National Strategic Plan

Prevention and Control of Dengue in Sri Lanka

2024 – 2030

National Dengue Control Unit
Ministry of Health
2024

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Sri Lanka

December 2024

National Strategic Plan for the Prevention and Control of Dengue in Sri Lanka: 2024 – 2030

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National Strategic Plan at a Glance	
Country	Sri Lanka
Title	National Strategic Plan for Prevention and Control of Dengue in Sri Lanka 2024 – 2030
Ministry	Ministry of Health
Duration	2024 – 2030
Budget	Approximately 576.8 million rupees per year
Implementing Institute	National Dengue Control Unit of the Ministry of Health
Geographical Target areas	National & subnational
Targets	To reduce by 2030 the case fatality associated with dengue to zero from the baseline rate of 0.08% and reduce the incidence of dengue in the country by 75% (<100/100,000) from the 2022–2023 baseline level
Strategic objectives	*Strategic Objective 1* Disease surveillance and risk assessment
	Strategic Objective 2 Early diagnosis and case management
	Strategic Objective 3 Vector surveillance and control
	Strategic Objective 4 Early detection and rapid response to dengue outbreaks
	Strategic Objective 5 Risk communication and community engagement and mobilization
	Strategic Objective 6 Enhancing multisectoral action
	Strategic Objective 7 Innovation and research

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Message from the Secretary of Health

In the background of an ever-increasing dengue disease burden contributed to by climate change, rapid urbanization, and increased travel, it has been recognized worldwide that reduction of the dengue disease burden requires a coordinated multi-sectoral approach.

The National Strategic Plan for the Prevention and Control of Dengue 2024-2030 is the next step in the two-decade-long journey of the National Dengue Control Unit (NDCU) of the Ministry of Health Sri Lanka to guide dengue prevention and control. This plan builds upon previous National Action Plans and aims to eliminate dengue through coordinated efforts at the national, provincial, district, and divisional levels. It emphasizes action, supervision, monitoring, and evaluation. The National Strategic Plan provides for a more integrated, cost-effective, technologically advanced, strategic, and sustainable dengue control and prevention programme to be implemented island-wide by all relevant stakeholders.

Various sectors contribute to the creation of environments where mosquitoes can breed, increasing the risk of dengue transmission due to inadequate practices and a lack of effective mitigation measures. To effectively prevent and control dengue, a comprehensive, multi-sectoral approach is essential, involving a range of stakeholders. Therefore, as highlighted in this important document, establishing a collaborative partnership framework is crucial for facilitating knowledge exchange, improving stakeholder coordination, enhancing communication, and strengthening intersectoral collaboration.

The technical and financial contributions of the World Health Organization (WHO) played a crucial role in ensuring the successful completion of the National Strategic Plan 2024-2030. I congratulate the National Dengue Control Unit and wish them all the best.

Dr. Anil Jasinghe
Secretary/ Ministry of Health and Mass Media

Message from the Director General of Health Services

Dengue remains a major public health concern in Sri Lanka, with over 89,000 cases reported in 2023. Despite the implementation of multiple control strategies, their implementation must be standardized and evidence-based to ensure effectiveness. The need for strong direction and guidance in dengue control cannot be overstated. However, the case fatality rate of dengue has significantly declined due to advancements in clinical management. Key contributing factors include capacity building of clinical staff, the development of evidence-based clinical management guidelines, and improvements in healthcare infrastructure. The collaboration between the clinical and public health sectors has played a crucial role in achieving these outcomes.

The National Strategic Plan for Dengue Prevention and Control (2024–2030) establishes a structured framework aimed at reducing the burden of dengue and further decreasing the case fatality rate. This plan was developed by incorporating insights from previous National Action Plans (2019–2023 and 2011–2015) while taking into account the evolving dynamics of dengue illness. Furthermore, it integrates global advancements in dengue control strategies to enhance its effectiveness.

Achieving sustainable success in dengue control requires effective collaboration between public health professionals and the clinical sector. By working together and complementing each other's efforts, the country can achieve significant and lasting improvements in dengue prevention and management.

This publication serves as a roadmap for implementing the necessary innovations and improvements planned across the country. I am confident that all stakeholders, both in health and non-health sectors, will adhere to and follow the strategic directions of the National Strategic Plan to achieve the outlined goals. I extend my support to the National Dengue Control Unit for the implementation of this comprehensive strategic plan.

Dr. Asela Gunawardena
Director General of Health Services

Message from the Deputy Director General Public Health Services 1

The National Strategic Plan for the Prevention and Control of Dengue (2024–2030) provides a comprehensive technical roadmap designed to coordinate the efforts of the National Dengue Control Programme, Ministry of Health, to prevent and mitigate dengue outbreaks. The primary objective of the National Strategic Plan is to reduce both morbidity and mortality associated with dengue with the end goals of (1) reducing the incidence rate from the 2022-2023 baseline of 376 cases / 100,000 population per year to <100 cases /100,000 population per year and (2) Zero mortality due to dengue illness by 2030.

The planned strategic directives encompass all critical action areas required for a comprehensive response to dengue within the context of hyperendemicity. The action plans are systematically organized into the following key categories: (i) disease surveillance and risk assessment, (ii) early diagnosis and case management, (iii) vector surveillance and control, (iv) early detection and rapid response to outbreaks, (v) risk communication, (vi) community engagement and mobilization, multisectoral action, and (vii) innovation and research activities. This strategic framework is aimed at fostering a sustained reduction in the dengue burden through targeted interventions and evidence-based approaches.

The National Strategic Plan incorporates promising initiatives, such as innovative geospatial mapping, the development of forecasting systems, and the integration of molecular biological advancements. These approaches, when combined with social mobilization, fostering community responsibility, and promoting behavioural change innovations, are expected to contribute significantly to the prevention and control of dengue in Sri Lanka.

In a context of renewed hope and developmental progress, a healthy population and workforce stand as one of the country's most valuable resources. I commend the authors and contributors whose efforts have brought this strategic directive a reality and continue to support the National Dengue Control Unit in its ongoing endeavours to protect the health of the citizens of Sri Lanka.

Dr. S. M. Arnold
Deputy Director General (Public Health Services) I

Preface

The National Dengue Control Unit (NDCU) in Sri Lanka has meticulously worked for dengue control and prevention measures since 2005. Despite ongoing efforts, the country has experienced recurring dengue epidemics over the past decade, with reported cases increasing gradually except in 2020 and 2021 during COVID-19 pandemic.

Sri Lanka has already achieved the lowest-ever dengue case fatality rate of less than 0.07% in 2023 with 89,799 cases and 62 deaths, indicating significant progress since 2009, despite the rise in the number of reported dengue cases. Further reducing the case morbidity, and mortality while preserving the gains achieved so far remains a top public health priority in the country. A comprehensive and sustainable dengue control programme is needed to achieve the aforesaid goals.

The National Strategic Plan for the Prevention and Control of Dengue (2024–2030) provides a roadmap for sustaining key interventions by thorough planning and holistic implementation to reduce the burden of dengue significantly in the country.

Over the next six years, the country's focus will be on strengthening healthcare and laboratory facilities for early diagnosis, enhancing fever screening processes, and improving emergency care at the initial point of contact. Additionally, reducing morbidity will be prioritized through targeted collaborative and community actions. Scaling up vector control, based on an integrated vector management approach, advocacy, social mobilization and risk communication, as well as legislation will be employed strategically, with guidance from the presidential task force for both intra- and inter-sectoral collaboration.

The introduction of new tools and technologies including geospatial risk mapping, risk mitigation, early detection, and rapid response to outbreaks, improving surveillance and case notification as well as functional integration of some activities with other health programmes in the country have the potential to increase the effectiveness of the dengue control programme and is expected to produce favourable outcomes.

Finally, ensuring sustainable implementation will depend on sufficient funding, a well-trained workforce and sustained political will.

Overall, this strategic plan aims to significantly reduce the public health burden of dengue in Sri Lanka.

Dr. Sudath Samaraweera
Director
National Dengue Control Unit
31.12.2024

Acknowledgements

The National Strategic Plan for Prevention and Control of Dengue 2024–2030 was prepared by the National Dengue Control Unit (NDCU) of the Ministry of Health, with the expertise of Dr. Rajpal S. Yadav, a World Health Organization (WHO) Consultant and former staff member of the WHO headquarters. His participation in the development of the plan was facilitated by the WHO Country Office in Sri Lanka, to which sincere gratitude is extended.

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The Ministry of Health acknowledges the technical inputs provided by programme managers, Health administrators, Experts/Consultants of relevant disciplines, Consultant Community Physicians, Regional Epidemiologists, Medical Officers – Epidemiology, Medical Officers of Health, Entomologists, SPHII/PHII of the districts/Provinces, SHEOs/HEOs at central and district levels, members of the Technical Advisory Group on Dengue prevention and control, and other stakeholders. Their contributions through a series of consultative meetings and the peer review of the plan document were invaluable.

The technical inputs provided by the vector borne diseases comprehensive external review team, led by Dr. Rajpal S. Yadav, with contributions from Prof. Lee Ching NG (Director of NEA, Singapore), Ms. Lynelle Seow (Assistant Director of NEA, Singapore), Dr. Jason Tan (Assistant Director of NEA, Singapore), Dr. Aya Yajima (Regional Advisor, Neglected Tropical Diseases), and Dr. Risintha Premarathna, (Regional Advisor, Malaria) from WHO SEARO were crucial to the success of this activity.

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Abbreviations

AMOOH	Additional Medical Officers of Health
AO	Administrative Officer
BH	Base Hospital
CCP	Consultant Community Physician
CFR	Case Fatality Rate (%)
CIDA	Construction Industry Development Authority
CMC	Colombo Municipal Council
COVID-19	Coronavirus disease of 2019
DDG	Deputy Director General
DENV	Dengue Virus
DEO	Data Entry Operator
DF	Dengue Fever
DGH	District General Hospital
DGHS	Director General of Health Services
DH	Divisional Hospital
DO	Development Officer
DS	Divisional Secretary
FAO	Food and Agriculture Organization
FBC	Full Blood Count
GA	Government Agent
GN	Grama Niladhari
GP	General Practitioner
GVCR	Global Vector Control Response 2017–2030
HDU	High Dependency Unit
HEO	Health Entomology Officer
HPB	Health Promotion Bureau
IHR	International Health Regulations
IVM	Integrated Vector Management
LLIN	Long-lasting insecticidal net
MA	Management Assistant
MEPA	Marine Environment Protection Authority
MO	Medical Officer
MOOH	Medical Officers of Health
MRI	Medical Research Institute
NaDSys	National Dengue Surveillance System
NDCU	National Dengue Control Unit

NEA	National Environment Agency
NGO	Non-governmental organization
NIHS	National Institute of Health Sciences
NO	Nursing Officer
NS1	Non-Structural Protein 1 (of dengue virus)
NSP	National Strategic Plan
NTD	Neglected Tropical Disease
OPD	Outpatient Department
PDHS	Provincial Director of Health Services
PHI	Public Health Inspector
PHII	Public Health Inspectors
PHS	Public Health Service
PTF	Presidential Task Force
RDHS	Regional Director of Health Services
RDT	Rapid diagnostic test
RE	Regional Epidemiologist
RFO	Regional Filaria Officer
ROP	Registrar of Pesticides
SEARO	South East Asia Regional Office
SHEO	Special Grade Health Entomology Officer
SKS	Saukya Kaarya Sahayaka (Health Assistant)
SMO	Spray Machine Operator
SOP	Standard Operating Procedure
SPHII	Supervising Public Health Inspectors
TAG	Technical Advisory Group
TOT	Training of Trainers
USS	Ultrasound scan
VBD	Vector-borne disease
VCNA	Vector control need assessment
WHO	World Health Organization

Executive Summary

Dengue has emerged as a significant global public health concern in recent years, causing high morbidity and notable mortality rates. Sri Lanka is one of the most highly endemic countries for dengue.

The National Dengue Control Unit (NDCU) of the Ministry of Health is the focal point for prevention and control of dengue in Sri Lanka. The Unit was established in 2005 following a policy decision by the Ministry of Health in response to a major dengue outbreak in 2004 and was later upgraded to a directorate in 2012. Dengue prevention and control require many activities that require close coordination with multiple stakeholders. Key activities include disease surveillance and response, entomological surveillance and integrated vector management, capacity building in clinical management, intersectoral collaboration, social mobilization, and community engagement. Additionally, it is paramount to monitor programme implementation, evaluate its performance, and provide technical guidance.

A national action plan for dengue control in Sri Lanka was first developed for the period 2011–2015. Thereafter, in response to the increasing endemicity and intermittent outbreaks of dengue, another plan covering the period 2019–2023 was developed, which emphasized the need for a reorganized and strengthened framework for dengue prevention, control, and clinical management through an integrated approach.

The National Strategic Plan for the Prevention and Control of Dengue, 2024–2030 (NSP) aims at galvanizing action and available resources at national and subnational levels to mitigate the burden of disease, prevent outbreaks, and further reduce the case fatality rate. It leverages the experiences from the dengue outbreaks in 2017, 2019, and 2023, gaps identified, gains made across surveillance, web-based case notification, vector control, case diagnosis, clinical care and case management, and networking. It considers the evolving dynamics of dengue virus serotypes, vector bionomics, the impact of sociocultural, environmental and climate changes, and technological advances.

The National Strategic Plan 2024–2030 aims to reduce by 2030 the case fatality associated with dengue to zero from the baseline rate of 0.08% and the incidence of dengue in the country by 75% (<100/100,000 population) from the 2022–2023 baseline level (376/100,000 population).

To meet these targets, the NSP 2024–2030 includes strategic objectives under the following key areas:

Strategic Objective 1. Disease surveillance and risk assessment

Strategic Objective 2. Early diagnosis and case management

Strategic Objective 3. Vector surveillance and control

Strategic Objective 4. Early detection and rapid response to dengue outbreaks

Strategic Objective 5. Risk communication and community engagement and mobilization

Strategic Objective 6. Enhancing multisectoral action

Strategic Objective 7. Innovation and research

The National Strategic Plan incorporates a performance framework to monitor programme implementation and evaluate the impact of interventions with quantifiable and verifiable processes, output, outcome, and impact indicators.

The publication of this National Strategic Plan is the culmination of a series of expert consultations, inputs from the Technical Advisory Group on dengue, the recommendations made by the WHO international review of the dengue programme of Sri Lanka in May 2024, and the support given by the WHO Country Office. Over the next seven years, the health system capacity will be strengthened, enabling actions such as advocacy and communication will be enhanced, and the planned activities will be executed in a phased approach to significantly reduce the health and socioeconomic burden of dengue in the country. A strong political will in the country provides a very favourable and sustainable policy environment and the NDCU stands committed to successfully implementing this strategic plan.

1. Introduction

1.1 Background

Over the past two decades, dengue illness has made a significant health, economic, and social impact in Sri Lanka, posing a major public health challenge. The WHO reports that currently nearly half of the global population is endemic or at risk of dengue with an estimated 100–400 million infections occurring each year [1]. At the end of April 2024, 7.6 million DF cases including 3.4 million confirmed cases of dengue were reported to WHO and the disease was endemic in 90 countries with active dengue transmission [2]. Notably, the incidence of dengue fever from January to April 2024 is three times higher than the number of cases reported during the same period in 2023, which was also a record year, making it the highest number of dengue cases reported.

There is no doubt that dengue, a vector-borne disease caused by four serologically related viruses, poses a significant infectious disease threat to human health. The World Health Organization's classification of dengue as a Grade 3 emergency in December 2023 underscores the urgency and severity of the situation. Although this National Strategic Plan (NSP) is specifically for the prevention and control of dengue, it is noteworthy that there is a considerable geographical overlap of dengue virus with its four serotypes (DENV-1, DENV-2, DENV-3, DENV-4) with two other co-circulating arboviruses namely chikungunya and Zika virus, all transmitted by *Aedes* mosquito vectors. These viruses share some clinical features posing a diagnostic challenge leading to misdiagnoses.

All countries in the Southeast Asia Region being endemic to dengue except the Democratic People's Republic of Korea. Bangladesh, India, Indonesia, Myanmar, Sri Lanka, and Thailand are among the most highly affected countries in the world. Despite efforts to control the disease, the number of dengue cases has significantly increased over the years, although improvements have been made in case management with decreasing case fatality rate (CFR).

The first serologically confirmed dengue patient in Sri Lanka was reported in 1962. Since 2000, dengue has become endemic in the country with periodic epidemics. Although the disease was first reported in the western province, it is currently widely distributed throughout the island, including rural areas. Hence, dengue has become the communicable disease of most significant public health importance in the country and was included in the list of notifiable diseases in the country since 1996.

There is currently neither a specific treatment for dengue nor a dengue vaccine that can be deployed for operational use. Therefore, reducing dengue morbidity and CFR requires improved case detection and notification, case management based on best practices,

developing mechanisms for early prediction and rapid response to outbreaks, need-based entomological surveillance and interruption of transmission through integrated vector management, community engagement, networking and multisectoral participation, as well as strengthening health system capacity. Much needed scientific evidence can come from basic and operational research including access to novel tools and technologies, diagnostics, case triage systems, clinical interventions and the development of suitable vaccines. Overall, the NSP focuses on effective use of the currently available tools, resources and mechanisms, but promotes evidence-informed interventions and innovations for the prevention and control of dengue in Sri Lanka.

The targets of this National Strategic Plan for the Prevention and Control of Dengue 2024–2030 have been aligned with the relevant global development and health targets such as the Sustainable Development Goals, the WHO roadmap for elimination of neglected tropical diseases 2021–2030 [*3*], and the WHO Global Vector Control Response 2017–2030 (GVCR) [*4*]. It will also meet the requirements of the International Health Regulations (IHR) 2005.

2. Dengue situation analysis

2.1 Disease burden

Dengue is now the leading communicable disease related public health problem in Sri Lanka, with hyper-endemicity in many areas. It was first reported in the country in the 1960s [5] and its first major outbreak occurred in 1989 in Colombo [6].

Usually, the number of dengue patients increases during the second and fourth quarters of each year coinciding with the two monsoonal rains. Large-scale outbreaks of dengue have occurred every three to four years with high intensity resulting in increased levels of disease endemicity in the country. A major epidemic of dengue occurred in 2009 resulting in 35,098 patients and a case fatality rate (CFR) of 0.99%. Thereafter marked surges in dengue cases occurred in alternate years until a massive outbreak in 2017 with 186,101 cases and 440 deaths. After a slight decline in 2018, the cases again increased to 105,049 in 2019 with 157 deaths. Later the number of cases receded until 2021 during the COVID-2019 period, the adverse impact of which significantly affected reporting of dengue cases and is worth exploring further. The year 2020 reported the lowest number of cases after 2016, with an incidence of 142/100,000. In 2021, there was a low reporting of dengue cases due probably to the mobility restrictions implemented during the COVID-19 pandemic.

After lifting the travel restrictions related to COVID-19 in 2022, 76,689 dengue cases were reported (case incidence 346/100,000; deaths 72; CFR 0.09%) with several districts reporting varying surges in cases in that year. In 2023, a 17% increase was reported (89,799 cases; case incidence 408/100,000; 62 deaths; CFR 0.08%) with a marked rise in December, due inter alia to a significant escalation of case reporting in Northern and Eastern provinces, especially in the Jaffna district (Fig. 1). The case incidence in 2023 though varied in different districts, ranging from <100 in three districts to 101–400 in 14 districts to 401–769/100,000 in 9 districts. The districts of Colombo, Jaffna, Gampaha, Kandy and Batticaloa led the rise in cases. Dengue has thus spread wings in some new territories in the Western province but also in the historically malaria endemic semi-arid regions in the east and the north regions. The incidence of dengue in all districts in 2023 is shown in Fig. 2 and the numbers of cases by provinces and districts are presented in Annex 1.

Despite these surges and outbreaks, the CFR is generally declining due apparently to good health system capacity for case management and was 0.07% in 2023.

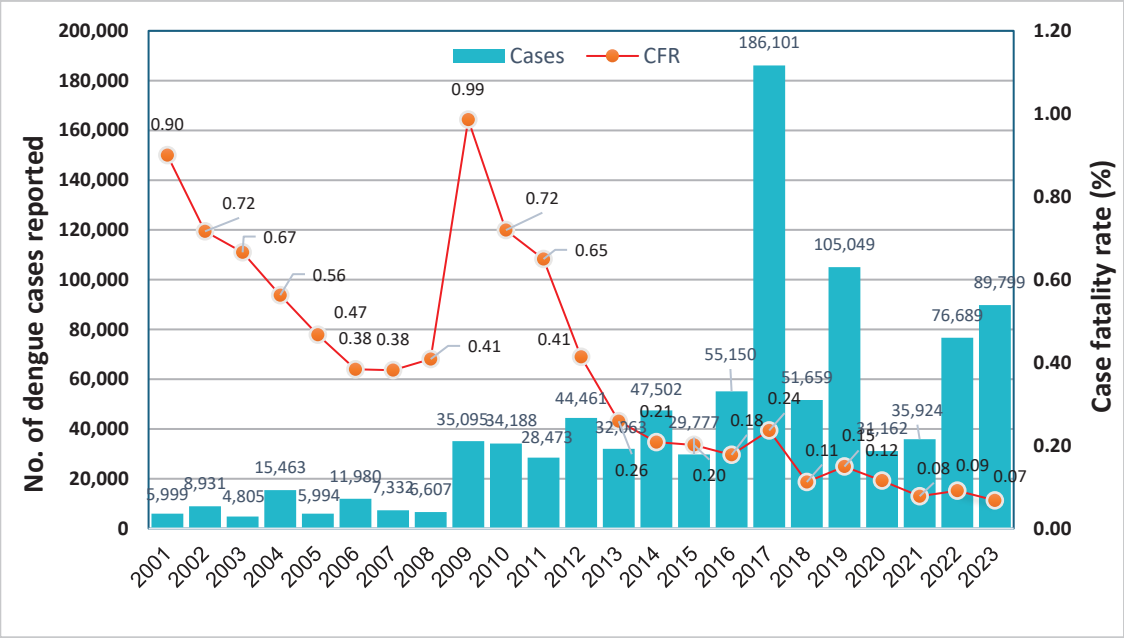

Fig. 1. Trend of reported dengue cases and case fatality rate (CFR) in Sri Lanka, 2001–2023 (Data source: NDCU).

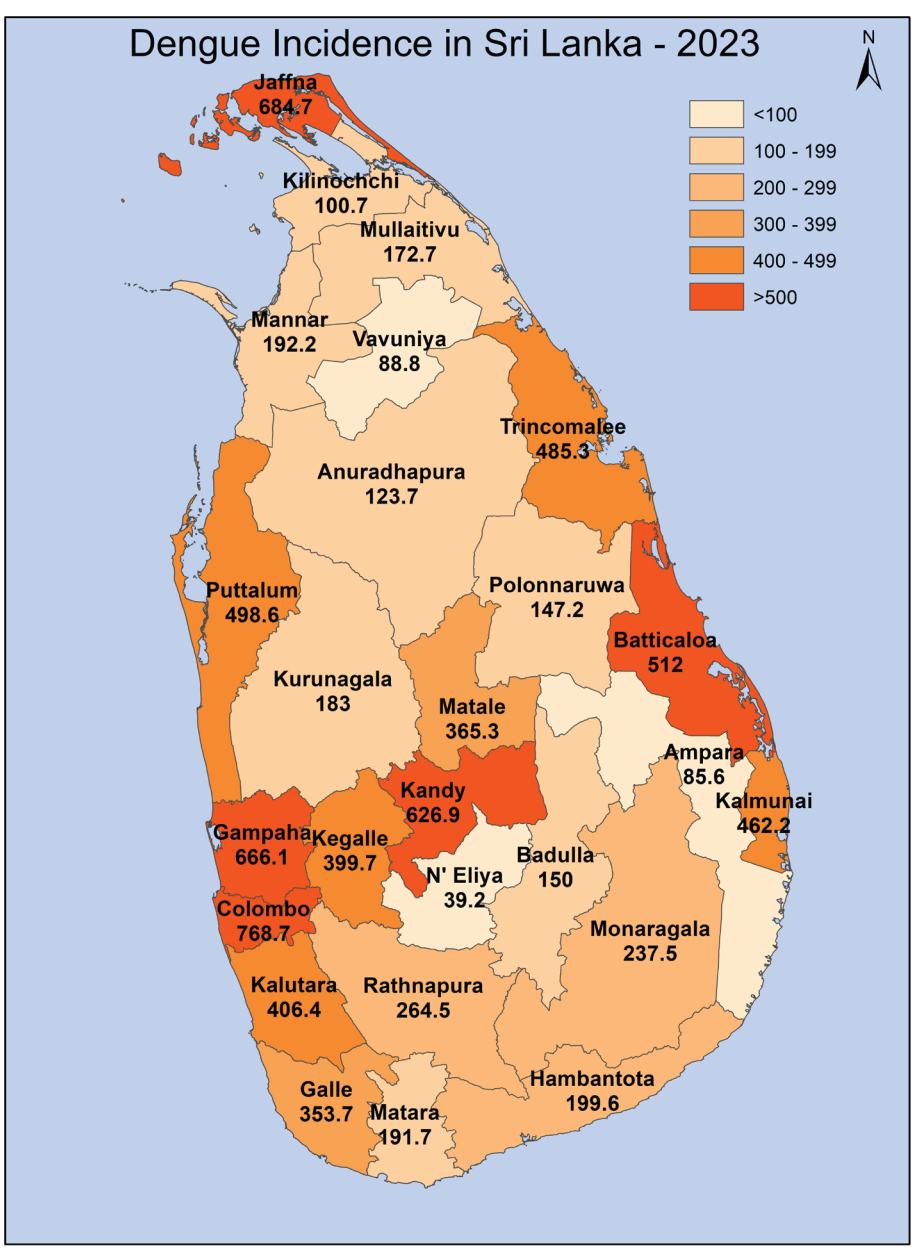

Fig. 2. Dengue incidence (cases/100,000/yr) by districts in Sri Lanka (2023)

Dengue has perennial transmission in Sri Lanka, with two seasonal peaks associated with South-West and North-East monsoonal rains i.e. in May–August and October–January, respectively (Fig. 3).

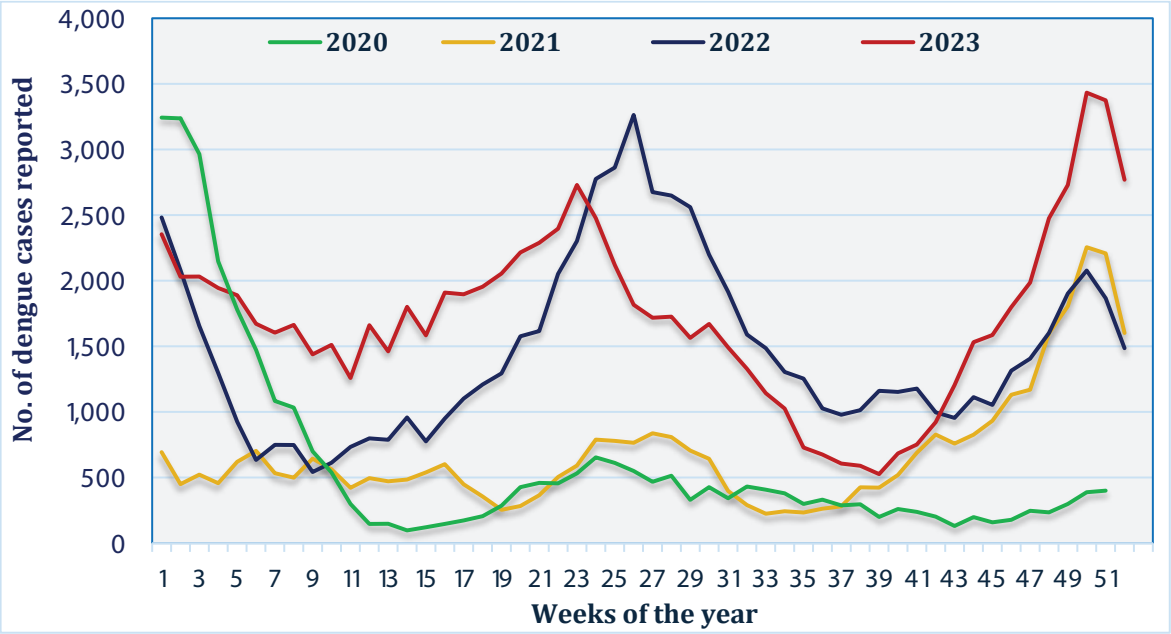

Fig. 3. Temporal pattern of dengue in Sri Lanka (2020–2023)

In Sri Lanka, all four dengue virus serotypes (DENV-1, 2, 3, 4) have been co-circulating [7]. The major outbreak of dengue in 2017 was attributed to the dominating serotype DENV-2 (cosmopolitan genotype) [8–10]. Subsequently, the rise in dengue cases in late 2021 coincided with an increased proportion of DENV-3 [11], and like the recent South-Asian trend, this rising trend has continued to the 2022–2024 period (48–74%) (data sources: Medical Research Institute, Centre for Dengue Research, National Hospital Kandy). Co-infection of these viruses, particularly with DENV-2, can result in unusual clinical outcomes and could be a key factor for the surge of dengue cases in outbreaks.

Over the last three decades, the age distribution of dengue cases has shifted from children under 15 [7] to adults (20–64 yr) who constitute a higher proportion of dengue cases now (64%; NDCU data). The male population shows a slightly higher incidence than females (e.g. 462.9 per 100000 population in males and 355.5 per 100000 population in females in 2023 respectively) which may be associated with occupational exposures or bias in health-seeking behaviour.

Two confirmed vectors of dengue in Sri Lanka are *Aedes aegypti* and *Ae. albopictus*. The seasonal pattern of densities of adult mosquitoes is shown in Fig. 4. No routine xenomonitoring of DENV has so far been conducted to measure the virus infection rates in wild populations of these vectors.

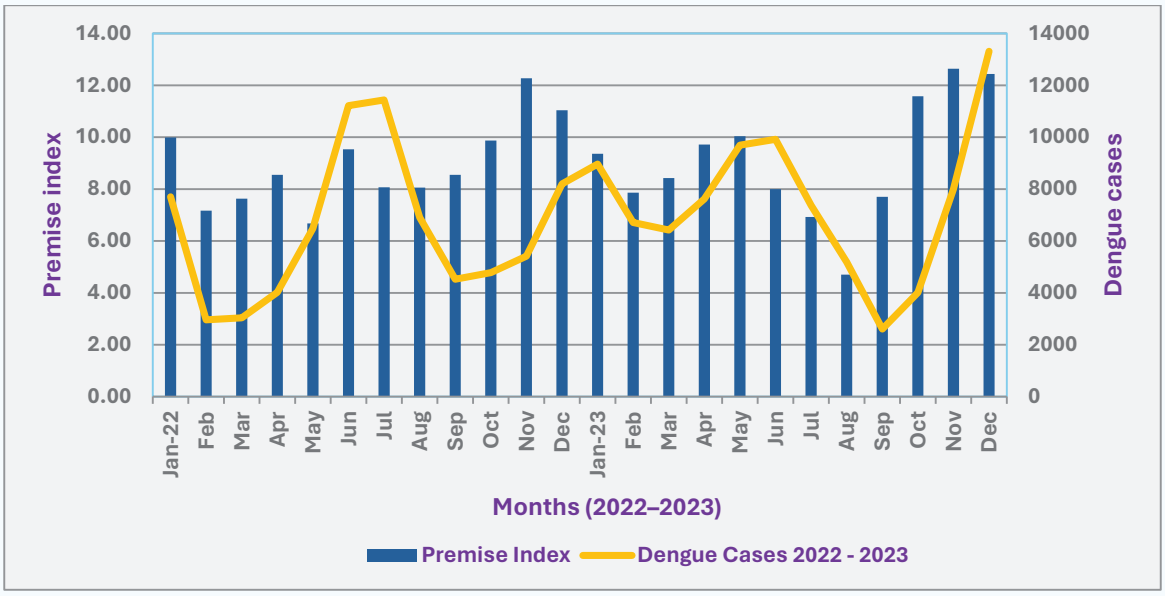

Fig. 4. Seasonal pattern of the Premise Index[1] for *Aedes aegypti and Ae. albopictus* (pooled data) and dengue cases reported in 2022 and 2023.

The key determinants and drivers of dengue transmission in Sri Lanka include immense anthropophagic opportunities in crowded populations; expanded mosquito breeding opportunities due to urbanization, housing expansion and low water security leading to water storage in open containers; solid waste accumulation; *Aedes* vector biology such as long survival of dry eggs; human behaviour; climate-related factors such as optimum temperature, high humidity and rainfall often influenced by the El Niño–Southern Oscillation, and sub-optimal case surveillance and treatment. Many of these factors are relevant to different eco-epidemiological settings in Sri Lanka.

1 Premise Index, percentage of premises infested with *Aedes aegypti* and/or *Ae. albopictus* larvae and/or pupae.

2.2 Analysis of strengths and gaps

Following are the key strengths and gaps identified through the dengue programme review and based on the outcomes of the NSP 2019–2023.

	Technical areas	Strengths	Gaps
1.	Disease Surveillance	• Functional real-time web-based National Dengue Surveillance system (NaDSys) • All Base and upper-level hospitals and major private hospitals are connected to NaDSys • Availability of guidelines for case detection • Well organized health care system for disease surveillance • Timely release and wide dissemination of weekly/ daily dengue updates	• Sub-optimal utility of NaDSys for case investigation • GPs are not included into Surveillance system • Poor notification by GPs (H544) • Low capacity for geo-spatial risk mapping • True burden of dengue unknown
2.	Diagnosis and case management	• Availability of dengue clinical management guidelines • Availability of experts for dengue clinical management for TOT trainings • Availability of adequate infrastructure for dengue case management at Base and upper-level hospitals	• Limited availability of FBC facility at OPD level • Poor adherence to standard dengue management guidelines by GPs • Poor health seeking behaviour of community • Poor understanding of the circulating serotypes • Lack of robust referral and back referral system for dengue patients
3.	Vector surveillance and control	• Extensive network of entomology surveillance sites • Trained relevant public health staff on vector surveillance and vector control • Entomological laboratories at the NDCU and district level • Adequate knowledge of efficacy testing of insecticides at NDCU	• Limited capacity for digitalizing data • Sub-optimal capacity for planning and implementing IVM • Low capacity for public health pesticide management • No capacity for xenomonitoring • Need for integrated vector surveillance and control guidelines
4.	Epidemic forecasting, preparedness and response	• Online dengue data availability (NaDSys) • Some response capacity in districts	• No validated dengue forecasting model • Lack of a guideline or SOP • Training needs
5.	Community participation	• Existing community groups/ village/ street committees	• Lack of risk and behavioural change communication strategy and capacity • Limited availability of communication tools
6.	Multisectoral participation	• Presidential, provincial and district taskforces	• Low priority by non-health sectors • Lack of guidelines on multi-sectoral participation
7.	Research	• Existing collaboration with research institutions and academia	• Translational research not practiced • Limited active partnerships and funding

3. National Dengue Control Unit

The dengue programme in Sri Lanka has a strong vertical structure at all levels of the health system, with the national programme overseen by the National Dengue Control Unit (NDCU) at the central level leading strategic guidance, policy development, resource mobilization and capacity building throughout the health system. The NDCU was established formally in 2005 as a coordinating unit and upgraded in 2012 as a directorate with an annual budget allocation by the Ministry of Health. It comprises both the technical and administrative staff under the Director and the Directorate operates under the Deputy Director General of Public Health Services 1, which is under the Director General of Health Services, Ministry of Health, Sri Lanka. The organogram of the central unit and the regional setup is presented in Annex 2.

The Unit is directly responsible for implementing dengue control jointly with the provincial, district and divisional curative and preventive health services. The activities of the NDCU include disease and vector surveillance, integrated vector management (IVM), evidence-based clinical care, intersectoral coordination, social mobilization, risk communication, outbreak preparedness and response, operational research support, national and international networking, and monitoring and evaluation. The NDCU provides technical guidance for vector control and IVM, however, some integration is needed for resource sharing at the grass root level. An important task of the Unit is to strengthen the capacity of public and curative health staff at all levels including provision of all necessary equipment, insecticides, reagents, supplies, items for clinical management and test kits for insecticide resistance monitoring. This also includes support to establish the High Dependency Units (HDUs) at the primary, secondary and tertiary care hospitals.

Although the NDCU is located centrally under the Ministry of Health, it conducts activities for the prevention and control of dengue, through the provincial and regional directors of health services up to the Medical Officers of Health. It provides both technical guidance and financial support to the provinces and districts to carry out dengue control activities.

A real-time web-based disease surveillance system called NaDSys is hosted by the National Dengue Control Unit to monitor the surveillance and response to dengue illness. It tracks notifications and investigations of suspected dengue cases.

The NDCU is mandated for the collection, analysis and interpretation of epidemiological and entomological data for decision-making and undertaking necessary actions for dengue outbreak prediction, preparedness and rapid response. It monitors programme implementation, periodically evaluates the impact of the interventions in coordination with the provincial and district teams, and reports progress to the Ministry of Health.

A Technical Advisory Group on Dengue provides technical guidance to the NDCU on matter related to dengue prevention and control (Annex 3). Sri Lanka also has a wealth of globally renowned experts on dengue epidemiology, surveillance, control and case management, who can play an important role in generating much needed scientific evidence for policies and operations.

There is a Presidential Task Force at the central level chaired by the President to coordinate and facilitate multi-sectoral actions (Annex 4). The guidance provided by this Task Force flows through the provincial, district and divisional up to the village level.

4. National Strategic Plan for 2024–2030

4.1 Vision

To contribute to achieving the elimination of dengue in Sri Lanka and maintaining a disease-free status thereafter.

4.2 Mission

To optimize planning, prediction and early detection capacity at all levels for better control of dengue endemicity and prevention of outbreaks through coordinated partnerships and sustainable efforts.

4.3 Goal

To reduce by 2030 case fatality associated with dengue to zero and the incidence of dengue in the country at least by 75% (<100/100,000 population) from the 2022–2023 baseline.

4.4 Strategic objectives

The general objective of the NSP is to reduce the incidence rate and mortality due to dengue. The strategic objectives of the NSP are listed below key areas.

Strategic objective 1. Disease surveillance and risk assessment

Strategic objective 2. Early diagnosis and case management

Strategic objective 3. Vector surveillance and control

Strategic objective 4. Early detection and rapid response to outbreaks

Strategic objective 5. Risk communication, and community engagement and mobilization

Strategic objective 6. Multisectoral actions

Strategic objective 7. Innovation and research

A detailed description of the actions and timelines is given in section 4.6 below and in Annex 6.

4.5 Key milestones and targets

As mentioned above, the targets and milestones of the NSP 2024–2030 have been aligned with the relevant global development and health targets such as the Sustainable Development Goals, the WHO Roadmap for Elimination of Neglected Tropical Diseases 2021–2030 and the WHO Global Vector Control Response 2017–2030.

- To reduce the case fatality rate due to dengue to zero by the year 2030
- To achieve dengue case incidence below 100/100,000 population by the year 2030

Indicator	2022–2023 (baseline)*	2027	2030
Case-fatality rate due to dengue (%)	0.08 (2022–2023)	0.05**	0.0**
Reduce the incidence of dengue (cases/100,000/yr)	376 (2022–2023)	250	<100
Number of districts reducing the dengue case incidence	District average baseline incidence 2022–2023	Incidence reduced by at least 40% from the 2022–2023 district average baseline in 75% of districts	Incidence reduced by at least 75% from the 2022–2023 district average baseline in all districts

** Average values are based on the period 2022–2023 because of low case reporting during the COVID-19 period (2020–2021).*

*** It is recommended that the Case Fatality Rate to be reviewed during mid-term evaluation and assessed with clinical management, logistics, reviews, training, etc., to see if zero mortality could be achieved in 2030 or if the target should be modified, taking feasibility into consideration.*

4.6 Activities for specific objectives and timeline

A detailed table of associated actions, indicators, means of verification and responsibilities for implementation for each of the strategic objectives (SO) is given in Annex 6.

Strategic Objective 1

Disease Surveillance and Risk Assessment

Strategic objective 1. Disease surveillance and risk assessment

Aim 1: Maximize surveillance for real-time detection and notification of dengue cases and understanding disease dynamics by intensifying disease surveillance at all levels including the outpatient departments and private sector to strengthen early detection and reduce the risk of outbreaks

Activity 1.1. Intensify case detection according to the dengue case definition following the surveillance case definition

Activity 1.2 Assess and address gaps in disease notification and coordinate with central, provincial, and regional level health facilities for accurate and real-time case notification on the NaDSys System

Activity 1.3 Improve laboratory diagnostic capacity and ensure sustained availability and affordability of rapid diagnostic tests

Implementing necessary dengue control strategies requires a focus on maximizing surveillance to strengthen the capacity for effective understanding of disease dynamics to detect dengue outbreaks early. A comprehensive outbreak surveillance system, incorporating contributions from both public and private sectors, is vital for enhancing national dengue control strategies. The importance lies in emphasizing real-time case detection and prompt notification to relevant health authorities. Intensifying case detection according to surveillance case definitions stipulated in guidelines is crucial for early and accurate identification of dengue cases, emphasizing the need for a strong surveillance system capable of managing dengue transmission dynamics. It is also important to develop an algorithm to triage dengue cases from other arboviral diseases. These proactive approaches can facilitate timely interventions, preventing further surges of dengue and reducing the risk of widespread outbreaks.

Assessing and addressing gaps in disease notification on the NaDSys would improve the accuracy and timeliness of case reporting across health facilities. Improving coordination by the central unit (NDCU) with provincial and regional healthcare institutions would ensure effective and real-time case notifications into the NaDSys, enabling a better understanding of the disease dynamics and providing rapid response to emerging dengue outbreaks. Other enabling activities are training of the health facility staff to improve dengue case notification, training and orientation of health facility staff at the Outpatient Departments (OPD) to assess dengue surge capacity and data management, and expansion of reporting of dengue cases on the NaDSys by general practitioners (GPs).

Optimizing laboratory infrastructure and equipment for virus serotyping/genotyping is required.

By improving early case detection, diagnostic capacity, and the disease notification

process, we can significantly enhance the ability to understand dengue dynamics, and respond to dengue outbreaks, ultimately reducing the impact of dengue disease on public health.

The National Action Plan for 2019 to 2023 states that all suspected cases of dengue must be reported within 24 hours (essentially within 48 hours) and investigated within three days of receiving the notification by the Medical Officer of Health. This practice is recommended to continue.

Aim 2: Enhance risk assessment capacity by improving utilization of NaDSys data, and develop and operationalize the use of a risk mapping tool

Activity 1.4 Enhance the utility of NaDSys and develop the capacity of healthcare staff for data analysis and decision-making for interventions.

Activity 1.5 Develop and validate a geospatial risk mapping tool for undertaking risk assessment and targeted interventions.

Risk assessment is an important step in identifying the vulnerabilities and exposure status of different communities and localities in the context of dengue. It would also enable policymakers and programme implementers to take a measure of their institutional capacities to prepare, mitigate and respond to probable dengue outbreaks. In addition, routine and frequent adjustment of the risk status based on the epidemiological, entomological and climatological evidence is essential for proactive dengue prevention and control at all levels.

Given the importance of this task, the NDCU has already implemented the NaDSys, which is an island-wide electronic dengue surveillance platform setup to assist both public health and curative sector professionals in monitoring dengue patient turnover as well as the geographical extent and distribution of cases. Enhancing the use of NaDSys for monitoring case incidence and fatality rate would enable the users to understand the potential risk of dengue in their relevant geographical areas. However, the close synchronization of dengue case data and geospatial data, which is required to visualize the risk, is lacking in the current system. Moreover, familiarity with data analytical tools is vital to execute the amalgamation of disease data with geospatial data.

Therefore, the NSP 2024–2030, envisions establishing infrastructure for geospatial risk mapping using a web-based tool, developing capacity for utilization of the tool and augmenting the capacities of the public health and curative teams to effectively compile, analyse and interpret data generated through the NaDSys platform and utilize the data to assess the risk and implement evidence-based interventions.

Strategic Objective 2

Early Diagnosis and Case Management

Strategic objective 2. Early diagnosis and case management

Activity 2.1 Update guidelines and strengthen capacity for clinical management of dengue cases

Activity 2.2 Expand the capacity of state health facilities for diagnosis and management of dengue cases

Activity 2.3 Improve laboratory diagnostic capacity and ensure sustained availability and affordability of diagnostic tests

Activity 2.4 Review of dengue deaths for improvement of case management

Early diagnosis and case management is an important strategic objective that has a bearing on the clinical complications and deaths of dengue patients. The scope of the objective is to ensure that the diagnosis and management of dengue cases is carried out optimally, leading to reduced complications and deaths.

The existing case management guidelines are to be reviewed and updated periodically based on evolving disease dynamics. Further, health staff should be given refresher training on diagnosis and management of dengue cases to ensure correct procedures are practised in line with the case management guidelines.

The state health facilities for the management of dengue were augmented during the previous dengue outbreaks. It included establishing HDUs for the management of dengue patients and increasing the availability of equipment such as multi-para monitors, ward-based portable ultra-sound scans (USS) and haematocrit monitoring machines. Dengue diagnostic facilities such as NS1 Antigen test, antibody tests (IgM, IgG) and FBC are available at the base hospital (BH) level and above. The FBC test facilities are also available at the divisional hospitals (DH). It is important to expand such capacity to district level hospitals that admit a high number of dengue patients while ensuring the availability of case diagnostic and management capacity at these institutions. Diagnostic capacity needs also to be established in outpatient departments as well as at the BH and DH.

Enhancing laboratory diagnostic capacity and ensuring the availability and affordability of rapid diagnostic tests and full blood count (FBC) tests for dengue are crucial to provide reliable tools for accurate diagnosis.

Finally, knowledge gained from investigation and review of all dengue deaths at institutional and field levels can contribute to improved case management. With the reduction of dengue deaths, selected dengue near misses too need to be periodically reviewed to identify common contributors.

Strategic Objective 3
Vector Surveillance and Control

Strategic objective 3. Vector surveillance and control

Aim 1: Implement efficient vector surveillance and digitalize entomological data for real-time analysis

Activity 3.1 Undertake regular vector surveillance by appropriate techniques to monitor vector prevalence, seasonality and bionomics in representative eco-epidemiological settings in the country

Activity 3.2 Monitor and manage insecticide resistance in vector species

Activity 3.3 Report accurate and complete entomological data timely for analysis, risk assessment and undertaking appropriate interventions

Activity 3.4 Develop capacity for digitalizing data and implement a real-time web-based system for vector surveillance and geospatial risk mapping for assessing transmission risk

Activity 3.5 Strengthen capacity for integrated vector surveillance

Activity 3.6 Update standard operating procedures for vector surveillance

Vector surveillance: Implementing efficient entomological surveillance assists in monitoring the spatial and temporal populations of *Aedes aegypti* and *Ae. albopictus* vectors of dengue in all eco-epidemiological settings in Sri Lanka. By adopting this proactive approach, it becomes possible to promptly intervene and effectively manage mosquito breeding and adult populations, thereby preventing the spread of dengue. The NSP envisages regular vector surveillance by appropriate entomological techniques for mosquito immatures and adults. Three types of entomological surveys will be undertaken in each district/CMC/NIHS area based on eco-epidemiological and entomological risk. These include routine surveys, spot surveys, and focus investigations [12]. Routine entomological surveys in all sentinel sites in endemic and at-risk areas and points of entry, ad hoc spot checks/ surveys supplementary to routine surveys at sites different from the sentinel sites with suspected changes such as focal outbreaks and focus investigations on specific sites with focal outbreaks will be undertaken. Mosquito species will be identified, larval and pupal indices will be calculated, key containers with pupae will be identified [13,14], adult population densities will be monitored every month and vector incrimination for dengue virus (xenomonitoring) will be undertaken. Laboratory technique for virus detection in *Aedes* spp. will be validated, such as by testing pools of mosquitoes using NS1 antigen kit. A list of activities and indicators is given in Annex 6.

Annual planning for entomological surveys will be done in consultation with the Anti-Malaria Campaign to achieve functional integration. For this, an entomological working

group will be established at the central level. The use of correct entomological techniques and equipment is very important, hence appropriate surveillance equipment will be procured according to the annual need assessment.

Monitor and manage insecticide resistance in vector species: It is essential to regularly monitor the resistance of *Aedes* species to insecticides to extend their useful lives, prevent vector control failure and reduce the risk of dengue. It is mandated to conduct insecticide resistance monitoring tests at each sentinel site annually. Insecticide resistance will be conducted according to the WHO guidelines [15–17] and resistance test kits, reagents and insecticide-impregnated papers will be procured from a WHO-coordinated supply facility [18].

Report accurate and complete entomological data timely for analysis, risk assessment and undertaking appropriate interventions: Timely, precise, and complete documentation of dengue entomological data is essential for various reasons. This enables NDCU and health authorities to study patterns in mosquito populations, evaluate the potential of dengue outbreaks, and conduct effective actions to minimize the spread of disease-carrying mosquitoes. Precise data facilitates comprehension of the correlation between mosquito population density and the transmission of diseases, enabling focused interventions to mitigate the transmission of dengue. Moreover, prompt reporting enables expedited decision-making, a crucial aspect in managing epidemics. Furthermore, it is necessary that all entomology teams follow the correct formats and timely distribute the reports; i.e. within a maximum of 5 days after survey completion.

Develop capacity for digitalizing data and implement a real-time web-based system for vector surveillance and geospatial risk mapping for assessing transmission risk: Digitalizing the entomological data enables swift analysis of changes in seasonal abundance and geographical distribution trends in vector populations and can inform evidence-based decision-making for vector control. The utilization of real-time data can optimize the effectiveness of well-planned and targeted vector control interventions to reduce the risk of disease transmission and will help allocate resources more effectively. Developing the capacity for digitalizing data and implementing a real-time web-based system for dengue vector surveillance and geospatial risk mapping is crucial for the following reasons:

Enhanced data collection and analysis: digital systems enable efficient collection,

Real-time monitoring: a web-based system allows for real-time monitoring of vector populations and environmental conditions, facilitating timely interventions to control outbreaks.

- **Improved risk assessment**: geospatial mapping helps identify high-risk areas, enabling targeted prevention strategies and resource allocation, ultimately reducing transmission risks.
- **Informed decision-making**: access to real-time data supports evidence-

based decision-making, improving the effectiveness of dengue prevention and control programs.

Strengthen capacity for integrated vector surveillance: Strengthening capacity for integrated vector surveillance is crucial for effective vector control. It enables efficient utilization of resources, improves surveillance systems, enhances coordination across different sectors, and responds effectively to disease outbreaks. The central entomology working group will coordinate for an integrated vector surveillance for all disease vectors across the vector-borne disease (VBD) programme. Furthermore, the integration would help to plan annual vector surveillance activities. The integrated approach aims to not only optimize available resources but also supports sustainable practices and strengthens the overall vector surveillance and control capacity.

Update standard operating procedures for vector surveillance: The existing Standard Operating Procedures (SOPs) for vector surveillance will be updated to include dengue and other vector species since most activities and procedures are similar and integration can be more productive and economical. Integration would ensure that the methods for vector surveillance, processing, and storage of mosquito samples are contemporary and scientifically sound, allowing national and subnational entomology teams and researchers to effectively monitor and control vector populations.

Aim 2: Apply vector control based on an integrated vector management approach to interrupt dengue transmission

Activity 3.7 Undertake situational analysis and stratify risk areas based on entomological and epidemiological data and apply appropriate vector control interventions including regulatory measures

Activity 3.8 Strengthen the managerial, technical and logistic capacity of public health staff for planning and implementing vector control based on the IVM approach

Activity 3.9 Monitor the implementation of vector control interventions applied and evaluate the impact on dengue transmission

Activity 3.10 Update vector control guidelines and standard operating procedures

Activity 3.11 Facilitate trials of novel interventions and test the bio-efficacy of insecticidal products including WHO pre-qualified products

Activity 3.12 Improve the capacity of public health staff for pesticide management

Integrated vector management (IVM) is a rational decision-making process that encourages optimal use of resources for efficient, cost-effective and sustainable vector control [19].

Situational analysis and stratification of risk areas based on entomological and epidemiological data to apply IVM-based interventions: Situation analysis and vector control needs assessment (VCNA), and stratification of at-risk areas based on dengue entomological and epidemiological data are key requirements to implement IVM. It will involve the quantification of transmission risks and the identification of high-risk areas for targeted interventions. Vector control measures can then be tailored to these areas to effectively reduce dengue transmission. Regulatory measures will also be implemented to enhance the effectiveness of interventions. A VCNA conducted in 2020 in South Asia including Sri Lanka and the Middle East showed some important gaps in entomological surveillance and vector control [20].

Strengthen the managerial, technical, and logistic capacity of public health staff for planning and implementing vector control based on the IVM approach: The managerial, technical and logistic capacity of public health staff and entomologists will be strengthened for effective planning and implementation of IVM as well as procurement of necessary insecticides and equipment for vector control.

Monitoring implementation of vector control interventions and evaluation of impact on dengue transmission: These activities allow public health authorities to assess the effectiveness of the IVM measures, identify areas for improvement, and adapt interventions according to local conditions to optimize resource allocation. Entomological surveys will be undertaken each month and bioassays conducted according to the interventions applied to monitor the effect of vector control.

Update vector control guidelines and Standard Operating Procedures: The vector surveillance and control guideline and the SOP for vector surveillance and control are outdated. The NSP envisages the development of the vector surveillance and control guideline and updating of the SOP.

Facilitate trials of novel interventions and test bio-efficacy of insecticidal products including WHO pre-qualified products: Facilitating trials of novel interventions and testing the bio-efficacy of insecticidal products, including those pre-qualified by the WHO, is crucial for improving vector control strategies against dengue. These efforts can lead to the development and optimization of effective tools to reduce dengue transmission, address public health challenges, and contribute to a multi-pronged approach necessary for managing dengue outbreaks effectively. It is important to evaluate the effectiveness of these interventions under local conditions to ensure their success in real-world scenarios. These innovative strategies, whether used alone or in combination through an integrated approach, can significantly improve dengue prevention and control efforts. Continuous research and adaptation to local contexts remain vital for success. Under the NSP 2024–2030, support will be provided for testing the entomological efficacy of new vector control

products and assessing the epidemiological impact of novel vector control interventions such as *Wolbachia,* sterile insect technique etc.

Improve the capacity of public health staff on pesticide management: Improving the capacity of public health staff on pesticide management is crucial because it enhances their ability to effectively and safely manage pesticides, thereby mitigating risks to human health and the environment. This training is essential for the effective implementation of vector control interventions and sustainable practices in public health. The staff training will include life-cycle management of vector control products including regulatory aspects such as quality control of pesticides to be procured, tendering process, safe transportation, storage and disposal of pesticide waste [21].

Strategic Objective 4

Early Detection and Rapid Response to Dengue Outbreaks

Strategic objective 4. Early detection and rapid response to dengue outbreaks

Aim: Prevent, detect and respond to dengue outbreaks promptly to reduce the magnitude of the burden

Dengue can cause frequent outbreaks associated with monsoonal rains as is seen in Sri Lanka. Hence, it is important to prevent, detect and respond to outbreaks. Further, the increase in the abundance of vector mosquitoes leads to increased dengue transmission, and population dynamics play a vital role in the occurrence of outbreaks. Therefore, forecasting outbreaks using these parameters and taking action to prevent such outbreaks is important. However, the capacity for forecasting disease outbreaks is low in Sri Lanka. The NDCU will address this issue and improve forecasting capacity among all relevant staff at all levels.

In the event of the occurrence of outbreaks, early response is vital to mitigate the risk. Any outbreak that is not detected promptly tends to increase rapidly. Therefore, early detection of impending dengue outbreaks through a robust early warning system should be improved. The outbreak detection should be followed by a rapid response. Improving the capacity of the health system for rapid response also needs to be further strengthened. Containment of outbreaks through a prompt and focused response will reduce the magnitude of the burden of dengue in the country.

The Strategic Objective 4 will address these issues (Annex 6). The following key activities will be undertaken.

Activity 4.1 Forecast dengue outbreaks using epidemiological, entomological, socio-economical, climatic and other appropriate parameters

- Monitoring potential drivers of dengue transmission associated with outbreaks (i.e. serotypes, vectors, environmental, human behavioural and socio-economic variables.) Serotypes will be collected from the sentinel hospitals/institutions and tested at the hospitals/institutions already having molecular detection facilities.
- Develop a dengue early warning platform and operationalize its use to forecast potential/ impending dengue outbreaks.
- To develop the capacity of the public health staff and institutions for forecasting dengue outbreaks.

Activity 4.2 Initiate early response for mitigation of risk and/or containment of outbreaks

- Set up and operationalize Rapid Response Teams at District and National levels.
- Develop capacity for rapid response using a specially developed training module, SOP, and online course.
- Initiate early response to the impending outbreak.
- Undertake post-outbreak follow up.

Strategic Objective 5

Risk Communication, and Community Engagement and Mobilisation

Strategic objective 5. Risk communication, and community engagement and mobilisation

Aim 1: Undertake effective risk communication to improve awareness and acceptance of interventions

Activity 5.1 Develop a risk communication strategy for the prevention and control of dengue through national and international collaboration

Activity 5.2 Implement an effective communication approach to generate awareness and behavioural change for the prevention and control of dengue

Communicating the risk to the public is an integral part of any emergency response, including during dengue outbreaks. Accurate, timely and contextualized information, that people can understand and relate to, can enable them to make the right decisions to protect themselves and their families from diseases. Moreover, real-time exchange of information tailormade to address the perceived risk and severity of the disease would empower people to mobilize and act in adherence to health advice. Additionally, balancing the way how the risk can be projected in close synchronisation with the ground realities can help to avoid unnecessary panic among the public in the event of an outbreak of dengue.

However, such communication should not be limited to dengue outbreak periods alone, but rather be continued throughout the preparedness and pre-outbreak periods. Given the complexities, drivers and social determinants of the disease, a continuous communication campaign is required that can be escalated whenever the risk is high. Further, as dengue is intrinsically associated with human behaviour, addressing such behaviours should be a prime objective of any communication campaign. Positive behaviour change advocated through communication would deliver sustainable results for community mobilization and engagement in dengue control.

Therefore, through the NSP 2024–2030, NDCU strives to develop a comprehensive risk communication strategy, taking into consideration, both local experiences and global best practices. Moreover, NDCU would augment the existing communication platforms by incorporating novel techniques and tapping into social media and social marketing interventions to reach a wider audience. It is expected that through such innovation and ingenuity, NDCU would empower communities to change their behaviours and sustain their positive behavioural actions in the long run.

Aim 2: Enhance community engagement and mobilisation

Activity 5.3 Undertake mass media, social media and print media campaigns to mobilize communities in support of dengue control activities and outbreak response

Activity 5.4 Strengthen local-level participation in anti-dengue activities

Recognizing that dengue control could not be achieved by the health and other governmental sectors alone, integration of community engagement has been identified as a key intervention approach for dengue prevention. Empowering and engaging communities on sustainable dengue prevention and control activities through continuous education via different platforms (formal and informal) would be important. The community education will include sharing knowledge about the disease, vectors, and virus, and how environmental management, solid waste management and healthy cities approach could lead to sustainable dengue prevention through community engagement and mobilization. Therefore, the NSP 2024–2030 will promote community engagement and mobilization and will include the following key actions in addition to those listed above:

- Set up a communication team using the available capacities
- Observe the national dengue day before the South-West monsoon followed by an anti-dengue campaign
- Activate local actions such as through Divisional Dengue Committees, village/street committees, community-based organisations, and civil society organisations.

All planned activities are listed in Annex 6.

Strategic Objective 6

Enhancing Multisectoral Collaboration

Strategic objective 6. Enhancing multisectoral collaboration

Activity 6.1 Promote intersectoral coordination through the work of presidential, provincial and district task forces and mainstream recommendations made

Many sectors either create mosquitogenic conditions and/or enhance the risk of transmission of dengue through their unhealthy practices but do not contribute to resources or mitigative interventions. Therefore, the prevention and control of dengue require a multi-faceted approach involving various stakeholders and multiple sectors [22]. The coalition of partners aims to share knowledge, strengthen coordination among stakeholders, enhance communication, and build partnerships [23]. Having identified this as a crucial need, H.E. the President of Sri Lanka set up a Presidential Task Force (PTF) in 2010 to institutionalize this activity to strengthen intersectoral collaboration and implementation of intervention strategies. The Ministry of Health through the NDCU is the Secretariat for the PTF and there are several other ministries and agencies directly involved in it such as the ministries of Provincial Councils and Local Government, Home Affairs, Education, Defence, Law and Order, Media, Environment, Disaster Management, Finance, and Public Administration. There is also a role for the private sector such as the pest control agencies, town and project planners, architects, and civil engineers on mosquito-free designs to prevent mosquito breeding and environmental management.

The constitution and terms of reference of the PTF are given in Annex 4. Meetings of the PTF are convened based on the dengue situation. The provincial, district, divisional and village committees are given mandates to mainstream the recommendations given by PTF.

Role of various health and non-sectors is summarised in Annex 7 and does not constitute a full list of protentional collaborators for intersectoral action.

Strategic Objective 7
Innovation and Research

Strategic objective 7. Innovation and research

Aim: Enhance innovation and new approaches and promote basic and operational research/survey

Activity 7.1 Identify and prioritize studies or surveys to provide information on dengue transmission dynamics and disease burden (*including behavioural surveys)

Activity 7.2 Facilitate systematic review of data for evidence-based decision-making for the prevention and control of dengue

Activity 7.3 Collaborate with the research community and academia for basic and operational research, development and/or evaluation of new tools and undertaking field surveys

Activity 7.4 Effective translation of research into practice and implementation of novel interventions

New evidence-based approaches are crucial for advancing the national dengue control strategy, as they focus on integrating cutting-edge research and innovative methodologies to address the multifaceted challenges posed by dengue. This objective is dedicated to deepening our understanding of dengue transmission dynamics, disease burden and management through the application of advanced research techniques, effectiveness evaluation of novel approaches and innovative interventions, pilot testing of vector control in urban environments with high dengue endemicity, operational and implementation research including on introduction of dengue vaccines upon their availability and WHO recommendation, and basic research such as gene sequencing for monitoring genotypes of arboviruses. By fostering collaboration with leading experts and researchers, we aim to develop more precise and effective interventions that address the multifaceted nature of dengue including human behaviours.

Identifying and prioritizing studies that provide robust, evidence-based information on dengue transmission dynamics for dengue control is central to this objective. Systematically consolidating and analysing data from diverse sources will enable us to address existing knowledge gaps and generate actionable insights. For instance, if we are to introduce a dengue vaccine, we need to have solid evidence on various aspects of the dengue transmission dynamics including from experiences in other countries and available research. The introduction of novel vector tools will require inter alia social science research and understanding of potential barriers. Facilitating systematic reviews ensures that our policies and strategies are informed by the most current and comprehensive evidence, thereby enhancing their effectiveness and efficiency. Ultimately, through these efforts and by leveraging our strong health system, demonstrated by significant

achievements such as malaria elimination, we aim to build on our successes and focus on mitigating the impact of dengue and advancing public health outcomes.

It is important to ensure evidence-based research findings are introduced for dengue prevention and control in a scientific manner.

The NSP also proposes to strengthen capacity on research methodology, preparing research protocols and grant proposals, systematic review of evidence, training of undergraduate and postgraduate medical students and other streams as well as in-service public health staff. The proposed activities are listed in Annex 6.

4.7 Monitoring and evaluation

Activity 1 Monitor dengue control programme implementation

Activity 2 Evaluate the impact of the dengue control programme

A robust monitoring and evaluation framework empowers decision-makers to gauge the effectiveness of different strategies in controlling dengue transmission. Monitoring is crucial for tracking the routine progress or performance of an implemented programme and to see whether the specific intervention is moving in the right direction to achieve the desired objectives. It plays a vital role in estimating the spread and burden of the disease over time. Effective monitoring enables immediate identification of deficiencies, allowing for timely rectification without hindering the programme's progress and also provides valuable feedback that is important to programme managers for readjusting the programmatic actions. The involvement of programme personnel at various levels in the monitoring process offers programme managers a comprehensive understanding of the programme's progress, strengths, and weaknesses. The insights gathered through monitoring help to strengthen weaker areas and optimize programme output.

Formal evaluation of the performance of the programme, both internal and external, at different intervals is necessary to assess a precise picture of the programme's progress. An evaluation plan with realistic and measurable targets is essential. The specific aims for evaluating the impact of the dengue control programme include measuring progress and specific achievements, identifying and resolving emerging problems, assessing programme effectiveness and efficiency, guiding the allocation of programme resources, collecting information for revising the policy and replanning interventions, and assessing the programme's sustainability.

The key monitoring and evaluation (M&E) activities are listed in Annex 6 and include an annual review of the impact of the NSP activities on dengue case incidence and case fatality rate, and pilot or nationally representative seroprevalence surveys to assess the burden of the disease, its economic impact and effectiveness of the control programme.

A detailed M&E framework is included in this National Strategic Plan in Annex 7.

5. Overarching and cross-cutting activities

Sri Lanka has had a good track record of disease elimination, including malaria and lymphatic filariasis among others. The efficiency of the VBD programmes can be improved by leveraging opportunities for cross-learning and cross-strengthening among them. In line with the recommendations of the WHO independent review of the VBD programmes of Sri Lanka in May 2024, the NSP will promote functional integration and coordination opportunities in the following areas.

Surveillance, epidemiology, and data analytics

An enormous amount of disease and vector data is being collected routinely by each programme through multiple surveillance methods. The cross-programmatic integration opportunities will be explored and include data analytics capability to enable granular analysis of the data to identify risk factors, risk mapping, disease forecasting and timely response, case investigation approach (e.g. dengue vs malaria), and surveillance quality. For vector surveillance, all entomological teams can collect all vector species and cross-share data relevant to the individual VBD programme selection of devices, cross-sharing of entomological and laboratory facilities, develop joint entomological surveillance data collection formats and sharing and analysis of data/information,[2] insecticide resistance monitoring and sharing data, creating digital database and threats mapping.

Vector control, new tools, and pesticide management

The cross-programme common factors for vector control are the overarching policies such as on IVM, the WHO Global Vector Control Policy 2017–2030, the Prevention of Mosquito Breeding Act, and environmental and pesticide management. Vector control is decentralized to districts and municipal councils, but different programmes have their own entomological personnel whose duty lists are unified at the district level and below and there is already some degree of cross-programme coordination. Many of these staff are transferable across VBDs and other public health programmes. The NSP will strive for cross-programmatic integration for vector control, e.g. for the selection and use of intervention products (indoor residual sprays, LLINs, larvicides) according to the IVM decision-making criteria, training/re-training of preventive sector public health technical staff for taxonomic identification, bionomics, surveillance and control of all vectors; quality control and procurement of WHO-prequalified and/or nationally registered insecticides and WHO-certified pesticide application equipment, coordinate with the Registrar of Pesticides for testing and registration of new/alternative insecticides, strengthening capacity of pesticide quality control laboratory according to the FAO/WHO specification guidelines [23], evaluation of innovative vector control products, and coordination for development of innovative vector control tools.

2 These activities are also in the NSP for prevention of re-establishment of malaria in Sri Lanka, 2023–2027.

Laboratory services and diagnosis

The routine entomology laboratory services are currently managed by individual disease control programmes and delivered at the district level separately. The potential cross-programmatic integration opportunities include optimization of laboratory infrastructure and equipment, for example through shared facilities across diseases, common laboratory procedures such as molecular analysis, and a system for quality control of RDTs.

Case management

The health care system in Sri Lanka is equipped with a network of hospitals and primary healthcare centres that provide diagnostic, treatment, and preventive services. However, the existing capacity for case management of vector-borne diseases varies by disease. Case management of dengue is well integrated into the existing health system, with the major hospitals in Sri Lanka having the high capability to manage dengue cases while also providing on-the-job training to other medical and healthcare personnel regularly in collaboration with NDCU.

Inter-sectoral collaboration, communication, and advocacy[3]

These activities are common to all VBDs and, therefore will be implemented by functional integration through annual programme planning.

Programme management

The dengue control programme can benefit from anti-malaria programme management experiences, processes used in malaria elimination and post-elimination surveillance, potential reassignment of staff duties, and reorientation of staff as dengue control proceeds successfully along the planned road map.

3 Also included in the NSP for prevention of re-establishment of malaria in Sri Lanka, 2023–2027.

6. Institutional repository

The aim is to create an institutional repository on dengue for collecting and sharing information.

Institutional repositories of disease burden data, information, technical and investigation reports, policy documents, publications, guidelines, SOPs, meeting proceedings, and reports of international programme reviews are valuable archives to retain institutional memory and are immensely useful to clinicians, public health staff, researchers, and academia.

It is proposed to create a central digital archive on dengue and other arbovirus diseases for collection, open access and rapid sharing of information, and increase scientific communication, citation, and visibility of the past work of the dengue control programme. In the long run, such digital archives have the potential to evolve into an integrated health and scientific repository.

7. Budget

OBJECTIVES	LK Rs. Millions						
	2024	2025	2026	2027	2028	2029	2030
Strategic objective 1. Disease surveillance and risk assessment	10	10	10	09	08	07	06
Strategic objective 2. Early diagnosis and case management	325	325	325	325	325	325	325
Strategic objective 3. Vector surveillance and control	45	45	50	55	60	66	72
Strategic objective 4. Early detection and rapid response to outbreaks	75	80	85	90	95	100	100
Strategic objective 5. Risk communication, and community engagement and mobilization	70	70	70	70	70	70	70
Strategic objective 6. Multisectoral actions	02	02	02	02	02	02	02
Strategic objective 7. Innovation and research	20	22	23	25	27.5	30	33
Total	**547**	**554**	**565**	**576**	**587.5**	**600**	**608**

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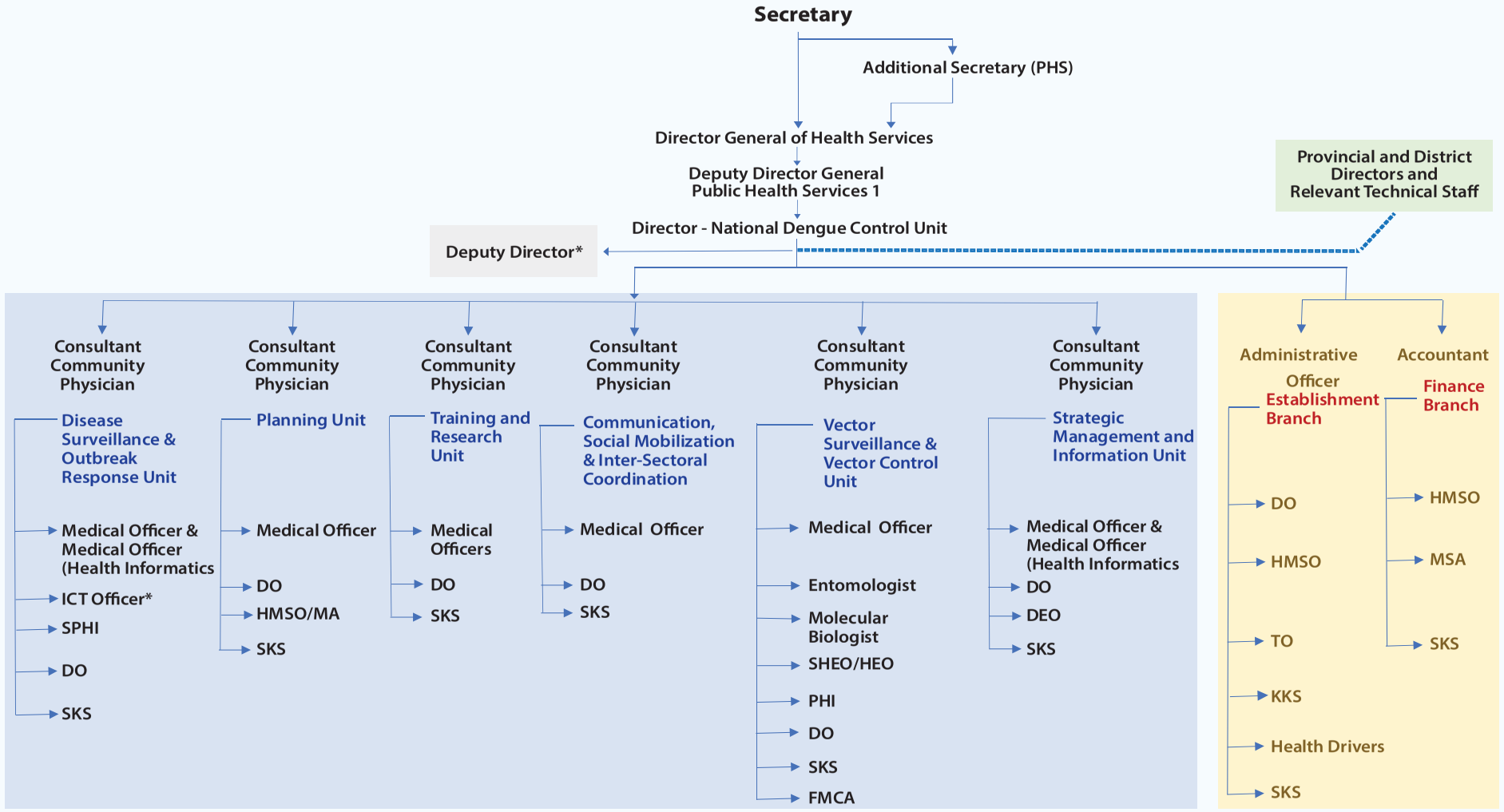
Annexures

Annex 1. Dengue cases by provinces and districts (2022–2023)

	Province/ District	Population ('000)	2022	2023
1	**Western Province**			
	Colombo	2460	17456	18911
	Gampaha	2421	13317	16127
	Kalutara	1279	6285	5198
	Total	**6160**	**37058**	**40236**
2	**Central Province**			
	Kandy	1482	6467	9291
	Matale	525	1293	1918
	Nuwara Eliya	781	203	306
	Total	**2788**	**7963**	**11515**
3	**Southern Province**			
	Galle	1139	3802	4029
	Hambantota	680	1439	1357
	Matara	869	1680	1666
	Total	**2688**	**6921**	**7052**
4	**Northern Province**			
	Jaffna	628	3410	4300
	Kilinochchi	136	139	137
	Mannar	116	282	223
	Vavuniya	196	99	174
	Mullaitivu	99	34	171
	Total	**1175**	**3964**	**5005**
5	**Eastern Province**			
	Batticaloa	582	1255	2980
	Ampara	749	177	242
	Trincomalee	443	1175	2150
	Kalmunai	459	2244	2155
	Total	**2233**	**4851**	**7527**
6	**North Western Province**			
	Kurunegala	1727	2508	3161
	Puttalam	845	4116	4213
	Total	**2572**	**6624**	**7374**
7	**North Central Province**			
	Anuradhapura	950	523	1175
	Polonnaruwa	445	346	655
	Total	**1395**	**869**	**1830**

	Province/ District	Population ('000)	2022	2023
8	**Uva Province**			
	Badulla	896	1303	1344
	Monaragala	509	511	1209
	Total	**1405**	**1814**	**2553**
9	**Sabaragamuwa Province**			
	Ratnapura	1188	3523	3523
	Kegalle	892	3102	3102
	Total	**2080**	**6625**	**6625**
	Grand total	**22496**	**76689**	**89717**

Annex 2. The organisational structure of the National Dengue Control Unit



DO - Development Officer, DEO - Data Entry Operator, SPHI - Supervising Public Health Inspector, PHI - Public Health Inspector, SHEO - Special Grade Health Entomological Officer, HEO - Health Entomological Officers, MSO - Management Service Officer, HMSO - Health Management Service Officer, MSA - Medical Supplies Assistant, TO- Telephone Operator, KKS - Karyala Karya Sahayaka, SKS - Saukya Karya Sahayaka, FMCA - Field Mosquito Control Assistant

Note: The new positions of Deputy Director and ICT Officer for NDCU - pending approval/ to be approved.

Annex 3. Technical Advisory Group for the prevention and control of dengue in Sri Lanka

The Technical Advisory Group (TAG) is appointed by the Director General of Health Services, Ministry of Health Sri Lanka, to provide carefully considered evidence-based strategic and technical recommendations to the NDCU for prevention and control of dengue in Sri Lanka. The TAG comprises members from the Ministry of Health and Professional Colleges and independent experts.

Composition of the TAG

Chairperson: The Director General of Health Services (DGHS) will be the chairperson in the official capacity. In the absence of the DGHS, the Deputy Director General (Public Health Services)-1 will chair the meeting. In the absence of both, the Director of NDCU will chair the meeting.

Secretary: The Director, NDCU will be the Secretary in the official capacity.

Permanent members

Ministry of Health

1. Director General of Health Services
2. Deputy Director General (Public Health Services)-1
3. Director, NDCU
4. Chief Epidemiologist, Epidemiology Unit
5. Director, Health Promotion Bureau
6. Three Consultant Community Physicians (CCP) of the NDCU
7. Entomologist of the NDCU
8. Consultant Virologist – Medical Research Institute
9. One Provincial CCP
10. One District CCP
11. One Regional Epidemiologist/MO Epidemiology at district level
12. One Entomologist from districts
13. One Supervising Public Health Inspector from districts
14. One Special Grade Health Entomology Officer from districts

Professional colleges

15. Ceylon College of Physicians – President or one nominee

16. Sri Lanka College of Paediatricians – President or one nominee
17. College of Community Physicians of Sri Lanka – President or one nominee

Independent experts in the following fields

18. Medical Professionals – Two Consultant Physicians
19. Medical Professionals – Two Consultant Paediatricians
20. Medical Professionals – One Consultant Community Physician
21. Entomology and Vector Control - Two members
22. Immunologist/ Molecular Biologist
23. Social scientist
24. Communication and behavioural specialist

Other invitees and observers

The Secretary to TAG may invite any other relevant officers as and when necessary for a TAG meeting. Any other persons may also be invited as observers at the discretion of the Chairperson or Secretary.

Terms of reference

- Regularly review the dengue situation in the country to assess challenges to the successful maintenance of prevention and control of dengue in Sri Lanka and make recommendations to the Ministry of Health and the National Dengue Control Unit
- Provide technical guidance and recommendations on the preparation of policies, guidelines, concept papers and grant applications when necessary
- Provide technical recommendations for the successful implementation of dengue prevention and control strategies in Sri Lanka
- Make recommendations in developing plans for key areas of interventions such as advocacy and capacity building

Annex 4. Presidential Task Force on dengue prevention and control

The Presidential Task Force was appointed by HE the President to strengthen multisectoral collaboration and implementation of strategies at the National/Provincial/District levels. Since its first meeting on 25 May 2010, the Task Force chaired by HE the President has been providing policy and strategic guidance on strengthening the multisectoral collaboration and implementation of the control strategies.

The Terms of Reference of the Presidential Task Force on Dengue Prevention and Control are as follows:

- To prepare strategic/action plans and programmes to implement effective Integrated Vector Management in collaboration with the National Dengue Control Unit
- To promote collaboration among other national health agencies and major stakeholders to implement dengue control programmes
- To address programmatic issues and gaps
- To adopt an enabling policy environment in implementing regulatory legislation for effective dengue prevention and control
- To develop coordinated actions for sustainable dengue vector management within and outside of the health sector
- To increase visibility and sustainability by providing greater opportunities for decision-making on vector control with the participation of local communities
- Setting up a core task force at Provincial, District and Divisional levels with multidisciplinary expertise

Annex 5. Multisectoral actions – the role of stakeholders and partners

Effective multisectoral coordination for dengue control involves collaboration within the government health sector as well as non-health sectors to harmonize efforts for the control of dengue and other vector-borne diseases. The success of the NSP 2024–2030 largely hinges on collective responsibility and active participation of all sectors and stakeholders involved. Some of these potential responsibilities are listed below;

Ministry and agencies	Responsibilities
Ministry of Health (National Dengue Control Unit)	• Overarching responsibility for health policy and dengue control • Focal Unit responsible for planning, implementation of the NSP, and monitoring and evaluation of dengue prevention and control in the country • Monitoring risk of dengue, forecast epidemics and take pre-emptive/mitigation actions • Develop guidelines and SOPs e.g. for surveillance, case management, outbreak containment, vector control • Data management and reporting • Promote research and innovation • Coordination and technical guidance to provincial, district and municipal council teams, and other stakeholders within the government sector • Collaborate with all other sectors and facilitate the Presidential Task Force meetings • Coordinate for national and international programme reviews • National and international networking
Ministry of Education	• Maintain all government, private and "Pirivena" schools, training colleges, and "Vidya Peeta" (National Colleges of Education) free of mosquito breeding grounds • Educate and train schoolchildren to keep the educational premises free of mosquito breeding • Monitor dengue control activities by the principals and teachers • Collaborate with respective MOH and staff to maintain schools, surrounding premises free of mosquito breeding grounds • Develop risk communication and mitigation materials and participate in national dengue day observation • Encourage schoolchildren to keep their homes free of mosquito breeding

Ministry and agencies	Responsibilities
Ministry of Provincial Councils & Local Government	• Collection of biodegradable and solid waste from the community and safe disposal to prevent rainwater accumulation and mosquito breeding • Take interim measures for allocation of human resource, transport facilities and proper disposal of collected items during the dengue control programmes • Allocate temporary waste dumping sites in collaboration with Central Environmental Authority • Educate public on domestic waste segregation • Cleaning and maintaining the drainage system to prevent wastewater accumulation • Keep public places free of mosquito breeding • Active participation in dengue prevention and control activities of the NDCU
Ministry of Home Affairs	• Maintain all government & private institutions free of mosquito breeding places • Actively involve and mobilize the district, divisional and village level officers under the ministry in dengue control activities.
Ministry of Defence and Ministry of Law & Order	• Maintain all institutions coming under the ministry, free of mosquito breeding grounds • Active involvement of tri-forces and police personnel in dengue control and prevention activities in collaboration with the NDCU
Ministry of Mass Media & Information	• Telecast/broadcast educational messages for the control of mosquito breeding and dengue disease control
Ministry of Disaster Management	• Provide support to control and prevent dengue outbreaks considering them as disaster situations
Ministry of Environment	• Formulation and implementation of policies for proper disposal of solid waste and insecticide waste • Regulate safe disposal of unwanted fiber boats (by MEPA and Central Environmental Authority) • Ensure that all institutions under the ministry keep premises free of mosquito breeding
Ministry of Ports and Shipping (Ports Authority)	• Collaborate on measures to educate port staff and visitors about dengue prevention • Prevent entry of new mosquito strains through inbound ships
Ministry of Transport	• Maintain all institutions coming under the ministry free of mosquito breeding • Ensure safe disposal of used tyres and safe storage of abandoned railway items

Ministry and agencies	Responsibilities
Ministry of Buddhasasana, Religious and Cultural Affairs	• Ensure that all religious places are kept free of mosquito breeding • Implement a community education and awareness initiative by engaging religious leaders
Ministry of Tourism and Aviation (Tourist Board)	• Ensure that hotels and other recreational places are free of mosquito breeding places • Ensure rational use of insecticides by pest control agencies in tourist destinations when applied
Ministry of Fisheries	• Maintain all institutions coming under the ministry free of mosquito breeding grounds • Develop regulations to prevent mosquito breeding in abandoned boats/yachts/ships
Ministry of Urban Development and Housing (CIDA)	• Environment and health clearance of projects • Develop/update policy to prevent mosquito breeding in construction sites • Establish a mechanism to register all construction sites under provincial councils, provide guidelines on mosquito control to contractors, monitor mosquito breeding potential sites and send a monthly report to the provincial council and relevant MOH offices • Appoint a health and safety officer/ mosquito control supervising officer at major construction sites • Incorporating dengue prevention into urban planning and environmental management at the urban development projects
National Water Supply and Drainage Board	• Maintenance of water supply lines and prevention of leakages
Municipal councils	• Maintenance of ornamental, fountain and garden pools and prevent mosquito breeding • Solid waste segregation and management, and support vector control in the area, etc.
Rubber Research Institute	• Prevention and control of *Aedes albopictus* mosquito breeding in rubber tapping pots
Department of Agriculture (Registrar of Pesticides)	• Register and regulate insecticides for vector control • Organize training and awareness programmes on the safe application of pesticides in agriculture and health • Strengthen the available policies on rational use of insecticides by pest control agencies
Pest control agencies	• Agriculture and public health pest control using safe and effective products, use of quality control products, safe disposal of used containers under the guidance of the MOH and Registrar of Pesticides
WHO	• Policy, technical, normative and financial support for dengue control

Ministry and agencies	Responsibilities
UNICEF	• Promote awareness on dengue prevention and control activities among public and encourage engagement of communities on dengue preventive practices • Provide financial support for operational research
Academia and Research Institutions	• Collaboration on testing novel control methods, epidemiological and entomological research, training of undergraduate and post-graduate medical students
NGOs (national/ international)	• Engage in community level dengue control activities in collaboration with relevant health authorities • Provide financial support of operational research studies

Annex 6. Activities and timeline

Activities		Indicator	Means of verification	Responsibility	Timeline						
STRATEGIC OBJECTIVE 1. DISEASE SURVEILLANCE AND RISK ASSESSMENT					**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Aim 1: Maximize surveillance for real-time detection and notification of dengue cases and understanding disease dynamics by intensifying disease surveillance at all levels including outpatients departments and private sector to strengthen early detection and reduce risk of outbreaks											
Activity 1.1	**Intensify case detection according to the dengue case definition following the surveillance case definition**										
1.1.1	Improve the capacity of both preventive and curative health staff on dengue case detection	Proportion of relevant staff trained	Data by institutions and MOHs	NDCU and district teams	√	√	√	√	√	√	√
Activity 1.2	**Assess and address gaps in disease notification and coordinate with central, provincial and regional level health facilities for accurate and real-time case notification on the National Dengue Surveillance System (NaDSys) webpage**										
1.2.1	Auditing NaDSys data for accuracy, timeliness and completeness of case notification and identification of causes for suboptimal performance	No of audits conducted per year Proportion of institutions audited	Audit reports	NDCU and district teams and relevant institutions	√	√	√	√	√	√	√
1.2.2	Train health facility staff to improve case notification	Proportion of health facilities that trained their staff	Institutional reports	NDCU and district teams and relevant institutions	√	√	√	√	√	√	√
1.2.3	Train and orient health facility staff at Outpatient Departments (OPD) to assess dengue surge capacity & data management	Proportion of health facilities having trained their staff	Institutional reports	NDCU and district teams and relevant institutions		√	√	√	√	√	√

1.2.4	Expand reporting of dengue cases by GPs into the NaDSys	No of GPs notifying suspected dengue cases through the NaDSys	Institutional reports	NDCU and district teams and relevant institutions		√	√	√	√	√	√
Activity 1.3	**Improve laboratory infrastructure for viral surveillance**										
1.3.1	To optimize laboratory infrastructure and equipment for virus serotyping/ genotyping.	No. of laboratories with virus serotyping/ genotyping facilities	Audits by NDCU	NDCU		√	√	√	√		
Aim 2: Enhance risk assessment capacity by improving utilization of NaDSys data, and develop and operationalize the use of a risk mapping tool											
Activity 1.4	**Enhance the utility of NaDSys and develop the capacity of healthcare staff for data analysis and decision-making for interventions**										
1.4.1	Enhance utility of NaDSys for monitoring case incidence, case fatality rate	No of risk assessment reports generated monthly	No of reports generated in NaDSys	MOOH and District teams	√	√	√	√	√	√	√
1.4.2	Develop capacity of healthcare staff on data analysis and decision-making for interventions	Proportion of MOOH trained	Training records	NDCU and District teams		√	√	√	√	√	√
Activity 1.5	**Develop and validate a geospatial risk mapping tool for undertaking risk assessment and targeted interventions**										
1.5.1	Establish infrastructure for geospatial risk mapping using a web-based tool and develop capacity for utilization of the tool	A functional and well-equipped risk assessment team in place	Operational team at NDCU	NDCU through international collaboration		√	√	√	√	√	√

Activities		Indicator	Means of verification	Responsibility	Timeline						
STRATEGIC OBJECTIVE 2. EARLY DIAGNOSIS AND CASE MANAGEMENT					**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Activity 2.1	**Update guidelines and strengthen capacity for clinical management of dengue cases**										
2.1.1	Revise or update and disseminate guidelines and tools for clinical management of dengue cases	Availability of revised or updated paediatric and adult guidelines	Publication of the guidelines	NDCU in collaboration with professional colleges	√	√		√	√	√	√
2.1.2	Conduct refresher training of healthcare/clinical staff to improve skills to triage/diagnose and manage dengue cases	Proportion of health staff (medical doctors & nursing officers) trained No. of trainings conducted	Training records	NDCU Professional colleges	√	√	√	√	√	√	√
Activity 2.2	**Expand the capacity of state health facilities for diagnosis and management of dengue cases**										
2.2.1	Develop capacity of High Dependency Units (HDU) for in-patient management	No. of new HDUs established No. of existing HDUs strengthened	Audits by NDCU	Ministry of Health NDCU District health authorities	√	√	√	√	√	√	√
2.2.2	Strengthen capacity of Primary Health Care institutions to diagnose and treat dengue cases in order to reduce the case load at secondary and tertiary care hospitals	No. of PHC institutions managing dengue patients	Reports by RDHS	PDHS RDHS		√	√	√	√	√	√
Activity 2.3	**Improve laboratory diagnostic capacity and ensure sustained availability and affordability of diagnostic tests**										
2.3.1	Improve the capacity of laboratory staff for dengue diagnosis	Proportion of relevant staff trained	Data by institutions	NDCU and district teams	√	√	√	√	√	√	√
2.3.2	Ensure adequate supply of affordable NS1 kits and laboratory reagents for dengue serological tests	Proportion of labs provided with adequate supplies	Procurement reports	Ministry of Health, NDCU and institutions	√	√	√	√	√	√	√

2.3.3	Ensure affordability of dengue RDT and FBC tests for diagnosis and case management	Pricing regulatory mechanism maintained	Regulated pricing	Ministry of Health, NDCU, Consumer Affairs Authority	√	√	√	√	√	√	√
Activity 2.4	**Review of dengue deaths and selected dengue near misses for improvement of case management**										
2.4.1	Review of all dengue deaths (institutional and field) as per the death investigation guidelines and conduct a National Dengue Death Review annually Review of selected dengue near-misses	Proportion of dengue deaths reviewed No of reviews conducted on Dengue near-miss cases	Review reports	NDCU District teams relevant institutions	√	√	√	√	√	√	√

Activities		Indicator	Means of verification	Responsibility	Timeline						
STRATEGIC OBJECTIVE 3. VECTOR SURVEILLANCE AND CONTROL					**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Aim 1: Implement efficient vector surveillance and digitalize entomological data for real-time analysis											
Activity 3.1	**Undertake regular vector surveillance by appropriate techniques to monitor vector prevalence, seasonality and bionomics in representative eco-epidemiological settings in the country**										
3.1.1	Establish an entomological working group at central level to plan annual vector surveillance activities and facilitate vector surveillance activities at district level	Availability of annual plan; Quarterly meetings	Meeting minutes	All central VBD units District teams	√	√	√	√	√	√	√
3.1.2	Conduct routine vector and viral surveillance at sentinel sites; spot surveys in all districts/regions/NIHS/CMC, and focal investigations at the sites of focal dengue outbreaks	% of districts with functional sentinel sites; % of districts doing planned surveys; % of planned surveys conducted; No. of focal surveys conducted	Monthly entomological survey reports	NDCU	√	√	√	√	√	√	√
3.1.3	Procure appropriate vector surveillance equipment according to the annual need assessment	No. of equipment procured	Procurement records	NDCU; Other central VBD units	√	√	√	√	√	√	√

Activity 3.2	**Monitor and manage insecticide resistance in vector species**										
3.2.1	Procure insecticide impregnated papers, kits, reagents for bottle bioassays and Wheaton bottles	Availability of the kits at central and district levels	Ordered forms Procurement records	Central VBD programmes	√	√	√	√	√	√	√
3.2.2	Insecticide resistance monitoring	No. of sites having tested resistance	Annual resistance monitoring test reports	Central and district/ regional/ NIHS/ CMC entomological teams	√	√	√	√	√	√	√
Activity 3.3	**Report accurate and complete entomological data timely for analysis, risk assessment and undertaking appropriate interventions**										
3.3.1	Preparation and distribution of entomological reports	Proportion of districts preparing and submitting reports withing 5 days of completion of surveys	Quarterly no. of reports submitted within 5 days of completion of surveys	RDHS/RE/ Entomologists	√	√	√	√	√	√	√

Activity 3.4	**Develop capacity for digitalizing data and implement a real-time web-based system for vector surveillance and geospatial risk mapping for assessing transmission risk**										
3.4.1	Develop and validate a web-based geospatial mapping system and developing infrastructure	Availability of the system	Availability of the system	NDCU		√	√	√	√	√	√
3.4.2	Train assigned staff for web-based surveillance system	Proportion of selected staff trained	Training records	NDCU		√	√	√	√	√	√
3.4.3	Web-based system made functional	No. of district using the system	No. of reports generated	NDCU District technical teams		√	√	√	√	√	√
Activity 3.5	**Strengthen capacity for integrated vector surveillance**										
3.5.1	Training on vector surveillance methods, taxonomy, ecology, molecular techniques, insecticide resistance monitoring, pesticide management	Proportion of staff trained/ retrained	Training records No. of trainings conducted	NDCU		√	√	√		√	
3.5.2	Establish dengue virus xenomonitoring laboratory	Availability of molecular laboratory for virus detection in mosquitoes	Availability of xenomonitoring reports	NDCU		√	√	√	√		
Activity 3.6	**Update Standard Operating Procedures for vector surveillance**										
3.6.1	Develop an integrated vector surveillance guidelines and SOPs	No. of guidelines and SOPs developed	No of guidelines and SOPs published	NDCU Other central VBD units	√	√					√

Aim 2: Apply vector control based on integrated vector management approach to interrupt dengue transmission											
Activity 3.7	**Undertake situational analysis and stratify risk areas based on entomological and epidemiological data and apply appropriate vector control interventions including regulatory measures**										
3.7.1	Prioritize at-risk areas based on analysis of entomological and disease epidemiological data	All areas categorized based on the risk	Annual plan document based on risk stratification	Central/district/ MOH	√	√	√	√	√	√	√
3.7.2	Implement appropriate vector control interventions based on decision making criteria	Proportion of targeted population protected	Intervention coverage records	District/MOH	√	√	√	√	√	√	√
3.7.3	Interventions applied at household levels upon report of new dengue cases	Proportion of households where appropriate interventions were applied by PHII according to NDCU norms	NaDSys reports	District/MOOH/ PHII	√	√	√	√	√	√	√
Activity 3.8	**Strengthen the managerial, technical, and logistic capacity of public health staff for planning and implementing vector control based on an IVM approach**										
3.8.1	Conduct training on planning, pesticide management, insecticide resistance monitoring and implementation of IVM	Proportion of responsible health staff trained	Training records No. of trainings conducted	Central/district/ MOH	√	√	√	√	√	√	√
3.8.2	Procure relevant supplies and make logistics for vector control	Required logistics available at district	Procurement records	NDCU	√	√	√	√	√	√	√

Activity 3.9	**Monitor implementation of vector control interventions applied and evaluate impact on dengue transmission**										
3.9.1	Conduct entomological surveys and bioassays according to the interventions applied	No. of surveys/ bioassays conducted	Entomological reports	Central/district/ MOH/ Entomologists	√	√	√	√	√	√	√
Activity 3.10	**Update vector control guidelines and standard operating procedures (SOPs)**										
3.10.1	Develop integrated vector control guidelines, annual plans and SOPs	Availability of annual plans and SOPs	No. of annual plans and SOPs published	NDCU	√	√	√	√	√	√	√
Activity 3.11	**Facilitate trials of novel interventions and test bio-efficacy of insecticidal products including WHO pre-qualified products**										
3.11.1	Support given for efficacy testing of new vector control products and assessing epidemiological impact of novel vector control interventions	No. of trials supported	Reports and publications	NDCU		√	√	√	√	√	√
3.11.2	Conduct bio-efficacy trials of vector control products	No. of trials conducted	No. of reports generated	NDCU	√	√	√	√	√	√	√
Activity 3.12	**Improve the capacity of public health staff for pesticide management**										
3.12.1	Train public health staff on life-cycle management of pesticides used in vector control	No. of selected staff trained	Training records	NDCU	√	√	√	√	√	√	√

Activities		Indicator	Means of verification	Responsibility	Timeline						
STRATEGIC OBJECTIVE 4. EARLY DETECTION AND RAPID RESPONSE TO DENGUE OUTBREAKS					**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Aim: Prevent, detect and respond to dengue outbreaks promptly to reduce the magnitude of the burden											
Activity 4.1	**Forecast dengue outbreaks using epidemiological, entomological, socio-economical, climatic and other appropriate parameters**										
4.1.1	Monitor potential drivers of dengue transmission associated with outbreaks	No. of regular reviews to assess the risk of dengue	Review of meeting reports	NDCU District teams	√	√	√	√	√	√	√
4.1.2	Develop a dengue early warning platform and operationalize its use to forecast potential/ impending dengue outbreaks	Availability of a functional platform	Forecasting reports	NDCU District teams		√	√	√	√	√	√
4.1.3	To develop capacity of the public health staff and institutions for forecasting and early reporting risk events/ outbreaks	Proportion of relevant public health staff trained	Training reports	NDCU District teams		√	√	√	√	√	√
Activity 4.2	**Initiate early response for mitigation of risk and/or containment of outbreaks**										
4.2.1	Set up and operationalize Rapid Communication and Response Teams at District and National levels	No of functional teams in place	Availability of team reports	NDCU District teams	√	√	√	√	√	√	√
4.2.2	Develop capacity for rapid response	Proportion of relevant public healthstaff trained relevantAvailability of training material or the course	Training reports	NDCU	√	√	√	√	√	√	√
4.2.3	Initiate early response to impending outbreak	Action taken reports	Availability of reports	NDCU District teams/MOH	√	√	√	√	√	√	√
4.2.4	Undertake post-outbreak investigations and share the reports for experience sharing	No. of investigations reports	Availability of reports	NDCU District teams/MOH	√	√	√	√	√	√	√

Activities		Indicator	Means of verification	Responsibility	Timeline						
STRATEGIC OBJECTIVE 5. RISK COMMUNICATION AND COMMUNITY ENGAGEMENT AND MOBILISATION					**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Aim: Undertake effective risk communication to improve awareness and acceptance of interventions											
Activity 5.1	Develop a risk communication strategy for dengue prevention and control through national/ international collaboration	Availability of a risk communication strategy	Risk communication strategy published	NDCU HPB		√					
Activity 5.2	**Implement an effective communication approach to generate awareness and behavioural change for the prevention and control of dengue**										
5.2.1	Set up a communication team using the available capacities	Availability of a risk communication team	Team work reports	NDCU HPB PDHS RDHS	√	√	√				
5.2.2	Develop an effective communication plan: identify target groups, key messages, and channels of communication	Availability of a risk communication plan	Plan document published	NDCU, HPB, Selected Partners		√	√	√	√	√	√
5.2.3	Develop communication tools based on behaviour surveillance	Availability of tools	Publication and dissemination of tools	NDCU, HPB, Selected partners		√	√	√	√	√	√
5.2.4	Assess the effectiveness of the advocacy, social mobilisation, and risk communication interventions	Reports of periodic surveys	Availability of survey reports	NDCU		√	√	√	√	√	√

Aim 2: Enhance community engagement and mobilisation											
Activity 5.3	**Undertake mass media, social media and print media campaigns to mobilize communities in support of dengue control activities and outbreak response**										
5.3.1	Observe National Dengue Day before South-West monsoon followed by a dengue prevention & control campaign	Conducting of the annual campaigns	District reports	NDCU, Districts, Partners		√	√	√	√	√	√
5.3.2	Community engagement activities undertaken through different media, different settings and different community groups	Socio anthropology feedback surveys	District level survey reports	District teams	√	√	√	√	√	√	√
Activity 5.4	**Strengthen local level participation in dengue prevention and control activities**										
5.4.1	To activate Divisional Dengue Committees, village/ street committees, Community Based Organizations, Civil Society Organizations etc. and encourage inclusion of 'Dengue' as an agenda item of existing regular forums	Proportion of MOOH areas having active dengue committees	Formal reports and informal feedback by MOOH	MOH, District teams	√	√	√	√	√	√	√

Activities		Indicator	Means of verification	Responsibility	Timeline						
STRATEGIC OBJECTIVE 6. ENHANCING MULTISECTORAL COLLABORATION					**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Activity 6.1	**Promote intersectoral coordination through the work of presidential, provincial and district task forces and mainstream recommendations made**										
6.1.1	Coordinate for convening task force meetings at all levels	No of meetings each year	Meeting reports	National level Presidential Secretariat, NDCU, Provincial level Governor, Chief Secretary and PDHS District level RDHS, District Secretary Divisional level MOH and Divisional Secretary (DS)	√	√	√	√	√	√	√
6.1.2	Follow up for actions taken on taskforce recommendations with relevant ministries and focal points	Reports of ministries, departments, and focal points	Meeting reports	NDCU and relevant ministries, departments and focal points	√	√	√	√	√	√	√

6.1.3	To enhance and facilitate multisectoral collaboration and coordination at all levels through appropriate advocacy approaches	Advocacy materials (videos, brochures, courses, workshops) on partner's roles (risk groups and risk professions) Online training modules Weekly dengue updates Create a Listserv to communicate with partners over email Case studies on best practices No. of meetings with partners	Advocacy materials published Training modules published Weekly dengue updates published online Online Listserv available Best practice case study reports Meeting reports	NDCU, PDHS, RDHS	√	√	√	√	√	√	√

Activities		Indicator	Means of verification	Responsibility	Timeline						
STRATEGIC OBJECTIVE 7. INNOVATION AND RESEARCH					**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Activity 7.1	**Identify and prioritize studies or surveys to provide information on dengue transmission dynamics and disease burden (*including behavioural surveys)**										
7.1.1	Identify priority areas for operational and implementation research	Priority list of research topics prepared	List of topics	NDCU	√	√	√	√	√	√	√
7.1.2	Review and update priorities regularly	Bi-annual updates	Published updated reports	NDCU	√	√	√	√	√	√	√
Activity 7.2	**Facilitate systematic review of data for evidence-based decision-making for the prevention and control of dengue**										
7.2.1	Identify key areas for systematic reviews for evidence-based decisions	No. of priority areas identified	List of priority topics published and updated	NDCU, Academia and research institutions	√	√	√	√	√	√	√
7.2.2	Collaborate on systematic reviews in identified priority areas	No. of collaborative systematic reviews undertaken	Systematic reviews published	NDCU, Academia and research institutions		√	√	√	√	√	√
7.2.3	Support the integration of review findings into decision-making processes	Recommendations developed according to new findings	Documents on decision-making process	NDCU		√	√	√	√	√	√
Activity 7.3	**Collaborate with the research community and academia for basic and operational research, development and/or evaluation of new tools and undertaking field surveys**										
7.3.1	Facilitate and/ or undertake research on identified priority areas	No. of projects/ research studies facilitated/ undertaken	No. of research reports published	NDCU Academia Research organizations	√	√	√	√	√	√	√

7.3.2	Facilitate testing efficacy of vector control tools/ products	No. of tools tested	Test reports	NDCU Academia Research organizations ROP	√	√	√	√	√	√	√
Activity 7.4	**Effective translation of research into practice and implementation of novel interventions**										
7.4.1	Research findings reviewed and interventions implemented	No of research findings revived and interventions implemented	Research reports	NDCU Academia Research organizations	√	√	√	√	√	√	√
7.4.2	Roadmap develop for interventions	Availability of Roadmap for interventions	Availability of implementation protocol	NDCU Academia Research organizations	√	√	√	√	√	√	√

Activities		Indicator	Means of verification	Responsibility	Timeline						
MONITOR PROGRAMME IMPLEMENTATION AND EVALUATE IMPACT OF INTERVENTIONS					**2024**	**2025**	**2026**	**2027**	**2028**	**2029**	**2030**
Activity 1	**Monitor dengue control programme implementation**										
1.1	Establish a M & E team at NDCU for monitoring programme implementation and evaluation of impact	Team in place	Administrative order	NDCU	√	√					
1.2	Coordinate with districts to implement M & E activities	No. of district M&E teams implementing M&E up to GN level	Reports of M&E reviews	NDCU District teams	√	√	√	√	√	√	√
Activity 2	**Evaluate the impact of dengue control programme**										
2.1	Conduct a pilot study/ nationally representative sero-prevalence surveys on dengue	No. of surveys conducted	Survey reports	NDCU Academia District teams		√	√				√
2.2	Annual review of the impact of NSP implementation	No. of annual reviews	Annual reports	NDCU		√	√	√	√	√	√
2.3	External reviews of the dengue control programme	Mid-term and end-term international reviews	External review reports	NDCU				√	√		√

Annex 7

Monitoring and Evaluation Framework

Annex 7. Monitoring and evaluation framework

	Key Indicators	Baseline			Milestones						Target
		Year	Parameter	Source	2024	2025	2026	2027	2028	2029	2030	
A.	**Impact indicators**											
1.	Case-fatality rate due to dengue (%)	2022–2023	0.08	Dengue death notification				0.05			0	0
2.	Dengue case incidence (cases/100,000)	2022–2023	376	Disease surveillance system				250			<100	<100
B.	**Outcome/output indicators**											
1.	Proportion of districts reducing the case incidence	2022–2023	Baseline incidence of each district	Disease Surveillance System				Incidence reduced at least by 40% from the baseline in 3/4th of districts			Incidence reduced at least by 75% in all districts	Incidence reduced at least by 75% in all districts
2.	Virus infection rate in Aedes mosquito vectors	Q4 2024–Q1 2025	% of district mosquito pools positive for DENV	Monthly entomological collections				40% reduction in infection rate			75% reduction in infection rate	75% reduction in infection rate

	Key Indicators	Baseline			Milestones						Target
		Year	Parameter	Source	2024	2025	2026	2027	2028	2029	2030	
C.	**Process indicators**											
C1	**Case detection and surveillance**											
1.	No. of districts in which annual TOTs conducted by NDCU	2023	28	NDCU records	28	28	28	28	28	28	28	28
2.	No. of hospitals/ institutions laboratories equipped with virus serotyping/ genotyping in high-risk provinces	2023	Serotyping - 4 (*Government Health Institutions:* MRI, National Hospital Kandy; National Hospital, Galle); *Universities*: Centre for Dengue Research, University of Sri Jayewardenepura); Genotyping - 2					1 (Northern province)		1 (Eastern Province		6
3.	Pilot or nationally representative sero-prevalence surveys conducted	2021 (small sample size)	-	-		Survey-1 (planning)	Survey-1				Survey-2	2 Surveys
4.	% of high-risk districts (total high-risk districts =14) audited for NaDSys use	2024	Not Relevant (NaDSys launched in 2024)	NaDSys	Establishing the system	50% (7 districts)	50% (7 districts)	50% (7 districts)	50% (7 districts)	50% (7 districts)	50% (7 districts)	Audit for each district every two years
5.	% of institutions (hospitals) randomly audited for NaDSys use each year	2024	Not Relevant (NaDSys launched in 2024)	NaDSys	Establishing the system	25%	25%	25%	25%	25%	25%	25%

	Key Indicators	Baseline			Milestones							Target
		Year	Parameter	Source	2024	2025	2026	2027	2028	2029	2030	
C2	**Diagnosis and case management**											
6.	No. of medical doctors & nursing officers trained on dengue clinical management and monitoring	2022	420	NDCU records	500	500	500	500	500	500	500	500 each year
7.	Percentage of Base hospitals and above hospitals with established HDUs	2022	According to the Service Availability and Readiness Assessment in 2022	NDCU records				60%				100%
8.	Percentage of hospitals (excluding PMCUs) with Full Blood Count testing facility availabe at OPD	2023	30%	Records from DDG laboratory services	35%	40%	55%	65%	75%	85%	100%	100%

	Key Indicators	Baseline			Milestones							Target
		Year	Parameter	Source	2024	2025	2026	2027	2028	2029	2030	
C3	**Vector surveillance**											
9.	(a) Proportion of districts having functional sentinel surveillance sites	2023	75%	NDCU & district records	75%	100%	100%	100%	100%	100%	100%	100%
	(b) Proportion of entomological staff trained on dengue related vector surveillance methods	2023	Data not available	Data not available		25%	25%	25%	25%			100% entomological staff
10.	Proportion of sites** having tested resistance	2022	80%	NDCU & district records	80%	90%	100%	100%	100%	100%	100%	100%
11.	National Vector Control Needs Assessment conducted	2020	2020					Repeat VCNA*				1 VCNA* during 2024-2030
12.	Proportion of districts where key containers identified based on pupal surveys	2023	0%	NDCU entomological surveys	10%	50%	75%	100%	100%	100%	100%	100%

* VCNA - Vector Control Need Assessment
** Sites = Districts and NDCU

	Key Indicators	Baseline			Milestones							Target
		Year	Parameter	Source	2024	2025	2026	2027	2028	2029	2030	
C4	**Vector control**											
13.	No. of public health technical staff trained on IVM	2022–2023	28 entomologists trained on insecticide resistance testing and monitoring	NDCU records			50% of MOOH and entomologists; 25% PHII	50% MOOH & entomologists; 25% PHII	25% PHII	25% PHII		100% of MOOH & entomologists; 100% PHII
14.	No. of districts/ reporting units having insecticide resistance test kits, impregnated papers, other equipment & reagents	2022	100%	NDCU records	28	28	28	28	28	28	28	28
15.	Number of districts/ reporting units receiving vector control interventions	2022–2023	28 (100%)	NDCU records	28 (100%)	28 (100%)	28 (100%)	28 (100%)	28 (100%)	28 (100%)	28 (100%)	28 (100%)

	Key Indicators	Baseline			Milestones							Target
		Year	Parameter	Source	2024	2025	2026	2027	2028	2029	2030	
C5	**Dengue outbreak detection and rapid response**											
16.	No. of districts/ reporting units with rapid response teams	2022	Data not available	NDCU & district records	10	28 (100%)	28 (100%)	28 (100%)	28 (100%)	28 (100%)	28 (100%)	28 (100%)
C6	**Effective communication and community engagement**											
17.	Implement mass media campaigns & observe National Dengue Day before South-West monsoons	2023–2024	Not undertaken/ available	NDCU records			1	1	1	1	1	1
C7	**Multisectoral collaboration**											
18.	No. of national level Presidential Task Force (PTF) meetings on dengue convened	2023	At least one meeting per quarter (in 2023, 14 PTF meetings convened including expert committee meetings (appointed by the PTF)	NDCU	4	4	4	4	4	4	4	4 PTF meetings per year
19.	No. of weekly dengue updates released online	2023	52	NDCU records	52	52	52	52	52	52	52	52 (1 per week)

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