specific intervention implementation. As Sri Lanka is on a learning curve with respect to PoR, case studies and piloting of novel intervention approaches are required.

In order to promote research, to disseminate results and to share experiences, a two-day research colloquium on malaria will be held annually with the participation of AMC staff, academia and the research community. In this meeting, priority research areas will be identified and a research agenda developed.

The AMC will facilitate funding for research through local funding agencies such as the National Research Council and the National Science Foundation, the ETR division of the Ministry of Health, and other international funding agencies and donor institutions.

7. Performance framework 2018-2022

The indicators recommended by the WHO and GFATM for prevention of re-introduction of malaria were used as shown in Table 8 (indicators 1-13). Additional indicators agreed upon at the workshop for prevention of re-introduction of malaria held in November 2017 were also included (indicators 14-18). The targets set at the above workshop were adopted.

Table 8. Performance framework 2018-2022

Indicator	Target					Frequency
	2018	2019	2020	2021	2022	
Impact indicators						
1. Number of malaria cases by classification, age, sex, species and country of origin	-	-	-	-	-	Monthly and cumulative
2. Number of malaria deaths	0	0	0	0	0	Monthly and cumulative
Outcome indicators						
3. Percentage of confirmed malaria cases who received first line treatment according to national guidelines	100%	100%	100%	100%	100%	Monthly and cumulative
4. Percentage of *P.vivax* and *P.ovale* cases who received radical cure	100%	100%	100%	100%	100%	Monthly and cumulative
5. Percentage of expected health facility reports received	100%	100%	100%	100%	100%	Monthly and cumulative
6. Percentage of cases investigated and classified	100%	100%	100%	100%	100%	Monthly and cumulative
7. Percentage of cases notified within 24 hours of detection	100%	100%	100%	100%	100%	Monthly and cumulative
8. Percentage of cases detected by private health care institutions	-	-	-	-	-	Monthly and cumulative
9. Percentage of health institutions with no stock outs	100%	100%	100%	100%	100%	Monthly and cumulative
10. Percentage of notified cases investigated within 3 days	100%	100%	100%	100%	100%	Monthly and cumulative
11. Percentage of rapid response teams for which mock exercises have been carried out	100%	100%	100%	100%	100%	Annual
12. Percentage of RMO regions having at least 1 accredited PHLT	40%	60%	80%	100%	100%	Annual
13. Percentage of Entomologists/EAs who can	100%	100%	100%	100%	100%	Annual

Indicator	Target					Frequency
	2018	2019	2020	2021	2022	
correctly identify 90% of Anopheline mosquitoes						
Output/coverage indicators						
14. Annual Blood Examination Rate (ABER)	3%	3%	3%	3%	3%	Annual
Input indicators						
15. Malaria expenditure per capita						Annually
16. Funding for malaria research						Annually

8. Financial Transition and Sustainability

A transition plan with regard to transiting from external support has already been developed and is currently been implemented. External support for personnel and other activities such as entomological surveillance has been gradually reduced in 2017 and 2018 with additional GoSL funding for these activities.

The National Strategic Plan for prevention of re-introduction of malaria 2018-2022 takes into consideration the financial transition that is required for sustainability of PoR. It is envisaged that most of the recurrent expenditure will be met by the GoSL. However, the AMC will require additional funding for some of the activities including capacity building activities proposed in this plan. The infrastructure development activities that will require external funding include refurbishing new regional offices, procurement of vehicles, upgrading IT facilities and establishment of a centre of excellence for entomology that will be shared with other vector borne disease control programmes. These activities have been proposed under the theme of building resilient and sustainable systems of health harmonising activities with other disease control programmes for sustainability of PoR. It is unlikely that GoSL will be able to provide a large quantum of initial capital funds for these activities but the recurrent expenditure of these projects such as maintenance of vehicles and the recurrent expenditure incurred in relation to establishment of new Regional Malaria Offices can easily be incorporated into the existing health budgets of the central government and the provincial health authorities.

As a method of risk reduction as outlined in figure 6, a mechanism to access emergency funds as part of preparedness has been suggested. There are mechanisms that already exist where emergency funds can be directly accessed for disasters and other events of national importance. In the case of an outbreak, such funds can be accessed. A formal mechanism will have to be established for health related events including for malaria.

This plan has been developed assuming that Sri Lanka will be successful in preventing re-introduction and re-establishment of malaria. In the event that there is an outbreak, this plan will have to be reviewed and revised as necessary which may require additional financial support.

9. Costing of NSP for prevention of re-introduction of malaria in Sri Lanka 2018-2022

The costing of the NSP was done based on the following:

1) Costs are based on current costs.
2) An inflation rate of 06 per cent per annum was used for subsequent years.
3) The NSP was costed taking into account spending on curative services, infrastructure maintenance, utilities, transport and fuel, and salaries of staff in AMC HQ only.
4) The NSP was costed excluding central government and provincial health authority, other than that of AMC HQ,spending on curative services, infrastructure maintenance, utilities, transport and fuel and salaries of staff in government institutions engaged in prevention of re-introduction activities.

The recurrent budget details of the AMC HQ are given in Table 9. The capital budget allocation for AMC HQ for 2017 was SLR 30 million. The capital budget allocation for AMC HQ in 2018 is SLR 30 million.

Table 9. Recurrent budget details of Anti Malaria Campaign Head Quarters in Sri Lankan Rupees (SLR) - 2017

Vote	Description	Allocation	Expenditure
111-02-14-03-1001	Salaries & Wages	33,700,000.00	33,615,953.55
111-02-14-03-1002	Overtime	9,433,312.00	8,941,305.13
111-02-14-03-1003	Other Allowances	30,000,000.00	27,830,072.91
111-02-14-03-1101	Traveling	1,550,000.00	1,350,077.37
111-02-14-03-1201	Stationery	1,000,000.00	655,298.29
111-02-14-3-1202	Fuel	2,500,000.00	1,493,044.19
111-02-14-03-1203	Uniform	1,000,000.00	687,400.00
111-02-14-03-1205	Other	10,800,000.00	9,766,579.10
11-02-14-03-1301	Vehicles	3,000,000.00	1,918,003.06
111-02-14-03-1302	Plant & machinery	2,700,000.00	2,294,966.39
111-02-14-03-1303	Buildings Structures	924,798.43	805,479.68
111-02-14-03-1401	Transport		0.00
111-02-14-03-1402	Postal	1,600,000.00	1,441,887.39

111-02-14-03-1403	Electricity & Water	12,000,000.00	11,016,684.21
111-02-14-03-1404	Rent & Tax	200,000.00	103,039.20
111-02-14-03-1409	Other (Services)	7,300,000.00	5,585,543.50
111-02-14-03-1502	Retirement Benefits		0.00
111-02-14-03-1506	Interest of Property	1,000,000.00	577,462.30
111-02-14-0-1003	Warming Cloth	13,681.50	13,681.50
111-02-11-01-1003	Warming Cloth	88,420.50	87,370.50
TOTAL		**118,810,212.43**	**108,183,848.27**

The summary of the costed NSP for PoR of malaria in Sri Lanka is given in table 10. The costing was based on proposed activities for different strategies.

Table 10. Summary of the costed NSP in SLR for PoR of malaria in Sri Lanka 2018-2022

Strategic Direction	2018	2019	2020	2021	2022	Total
Universal access to diagnosis and treatment	11,335,690	12,082,745	12,881,316	13,735,161	14,648,334	64,683,246
Surveillance	73,660,125	72,332,727	76,588,617	56,709,198	59,147,145	338,437,812
Malaria Prevention	171,024,911	48,966,035	80,697,900	84,398,076	79,420,544	464,507,466
Quality Assurance	2,768,000	4,535,400	5,575,969	5,241,776	3,121,982	21,243,126
Monitoring and Evaluation	15,947,210	3,735,111	3,959,218	16,608,771	4,448,577	44,698,888
Information, education and communication (IEC) and advocacy	24,638,491	16,279,750	15,995,535	17,445,268	17,230,984	91,590,028
Partnerships	4,466,750	1,533,555	1,217,160	4,310,190	1,367,601	12,895,256
Capacity building	59,492,880	192,719,313	106,387,860	35,773,626	32,940,077	427,313,756
Program Management	869,792,823	829,921,860	882,566,421	933,878,840	990,795,309	4,506,955,253
Operational Research	1,441,200	2,553,000	2,500,000	2,559,551	2,563,124	11,616,874
Grand Total	1,234,568,080	1,184,659,497	1,188,369,997	1,170,660,456	1,205,683,676	5,983,941,706

The detailed costed NSP for PoR of malaria in Sri Lanka 2018-2022 is given in Annex II.

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Annex I
List of equipment needed for upgrading IT, communication, publication and networking facilities at AMC HQ and Regional Malaria Offices.

Category	Item	Amount required for AMC HQ	Amount required for regions
ICT Equipment for productivity improvement	Laptops	5	6
	Desktop computer	3	32
	Laser printer	0	5
	Scanner	5	7
	External disk drive (Portable data bank)	17	17
	Photocopy machine	0	6
	Duplo copier	0	2
Improving communication facilities			
	Fax machine	4	6
	Multi-media projector	0	21

Category	Item	Amount required for AMC HQ	Amount required for regions
Health Education aids	Public addressing system	0	19
	Portable screen	0	22
	Digital camera	2	26
	Digital screen	0	5
	Digital Pointers	4	18
Mobile surveillance equipment	GPS device	2	44
	Pen drive	5	6
Improved publishing capacity	Colour photocopy	1	0
	Duplo copier	0	0
	Photocopy machine	0	0
	Laser printer-Colour	0	0
Improved networking and server infrastructure	Wireless access point with controller - enterprise level	10	0
	Upgraded network - implementation charges	1	0
	Re-cabling of the existing network with all necessary cabinets, switches, etc	1	0
	Cyberom 100 fail over firewall + TVS license (1 year subscription)	1	0
	Annual maintenance agreement LAN Network with active & passive devices	3	0
	Annual maintenance agreement -firewall with license renewal	3	0
	Annual maintenance agreement - Server	3	0
Improvements to AMC auditorium	Gooseneck microphones	10	0
	65 Inch Digital Smart TV for AMC	2	0
	Voice recorder	2	0
	Auditorium Power wiring	1	0

Annex II

Detailed Budget

	Strategic Direction	NSP Reference	Priority	Activity	2018	2019	2020	2021	2022	Total	Remarks
1	Universal access to diagnosis and treatment	6.2 & 6.3.4	Absolute	1.1 Artemisinin combination antimalarial medicines	1,542,858	1,697,143	1,866,858	2,053,544	2,258,898	9,419,300	
		6.2 & 6.3.4	Absolute	1.2 Chloroquine, Quinine and primaquine	1,870,832	1,983,082	2,102,067	2,228,191	2,361,882	10,546,054	
		6.3	Absolute	1.3 RDTs	5,292,000	5,609,520	5,946,091	6,302,857	6,681,028	29,831,496	
		6.2 & 6.3.4	Absolute	1.4 G6PD deficiency test kits	130,000	143,000	157,300	173,030	190,333	793,663	
		6.3	High	1.5 Follow up of patients	2,500,000	2,650,000	2,809,000	2,977,540	3,156,192	14,092,732	
2	Surveillance	6.3.1	High	2.1. Passive case detection	0	0	0	0	0	0	Included as provincial recurrent budget
		6.3.2	High	2.2. Pro active Surveilence-Mobile Malaria Clinics	11,193,600	12,720,000	13,483,200	14,246,400	15,101,184	66,744,384	
		6.3.2	High	2.3.Reactive surveillance	1,480,000	1,568,800	1,662,928	1,762,704	1,868,466	8,342,898	
		6.7.3	Absolute	2.4. Clinician programmes-2.4.1.Medical Doctors	1,237,275	2,712,722	2,791,412	2,874,824	2,082,708	11,698,941	
		6.7.3	High	2.4. Clinician programmes-2.4.2.General Practitioners	3,063,450	3,247,257	3,442,092	3,648,618	3,867,535	17,268,952	

	Strategic Direction	NSP Reference	Priority	Activity	2018	2019	2020	2021	2022	Total	Remarks
		6.3.5	Absolute	2.5. Case and foci investigation-2.5.1 Entomological Surveilence	2,535,000	2,687,100	2,848,326	3,019,226	3,200,379	14,290,031	
		6.3.6	High	2.6. Routine Entomological surveilence	46,350,000	49,131,000	52,078,860	30,858,720	32,710,243	211,128,823	
		6.3.7	High	Vulnerability	7,550,000	0	0	0	0	7,550,000	
		6.3.7	High	2.8. Risk mapping	250,800	265,848	281,799	298,707	316,629	1,413,783	
3	Malaria Prevention			**3.1 Vector Control**							
		6.4.1	Absolute	3.1.1.Insecticides-(IRS and space spraying)	691,969	7,700,000	8,470,000	9,317,000	10,248,700	36,427,669	
		6.4.1	Absolute	3.1.2.Chemical Larviciding	5,000,000	5,500,000	6,050,000	6,655,000	7,320,500	30,525,500	
		6.4.1	Absolute	3.1.3.LLINs	140,452,495	0	30,200,000	33,220,000	36,542,000	240,414,495	
		6.3.8 & 6.4.1.2	Medium	3.1.4.Larval Source Management (Filling up of abandoned wells)	3,000,000	3,180,000	2,120,000	0	0	8,300,000	
		6.9.1	High	3.1.5.Developing vector Control Training Package	1,982,200	0	0	0	0	1,982,200	
		6.4.1.1	Medium	3.1.6 Insecticide resistence monitoring	2,497,865	2,647,737	2,806,602	2,974,998	3,153,498	14,080,700	
			Medium	3.1.7.Development of insecticide policy	0	1,047,500	0	670,000	0	1,717,500	
		6.4.1.2	High	3.1.8.community program for water storage tanks	115,000	62,500	62,500	62,500	62,500	365,000	
		6.4.2	High	3.2.Procurement of chemoprophylaxis-Mefloquine and Doxycycline	15,178,542	29,875,798	30,988,798	32,168,578	22,093,347	130,305,063	
4	Quality Assurance	6.5.1	High	4.1.External competency assessment	660,000	0	741,576	0	833,235	2,234,811	
		6.5.1	High	4.2.National Competency assessment	0	2,347,000	2,637,089	2,963,033	0	7,947,123	

	Strategic Direction	NSP Reference	Priority	Activity	2018	2019	2020	2021	2022	Total	Remarks
		6.5.1	High	4.3.Training of Hospital staff on RDT	140,000	148,400	157,304	166,742	176,747	789,193	
		6.5.1	High	4.4.Cross checking of slides	1,968,000	2,040,000	2,040,000	2,112,000	2,112,000	10,272,000	
5	Monitoring and Evaluation	6.6.1	High	5.1.Supervision	868,000	920,080	975,285	1,033,802	1,095,830	4,892,997	
		6.6.2	High	5.2 Monthly review meetings	2,221,620	2,342,706	2,483,268	2,632,264	2,790,200	12,470,059	
		6.6.4	High	5.3.Mid-term external review	12,412,000	0	0	12,412,000	0	24,824,000	
			High	5.4.Oversight	0	0	0	0	0	0	
		6.6.6	High	5.4.1.Meeting of TSG	190,170	201,580	213,675	226,496	240,085	1,072,006	
		6.6.6	High	5.4.2.Meeting of CRC	255,420	270,745	286,990	304,209	322,462	1,439,826	
6	Information, education and communicatio n (IEC) and advocacy										
		6.7	Medium	6.1Development of IEC material	15,500,000	3,000,000	3,000,000	3,000,000	3,000,000	27,500,000	
		6.7	Low	6.2.Viewing time on electronic media	0	3,000,000	3,000,000	3,000,000	3,000,000	12,000,000	
		6.7.1	Medium	6.3.Group advocacy sessions	4,459,465	4,727,033	5,010,655	5,311,294	5,629,972	25,138,419	
		6.7	Low	6.4.Message posts at international airports	0	850,000	0	850,000	0	1,700,000	
		6.7.3	High	6.6.Advocacy for Health care personnal	1,577,120	1,671,747	1,772,052	1,878,375	1,991,078	8,890,372	
		6.7.3	Medium	6.7.Development of module for undergraduates	242,500	0	0	0	0	242,500	
		6.7.3	High	6.8.Advocacy for Health Directors	1,090,901	1,156,355	1,225,736	1,299,281	1,377,237	6,149,510	
		6.7.3	High	6.9. Advocacy programmes for Colleges	600,000	636,000	674,160	714,610	757,486	3,382,256	
		6.7	High	6.10.-Organization of high impact public heath events related to malaria	1,168,505	1,238,615	1,312,932	1,391,708	1,475,211	6,586,971	

	Strategic Direction	NSP Reference	Priority	Activity	2018	2019	2020	2021	2022	Total	Remarks
7	Partnerships	6.8	High	7.1.Stakeholders meetings	1,446,750	1,533,555	1,217,160	1,290,190	1,367,601	6,855,256	
		6.8.2	High	**7.2.Regional Co-operation**							
		6.8.2	Low	7.2.1.Regional cooperation two days annual meeting	0	0	0	0	0	0	To be held with other WHO meetings
		6.8.2	Low	7.2.2.International Workshop on PoR	3,020,000	0	0	3,020,000	0	6,040,000	
8	Capacity building			**8.1.Developing/Updating Standard Operating Procedures and guidelines**							
		6.9.1	High	8.1.1.Scope of work when a malaria case is detected	0	155,000	0	174,158	0	329,158	
		6.9.1	High	8.1.2.Surveillance guidelines	756,500	0	0	407,000	0	1,163,500	
		6.9.1	High	8.1.3.Manual for Regional Malaria Officers	0	895,000	0	0	0	895,000	
		6.9.1	High	8.1.4.Malaria microscopy	603,750	0	0	0	0	603,750	
		6.9.1	High	8.1.5.Entomological surveillance	0	655,000	0	780,115	0	1,435,115	
		6.9.1	High	8.1.6.Vector control guideline development	2,106,840	0	0	0	0	2,106,840	
		6.9.1	High	8.1.7.Outbreak preparedness and response	0	0	670,000	0	0	670,000	
		6.9.1	High	8.1.8.National Treatment Guidelines	670,000	0	0	0	0	670,000	
		6.9.1	High	8.1.9.Chemoprophylaxis guidelines	670,000	0	0	670,000	0	1,340,000	
		6.9.1	High	8.1.10.Diagnostic quality assurance	0	670,000	0	0	670,000	1,340,000	

	Strategic Direction	NSP Reference	Priority	Activity	2018	2019	2020	2021	2022	Total	Remarks
		6.9.1	Medium	8.1.11.Entomological techniques SOP	0	670,000	0	0	0	670,000	
		6.9.1	High	8.1.12.M & E Plan	1,853,155	0	0	0	0	1,853,155	
				8.2 Human resources	0	0	0	0	0	0	
		6.9.2.1	High	8.2.1.Development of a HR Plan	0	500,000	0	250,000	0	750,000	
		6.9.2.1	High	**8.2.2 Local in-service training**							
				AMC HQ staff and RMOs							
		6.9.2.2	High	8.2.2.1RMO Training (including supervision, monitoring and evaluation, case management, POR updates)	0	455,250	482,565	511,519	542,210	1,991,544	
		6.9.2.3	High	8.2.2.2.Training programme on entomology techniques	0	396,750	0	445,788	0	842,538	
		6.9.2.2	High	8.2.2.3.In-service GIS training programme	900,000	0	0	0	0	900,000	
		6.9.2.2	High	8.2.2.4.DHIS2 training programme	0	310,315	0	0	0	310,315	
		6.9.2.2	Medium	8.2.2.5.DHIS2 updates	0	0	99,640	105,618	111,956	317,214	
		6.9.2.2	High	8.2.2.6.In-service training programme-PHLTs	6,049,620	5,041,350	5,343,831	5,664,461	6,004,329	28,103,590	
		6.9.2.2	High	8.2.2.7.Training of Trainers on Microscopy Teaching skills-PHLTS	0	326,250	0	366,575	0	692,825	
		6.9.2.2	High	8.2.2.8.Accreditation programme-PHLTs	281,850	0	316,687	0	355,829	954,366	

	Strategic Direction	NSP Reference	Priority	Activity	2018	2019	2020	2021	2022	Total	Remarks
		6.9.2.2	High	8.2.2.9.Training programme on malaria diagnosis-Private Sector Laboratory Technologists	259,020	562,500	596,250	632,025	669,947	2,719,742	
		6.9.2.2	High	8.2.2.10.In-service training programme-Public Health Field Officers (PHFOs)	750,550	1,372,700	1,455,062	1,542,366	1,634,908	6,755,585	
		6.9.2.2	High	8.2.2.11.In-service training programme-Public Health Inspectors (PHIs)	786,950	1,113,000	1,179,780	1,250,567	1,325,601	5,655,898	
		6.9.2.2	High	8.2.2.12.In-service training programme-Health Entomological Officers (HEOs)	1,079,290	1,109,714	1,176,297	1,246,875	1,321,687	5,933,863	
		6.9.2.2	High	8.2.2.13.In-service training programme-Spray Machine Operators (SMOs)	583,000	957,180	1,014,611	1,075,487	1,140,017	4,770,295	
		6.9.2.2	High	8.2.2.14.In-service training programme-Entomologist,new RMO,medical Officers	647,245	667,000	707,020	749,441	794,408	3,565,114	
		6.9.2.2	High	8.2.2.15.Provincial Training	5,908,572	6,263,086	6,638,871	7,037,204	7,459,436	33,307,170	
		6.7.3	High	8.2.2.16.Pre-internship update	182,800	193,768	205,394	217,718	230,781	1,030,461	
		6.9.2.2		**8.2.3 International training**							
		6.9.2.2	Absolute	8.2.3.1.Training programme on clinical management of malaria	444,100	1,344,170	1,424,820	1,510,309	1,600,928	6,324,328	
		6.9.2.2	High	8.2.3.2.Entomology and vector control	4,793,510	5,081,120	5,385,987	5,709,147	6,051,695	27,021,459	

	Strategic Direction	NSP Reference	Priority	Activity	2018	2019	2020	2021	2022	Total	Remarks
		6.9.2.2	High	8.2.3.3.Advanced entomology training programme	737,000	1,279,150	1,355,899	1,437,253	1,523,488	6,332,790	
		6.9.2.2	High	8.2.3.4.Training on quality assurance on microscopy	0	731,550	821,970	0	923,565	2,477,085	
		6.9.2.2	High	8.2.3.5Training on mosquito taxonomy for HEOs	458,855	0	515,569	0	579,294	1,553,718	
		6.9.2.2	Absolute	8.2.3.6 DHIS2 Disease Surveillance Training	724,036	0	0	0	0	724,036	
				8.3 Infrastructure development							
		6.9.3	High	8.3.1 Refurbishment of RMO offices	600,000	14,000,000	0	0	0	14,600,000	
		6.9.3	High	8.3.2 Upgrading 3 entomology laboratories	0	9,000,000	0	0	0	9,000,000	
		6.9.3	High	8.3.3 Establish a centre for entomology and vector control training including a field station	0	50,000,000	50,000,000	0	0	100,000,000	
		6.9.3	High	8.3.4 Establish microscopic diagnostic facility in hospitals above base hospital level	0	5,000,000	0	0	0	5,000,000	
		6.9.3	High	8.3.5 Construct 22 Fish tanks	0	1,250,000	0	0	0	1,250,000	
		6.9.3	High	8.3.6 Procurement of new editions of digitized maps	793,764	0	0	0	0	793,764	
		6.9.3	High	8.3.7 Upgrading IT facilities at AMC HQ	0	13,361,960	0	1,245,000	0	14,606,960	
		6.9.3	High	8.3.8 Procure 15 vehicles for regional offices	0	68,310,000	0	0	0	68,310,000	

	Strategic Direction	NSP Reference	Priority	Activity	2018	2019	2020	2021	2022	Total	Remarks
		6.9.3	High	8.3.9 Upgrade IT facilities in Regional Office	23,458,170	0	0	2,075,000	0	25,533,170	
		6.9.3	High	8.3.10 Refurbishing Regional Offices	5,501,143	0	5,498,857	0	0	11,000,000	
		6.9.3	High	8.3.11. Procurement of microscopes for district and central entomological teams	0	0	21,498,750	0	0	21,498,750	
9	Programme Management	6.1	High	10.1 Supplies for PCR - parasitological laboratories	6,250,000	7,435,000	9,580,000	9,960,000	10,557,600	43,782,600	
		6.1	High	10.2 Supplies for entomology laboratories	1,927,205	577,500	1,762,500	552,500	585,650	5,405,355	
		6.1	High	10.3 Maintenance of equipment (including IT and laboratory equipment)	2,488,877	2,638,210	2,796,503	2,964,293	3,142,150	14,030,034	
		6.1	Medium	10.4 Printing of the national malaria strategic plan, M&E plan, annual action plans, and annual reports of the AMC.	1,500,000	1,060,000	1,123,600	1,060,000	2,007,338	6,750,938	
		6.1	High	10.5 Office supplies for AMC HQ and Regional Offices	12,951,654	13,728,753	14,552,479	15,425,627	16,351,165	73,009,679	
		6.1	High	10.6 Recurrent expenses AMC	108,183,848	114,674,879	121,555,372	128,848,694	136,579,616	609,842,409	
		6.1	Low	10.7.Salaries-Project Staff	85,729,430	0	0	0	0	85,729,430	
			High	Recurrent provincial (salaries, overtime and fuel)	650,761,808	689,807,517	731,195,968	775,067,726	821,571,789	3,668,404,808	
10	Operational Research	6.11	Medium	11.1 Two-day research colloquim	0	53,000	0	59,551	63,124	175,675	