

Building Climate Change Resilience in the Cambodian Health System

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Abstract

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The Global Environment Facility is the financial mechanism for the United Nations Framework Convention on Climate Change, and it is the primary vehicle for funding climate change adaptation activities in lower resource settings. In March of 2016, GEF approved a \$9,000,000 concept note covering Bangladesh, Cambodia, Lao, Myanmar, Nepal, and Timor Leste. Each country worked with the WHO to develop a four-year proposal to utilize it's \$1.5 million share of the funding to mitigate the health impacts of climate change. The outcomes established in the concept note are:

- 1.1 Institutional capacities are strengthened to effectively integrate climate risks and adaptation options in health sector planning and implementation

2.1 Effective decision-making for health interventions is enabled through generation of information and improved surveillance and/or early warning systems

3.1 Climate resilience is enhanced in health service delivery

4.1 Enhanced regional cooperation and knowledge exchange for promoting scaleup and replication of interventions

4.2 Health National Adaptation Plans are effectively integrated into ongoing National Adaptation Plan processes

The following country proposal detailed the current status of climate change adaptation in Cambodia and the activities proposed to achieve the project outcomes.



**GEF-LDCF Climate Change and Health Adaptation
Project Proposal
National report**

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1. Development challenge

1.1 Objective of the project within the national context

The proposed project will promote an integrated strategy to improve adaptation to climate change in Cambodia, with a focus on preventing increasing morbidity and mortality from climate-sensitive diseases.

1.2 Socioeconomic and environmental context within the country and effects related to health

Cambodia is located in South-East Asia on the southern end of the Indochina peninsula. It is situated within the tropics, at 10–15° north latitude and 102–108° east longitude. The country covers approximately 181 000 km² and had an estimated population of 15.6 million people as of 2015. The coastline is about 440 km long.

1.2.1 Socioeconomic conditions

Cambodia is a low-income country with an estimated population of 15.6 million people with a median age of 24.9 years. Approximately 79% of the population lives in rural areas. The Khmer people, the predominant ethnic group in Cambodia, make up 90% of the population. Cambodia has a Gini index of 30.8. The gross domestic product (GDP) per capita is US\$ 1158.70, 1.3% of which is spent on health. The country's GDP has grown an average of 7% per year since 1995. Cambodia uses a dual currency system, consisting of United States dollars and the Cambodian riel.

The proportion of people living in poverty fell from 50% in 2004 to 18% in 2012, although many people are vulnerable to economic shocks.

Cambodia is an agrarian society, and in 2012 agriculture employed around 70% of the workforce (1). Most arable land in Cambodia is used for rice production, of which 86% is rain-fed (non-irrigated). Cassava, maize, sweet potatoes, soybeans, sesame seeds and groundnuts are important secondary crops. Major commercial commodities include rubber, fish and timber.

Potential hydroelectric power development in the Mekong basin threatens Cambodian agriculture and food security. Future dams may damage fish stocks through reduced water flow and would prevent the silt distribution essential for rice farming.

Cambodia's second largest industry is garment manufacturing, which in 2015 accounted for US\$ 6.8 billion of exports and employs approximately 600 000 people (2). The garment industry has grown steadily since 1996, and wages have increased significantly in the past two years. The industry has very low levels of Cambodian ownership, however, and is vulnerable to global competition and reliance on imported textiles. The third largest industry is tourism, which was responsible for 15.7% of GDP in 2012.

International arrivals, tourism revenue and tourism jobs have all increased over the past few years.

1.2.2 Overview of current climate and future projections

Cambodia has two distinct seasons: a dry season from mid-November to April and a rainy monsoon season from May to October, interrupted by a short “mini dry season” in late July and August. The annual average temperature is 28 °C, with average maxima and minima of 38 °C in April and 17 °C in January, respectively. The average annual rainfall is 1400 mm in the central lowland regions but may reach 5000 mm in coastal zones. The ring of mountain ranges affords the country protection from severe storms or cyclones, but when extreme storms do occur they predominantly strike coastal regions from August to November. Floods commonly occur between May and October, resulting from heavy rains that fall both locally and upstream in the Mekong basin. Floods and droughts have caused considerable economic losses through the destruction of crops and other household assets and through the associated social and environmental impacts.¹¹

Climate change is already evident in Cambodia. The mean annual temperature has increased by 0.8 °C since 1960, at a rate of approximately 0.18 °C per decade. All areas of Cambodia are expected to experience further temperature increases in the twenty-first century: the temperature is expected to increase by 0.7–2.7 °C by the 2060s and by 1.4–4.3 °C by the 2090s.^{11, 12}

Average annual rainfall is expected to increase in Cambodia with climate change, with shorter, more intense wet seasons, but longer, drier dry

seasons. Accordingly, the risk of extreme weather events such as floods and droughts is expected to increase. Heatwaves are a growing threat. The frequency of hot days and nights has increased significantly since 1960, with further increases expected: 14–49% of days will be considered hot (based on the current climate) by the 2060s, and 20–68% of days by the 2090s.^{11,}

12

Cambodia's coastline is vulnerable to an expected sea-level rise of up to 0.98 m by 2100, causing saline intrusion and increasing the risk of coastal inundation during storms and typhoons. Although future projections for tropical storms (typhoons, cyclones) are subject to greater uncertainty, Cambodia remains at risk of these natural disasters.^{13, 14}

In Cambodia the increasing risk of extreme weather events due to climate change is a particular concern. The repeated nature of disasters such as droughts and floods perpetuates and amplifies existing vulnerabilities to climate change, including poverty, food insecurity and poor health status. The increasing frequency and severity of extreme weather events caused by climate change will exacerbate this cycle further, compromising resilience and adaptive capacity and contributing to a perpetual state of recovery.¹¹

1.2.3 Overview of health concerns and impact on vulnerable groups

The health status of the Cambodian people has improved steadily over recent decades, but challenges remain. Cambodia is undergoing an epidemiological transition from communicable diseases to noncommunicable

diseases, although communicable diseases still represent a significant burden. Major infectious diseases include acute respiratory infections, gastroenteric infections, and outbreak-prone waterborne and vector-borne diseases. The country is classified as high-burden for tuberculosis.

Noncommunicable diseases and injuries will be the challenge of the future: surveys have indicated high levels of diabetes and hypertension in rural and urban areas, and the number of road accidents is rising rapidly. Health risks are exacerbated by environmental circumstances, especially the lack of safe drinking water and poor sanitation and hygiene.¹⁵

Numerous factors contribute to Cambodia's vulnerability to the health impacts of climate change, including high rates of poverty, particularly in rural areas; high burdens of disease; rapid urbanization; poor coverage of water, sanitation and hygiene services; low levels of education; poor access to health-care services; food insecurity; malnutrition; reliance on agriculture; and the tendency of populations to live in flood- and drought-prone areas. These factors also limit the adaptive capacity of populations as they attempt to respond to a changing climate.³

Cambodia's young population (37% of the population are aged under 15 years) is particularly sensitive to some of the effects of climate change. Children aged under 5 years are particularly susceptible to diarrhoeal disease, the rates of which may be influenced by increasing temperatures, altered precipitation and the consequences of extreme weather events. The

recent Cambodia Anthropometrics Survey, conducted by the United Nations Children's Fund Cambodia, has reported high rates of undernutrition in children as a nationwide issue, but particularly affecting urban poor children. Undernutrition leaves this population vulnerable to the health impacts of climate change, particularly further food insecurity and vector-borne and waterborne diseases.

Women and girls are more sensitive than males to the effects of climate change. Although the Cambodian constitution guarantees gender equality in all areas of society, there are significant differences in important indicators of well-being and access to health and education resources. Compared with males, females are less likely to be literate as adults (64% versus 85%), complete higher levels of schooling or earn a similar wage (female/male wage earnings ratio: 0.74). As a legacy of the Khmer Rouge conflict, approximately 25% of households are headed by a widowed woman. These families are particularly vulnerable to the effects of poverty because female-headed households generally own smaller lots of land and are more vulnerable to losing their land. These factors leave women more vulnerable to the health impacts of climate change. Literacy is strongly protective against diarrhoeal disease, and low levels of literacy leave women exposed.⁴ Lower wages and asset levels limit the resources available to women to adapt to climate change at the individual level.

Urban populations are sensitive to consequences of climate change.

Urbanization of populations is currently occurring in Cambodia and is likely to increase under future climate change conditions, as employment and livelihoods in rural areas become more difficult. Infrastructure such as sewerage, roads and housing and ready access to educational and health services are often lacking at the burgeoning edges of cities and large towns. As noted above, undernutrition among urban Cambodian children is now recognized as a major issue.

The relative scarcity of health resources and health professionals in Cambodia increases the sensitivity of the population to the more severe health impacts of climate change. In the event of a large-scale climate-related infectious disease outbreak, flooding event or famine, the current health system would be unable to cope with the increased workload, with a detrimental effect on health outcomes. In addition to the scarcity of health resources, the significant out-of-pocket expenses that individuals bear in accessing the health system further limits its universal use.

1.2.4 Discussion of key climate-sensitive health risks

The 2010 climate change and health in Cambodia vulnerability and adaptation assessment identified four high-priority health impacts of climate change: vector-borne diseases, particularly dengue fever and malaria; food insecurity; effects of extreme weather events; and water-borne diseases.

The Ministry of Health's 2012 Climate Change Strategy for Public Health

narrowed these down to three key areas: vector-borne diseases; waterborne and foodborne diseases; and the health impacts of extreme weather events, including death, injury, and vector-borne and waterborne diseases. These three areas were reiterated in the National Climate Change Action Plan for Public Health 2014–2018.

Vector-borne diseases

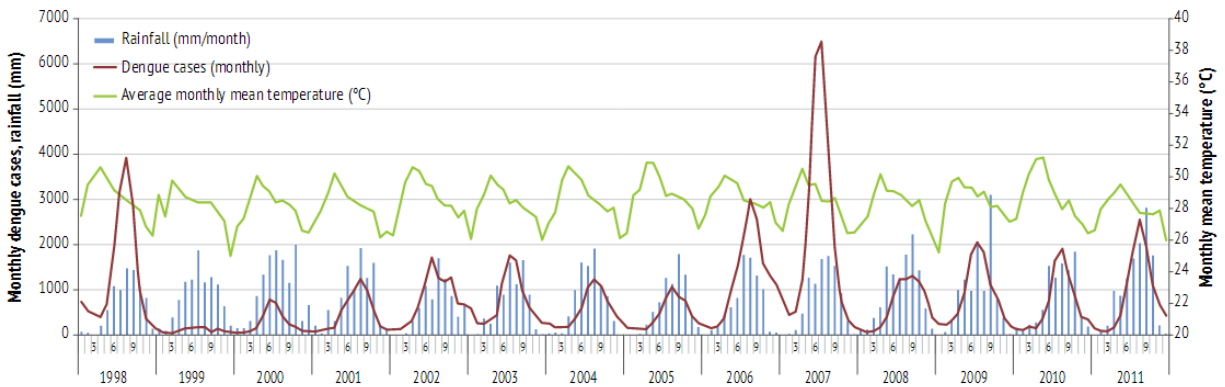
The risk of vector-borne diseases is expected to increase due to climate change, as a result of increasing temperatures, changing patterns of precipitation, increasing urbanization and population migration. The two major vector-borne diseases in Cambodia are malaria and dengue, but Japanese encephalitis, chikungunya and Zika are also expected to be impacted by climate change. Adapting to the increased risk of vector-borne disease will require improved surveillance, integrated vector management, and epidemic early-warning systems to inform the allocation of resources for prevention and treatment.

Dengue

Endemic dengue transmission peaks during the rainy season, with high transmission epidemics occurring periodically in Cambodia. The annual age-adjusted incidence ranges from 0.7 to 3 per 1000 population, and increased incidence is observed during rainy seasons. The case fatality rate ranges from 0.7% to 1.7%. Almost 80% of reported dengue cases occur in children aged 9 years or younger, with the highest age-specific incidence occurring in

children aged under 1 year. Dengue incidence is associated with weather variables, particularly temperature, rainfall and relative humidity (Figure 1). The association has lag times of up to three months, indicating potential for a dengue early-warning system.¹⁶

As the climate changes, changing rainfall patterns will alter potential breeding sites for the *Aedes* mosquitoes that transmit the dengue virus. In rural areas, entomological surveys have found that traditional rainwater-collection jars account for 80–90% of larvae. As rainwater harvesting increases in anticipation of droughts, it is critical to implement vector-control measures to prevent increases in vector-borne diseases. Ongoing urbanization is expected to increase proximity of breeding sites to human populations. Given the prevalence of piped water systems in cities, it is expected that cryptic sites are responsible for a larger proportion of larvae in urban areas, but more research is required. Cryptic urban sites are likely to include pooled water and trash. Internal and cross-border travel patterns will alter population immunity and susceptibility to different dengue serotypes and will alter the distribution of dengue types, potentially increasing the risk of outbreaks. Extreme weather events may also disrupt health systems and their capacity to prevent, diagnose and manage dengue outbreaks. Dengue surveillance has improved over the years, but significant underreporting to the National Dengue Surveillance System occurs. Actual incidence of dengue may be 29 times higher than that reported.⁵



Source: Ministry of Health, Cambodia, 2010.

Figure 1. Relationship between monthly rainfall, temperature and dengue incidence in selected Cambodian provinces.

Malaria

Between 2004 and 2014 the annual number of reported malaria cases in Cambodia decreased by more than 50%, from 113 855 to 56 271. The recorded mortality rate has also declined from 0.98 per 100 000 in 2010 to 0.12 per 100 000 in 2014. In 2015 the countrywide incidence of Malaria was 2.29 per 1000. Approximately three-quarters of cases occurring from 2004 to 2013 were caused by *Plasmodium falciparum*, 28.1% were caused by *Plasmodium vivax* and 5.7% were mixed infection. As with dengue, increased incidence is observed during rainy seasons, with the highest monthly malaria (*P. falciparum* and *P. vivax*) incidence observed between June and January.⁶ As shown in Figure 2, malaria incidence is highest in the forested north-eastern provinces on the border with Viet Nam, the Lao People's Democratic Republic and Thailand.⁷

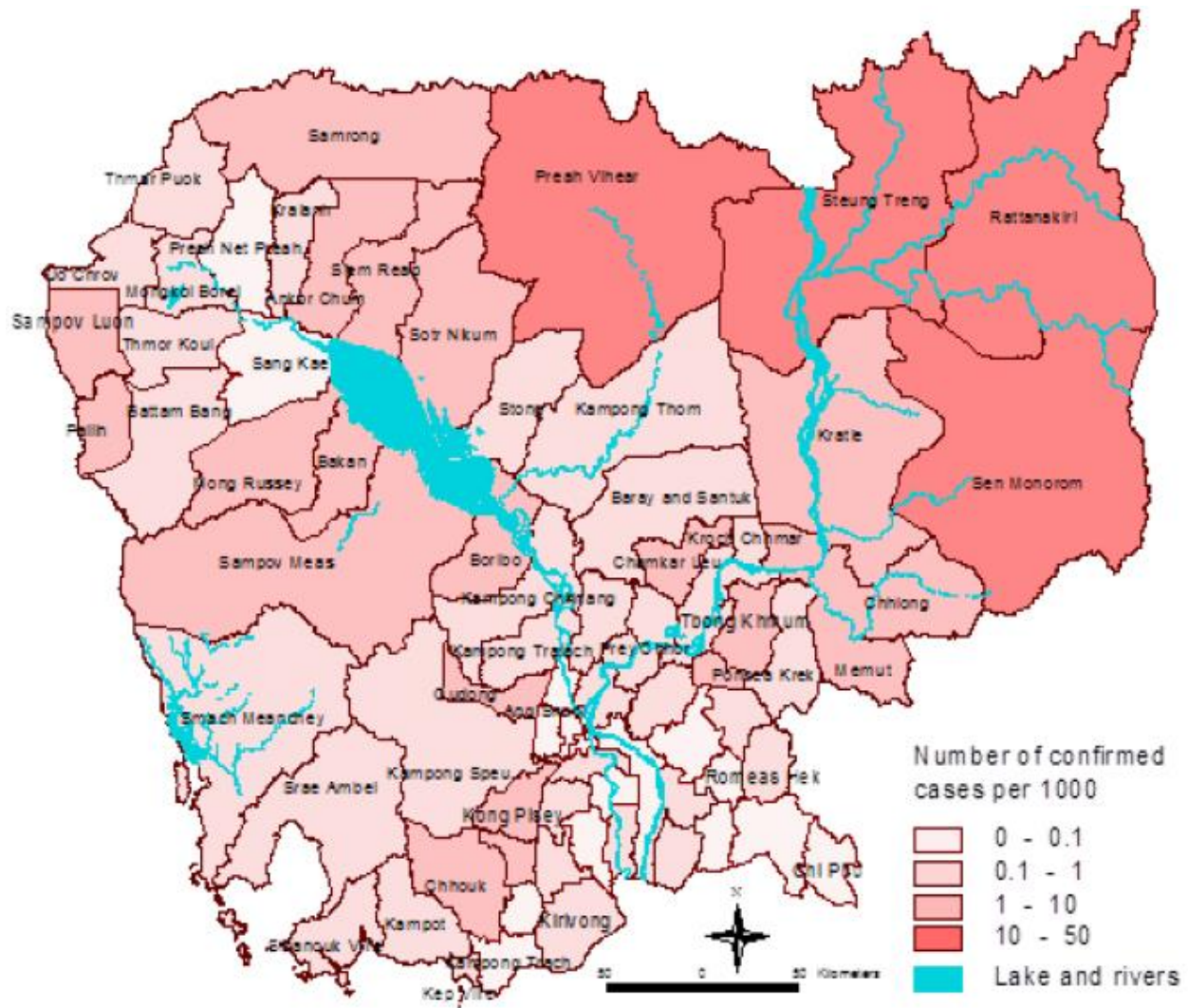


Figure 2. Confirmed malaria cases per 1000 population in 2014, by operational district.

Source: Cambodia Malaria Elimination Action Framework 2016–2020.

The burden of disease attributable to malaria may increase as the climate changes, particularly when considering other associated impacts of climate change such as malnutrition, population displacement and disruption of health services, including disease surveillance and vector-control programmes. Although models are subject to significant uncertainty, the

distribution of the *Anopheles* mosquitoes that transmit *Plasmodium* malaria may change, exposing non-immune populations to the risk of infection.

Impacts of climate change on malaria would be reduced by successful and intensive malaria public health campaigns, including the distribution and use of insecticidal bednets and the timely use of effective antimalarial treatments.

Waterborne and foodborne diseases

Climate change is expected to make the provision of clean water and adequate sanitation in Cambodia more challenging. Changing rainfall, temperature and Himalayan glacial melt patterns will affect water availability, waterflow timing and water quality. Increased rainfall and glacial melt may reduce water scarcity in some regions, but the need to increase water storage between the wet and dry seasons may lead to the creation of vector breeding sites. In some regions, reductions in rainfall and glacial melt will lower river flows, reducing effluent dilution and leading to increased pathogen loading in freshwater supplies, particularly at certain times of the year. Receding glaciers may dramatically decrease river flows in the long term, presenting challenges to the 86% of Cambodians who meet their water needs from the Mekong river basin.³

Water-related diseases known to exist in Cambodia include diarrhoeal disease (caused by a range of pathogens, including rotavirus, *Escherichia coli*, *Shigella*, cholera and typhoid), leptospirosis, melioidosis, hepatitis E,

schistosomiasis and arsenicosis. The burden of waterborne diseases may increase as water scarcity is exacerbated and extreme weather events threaten safe water and sanitation services. Waterborne diseases are associated with alterations in rainfall, water availability and water quality. Foodborne diseases are related to quality of food, storage conditions (such as exposure to insects, mould and moisture), water contamination and the direct effects of temperature. Water scarcity also limits hygiene activities such as washing and the use of flushing toilets, which contributes to food- and waterborne diseases. Manifestations of water- and foodborne diseases range from acute diarrhoeal illness or food poisoning to chronic gastrointestinal infection contributing to malnutrition. Children are particularly vulnerable to waterborne diseases, because a high prevalence of undernutrition increases the risk of waterborne diseases.^{3, 10}

Cambodia is vulnerable to water-related diseases for several reasons. Common drinking water sources such as unprotected springs and rainwater collection are often insecure and easily contaminated. As of 2014, during the wet season 57% of rural households used unimproved sources of drinking water such as unprotected springs and rainwater catchments (Figure 3). The percentage of rural households using unimproved water sources reduces during the dry season, but is still high at 48.8%. These unimproved water sources are at risk of contamination during flood events, promoting the spread of waterborne diseases. Water collection and storage containers also

provide habitats for mosquito breeding and facilitate the spread of vector-borne diseases.

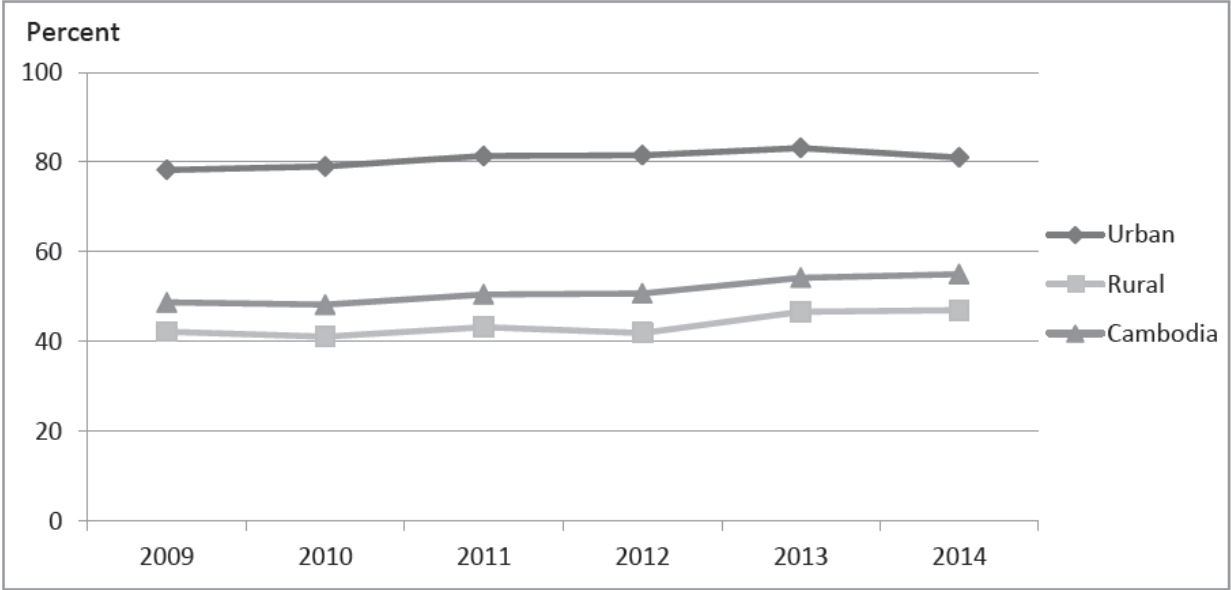


Figure 3. Access to improved drinking water sources, 2009–2014.

Source: Cambodia socio-economic survey 2014. Phnom Penh: National Institute of Statistics, Ministry of Planning; 2015.

Access to sanitation services is also limited in many regions, particularly in rural areas where, as of 2014, 53.5% households had no improved sanitation facilities (Figure 4), including 46.9% of households who practise open defecation.⁸

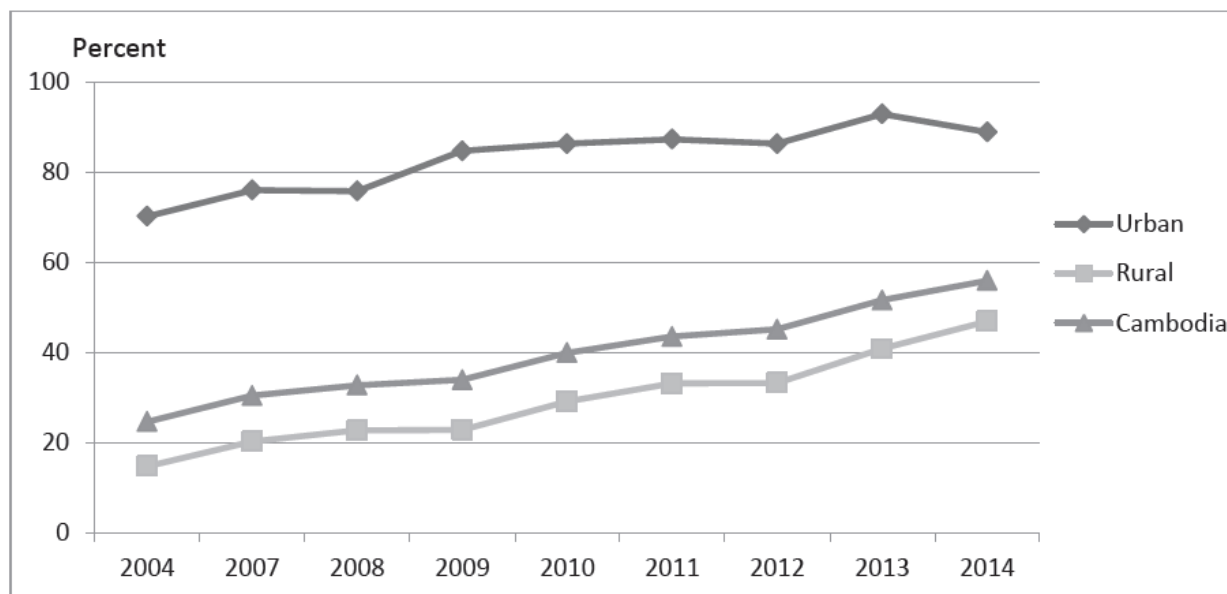


Figure 4. Access to improved sanitation facilities, 2004 and 2007–2014.

Source: Cambodia socio-economic survey 2014. Phnom Penh: National Institute of Statistics, Ministry of Planning; 2015.

Health-care facilities in Cambodia lack water and sanitation infrastructure: only 67% of the country’s health-care facilities have a reliable water supply to provide for drinking, personal hygiene, medical care and other needs.⁹ Population knowledge of safe water, sanitation and hygiene practices is limited, as is health stakeholder knowledge of and capacity to manage water-related diseases.

Adapting to the health risks of water- and foodborne diseases will require improved water, sanitation and hygiene infrastructure and educational and behaviour change campaigns to promote good hygiene practices. These interventions would also help address undernutrition in Cambodia through

the reduction of diarrhoeal disease, further reducing population vulnerability to disease.

Diarrhoea

Diarrhoea is the second most common inpatient and outpatient illness recorded by the Ministry of Health Information System, after acute respiratory illness. It is also the main type of water-related disease occurring after flooding in Cambodia, particularly among children aged under 5 years. Chronic diarrhoea has significant consequences for children's health, including malnutrition, poor growth, cognitive deficits and poorer schooling outcomes. Literacy is strongly protective against diarrhoeal disease in Cambodia. Other protective factors include availability of toilet facilities and access to piped water, while unimproved drinking water sources and lack of access to on-premises toilet facilities increase the risk of diarrhoeal disease. A recent study found that temperature is positively associated with monthly cases of diarrhoeal disease in parts of Cambodia at lags of up to four months. Rainfall is also associated with diarrhoeal disease: a positive association was seen in some areas and a negative association in others. Further research is required to explain these heterogeneous associations. Cholera, which occurs in relatively frequent epidemic cycles in Cambodia, has been shown to be strongly linked to changes in temperature, rainfall and other environmental conditions.

Extreme weather events

The health consequences of extreme weather events are well documented and include increased morbidity and mortality from heatwaves, floods and droughts; increased burdens on health services; food shortages as a result of crop destruction, leading to malnutrition; effects on water supplies, sanitation and drainage; population displacement; and mental health impacts. Extreme weather events are likely to amplify existing health problems in Cambodia. For example, high baseline rates of diarrhoeal disease, respiratory infections and vector-borne diseases such as dengue fever will be compounded by extreme weather events, with children among the most vulnerable people. Limited access to health-care services, particularly among poor people and people in rural areas, is further compromised during extreme weather events, and the effects of floods, droughts and storms on economic productivity are an additional barrier to health care in many communities. Vulnerability to the health impacts of extreme weather events is compounded further by low levels of education on health and related issues, particularly among women. Lack of early warning systems and limited distribution of information relevant to extreme weather events heightens the threat posed by disasters, particularly in rural areas. Adaptation to extreme weather events will require climate-proofing infrastructure to withstand floods and other extreme weather, and improving water collection, storage and management to prepare for droughts.

Flood

Since 1996 floods have caused 1131 deaths in Cambodia, amounting to 50% of all recorded deaths caused by disasters in the country. Floods are the most common disaster type in Cambodia, and floods classified as disasters have increased in frequency in recent years. Over recent years, an increasing frequency of severe flooding events has been observed in Cambodia and flood periodicity has also increased, affecting large populations almost annually over the past decade. The sea level has been rising at 2–3 mm per year over the past two decades, and it is projected to accelerate to a rate of about 5 mm per year over this century. This will increase the number of people in Cambodia's coastal areas at risk from flooding and saltwater intrusion, which may be exacerbated by declining dry-season precipitation. Associated effects may be felt by industry and agriculture in coastal areas.

The health effects of floods include drowning, injuries, hypothermia, domestic violence and mental health impacts. Floods may also cause damage to housing and shelter, health-care facilities, water and sanitation infrastructure, and transport systems. The subsequent failure of routine health services leads to adverse health outcomes. Floods are associated with reduced short-term water quality as they flush pathogens and hazardous chemicals into the water and overwhelm containment and treatment systems. The risk of diarrhoeal, skin, soft tissue and respiratory diseases is increased, as is the risk of vector-borne diseases. Diarrhoeal disease is the

main type of water-related disease occurring after flooding in Cambodia, particularly among children aged under 5 years. Improved water and sanitation services, such as piped water and toilets, may be protective against the effect of flooding on diarrhoeal disease incidence. Risk factors for diarrhoeal diseases during and after flood events likely include impaired access to health services and compromised ability to boil or treat water before consumption, for example due to power failures.

Adapting to increased frequency and severity of floods will require flood-proofing infrastructure, particularly water, sanitation and hygiene infrastructure. Water sources should be protected from contamination during floods, and sanitation systems should be upgraded to remain secure during floods. Water safety planning can be used to identify the climate-related hazards that threaten water, sanitation and hygiene infrastructure and plan risk-mitigation measures.

Drought

Climate change may cause increased frequency and intensity of drought in Cambodia as seasonal rains become less predictable. Droughts limit the amount of water available for agriculture and sanitation, increasing the risk of food- and waterborne diseases. Safe water sources may dry up, causing users to turn to less safe alternative sources. Lack of rainfall may make surface water less safe, as reduced effluent dilution leads to increased pathogen loading in freshwater supplies. Groundwater pollutants such as

arsenic, iron, manganese and fluoride are expected to increase to unhealthy levels under drought conditions. Vector-borne disease risk may also increase as increased water storage to prepare for drought conditions creates mosquito breeding habitats. Food insecurity occurs in the context of poor crop and stock yields and increases the risk of malnutrition. Drought is also associated with mental health impacts such as depression and suicide, particularly among people dependent on agriculture, such as farmers.

Adapting to increased frequency and severity of droughts will require increased water storage and management of demand. As irrigation typically uses a significant portion of freshwater resources, the safe use of wastewater in agriculture has the potential to reduce demand during droughts. This would need to be managed carefully, as wastewater use poses health risks. Increased water collection and storage during the rainy season can increase the availability of water during a drought; however, water must be stored safely to prevent the growth of pathogens and the breeding of mosquitos and other vectors.

1.2.5 Vulnerability to climate change

All of Cambodia is susceptible to the health impacts of climate change discussed in the previous section, but hazard exposures and adaptive capacity vary among provinces, as does the baseline health status of the population. Vulnerability to droughts and floods is higher among people living along the Mekong and Tonle Sap hydrological systems, while

vulnerability to cyclones and saltwater intrusion is higher among people living in coastal areas. Malaria is higher in the forested regions in the border provinces, although deforestation has reduced the *Anopheles* habitat and thus exposure to malaria. Dengue incidence varies within and between provinces but is not concentrated in a particular geographical area.³

Data were collected showing exposure and vulnerability to the health impacts of climate change. One of the most exposed and vulnerable provinces was Ratanakiri, as shown by the indicators in Tables 1 and 2.

Table 1. Exposure to climate-sensitive diseases and events in Ratanakiri province.

Dengue incidence (2012–2016) ^a	Malaria incidence (2015) ^a	Diarrhoeal disease in children aged under 5 years (2014) ^b	Affected by flood (2013–2015) ^c	Affected by drought (2013–2015) ^c
10/100 000	123/10 000	15.6%	2.1%	1.9%

Table 1. Exposure to climate-sensitive diseases and events in Ratanakiri province.

^aNational Centre for Parasitology, Entomology and Malaria Control data.

^bDemographic and Health Survey.

Table 2. Vulnerability to climate-sensitive diseases and events in Ratanakiri province.

Households with improved latrine (2015) ^a	Households with improved water (2015) ^a	Poverty (2012) ^b	Children aged under 5 years underweight (2014) ^c
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16.3%	49.1%	36.2%	32.2%
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Table 2. Vulnerability to climate-sensitive diseases and events in Ratanakiri province.

^aCommune Database.

^bMinistry of Planning and United Nations Development Programme, 2012.

^cDemographic and Health Survey.

Ratanakiri has the lowest rate of household access to improved sanitation and the fourth lowest rate of access to improved water in the country, leaving households vulnerable to waterborne diseases. High levels of poverty and child undernutrition mean the populace is vulnerable to climate-sensitive diseases and has few resources to adapt to climate change. The province currently has high levels of malaria and low levels of dengue, but this may change as climate change, deforestation and changing water storage practices impact on mosquito habitats. To account for this adaptation, efforts must be forward-thinking rather than simply based on past trends.

As noted previously, women, children and poor communities are more vulnerable to the impacts of climate change. Women are less likely to be literate and more likely to be poor, which limits the resources they have available for adaptation. Women and children are more likely to bear the burden of water collection and treatment, and this burden is expected to increase as floods and droughts impact on water quality and availability. Children are more likely to have climate-sensitive diseases, and their cases

are more likely to be severe. Poor communities have limited ability to adapt to the impacts of climate change and are more vulnerable to even small economic shocks resulting from the destruction of assets or medical costs.

1.3 Policy context: governance of health sector and support programmes

1.3.1 Identify key laws and policies

Several national commitments, strategies and action plans have been developed in Cambodia to guide health sector planning and climate change adaptation. The Rectangular Strategy Phase III describes the adverse impact of climate change on Cambodia's development and commits to increasing adaptive capacity and resilience and to mainstreaming climate change into policies, laws and plans at national and subnational levels. The National Strategic Development Plan 2014–2018 calls for sustainable development within the health sector and prioritizes reduction of health risks caused by environmental pollution and climate change. Specific to climate change, the National Adaptation Programme of Action to Climate Change 2006 identifies high-priority adaptation projects in key sectors, including agriculture, water resources, coastal zone management and human health. The four projects specific to health are the production of bio-pesticides; development of health-care centres and posts; provision of safe water in high-risk malaria regions; and malaria education and mosquito habitat clearance campaigns. The Cambodia Climate Change Strategic Plan 2014–2023 creates a national framework for engaging the public and private sectors, civil society

organizations and development partners in a participatory process for responding to climate change to support sustainable development.

The health sector-specific plans are the Climate Change Strategic Plan for Public Health 2012 and the subsequent National Climate Change Action Plan for Public Health 2014–2018. These plans prioritize investments in infrastructure, institutional capacity and emergency preparedness to adapt to the increasing threats of vector- and waterborne diseases and the health impacts of extreme weather events, particularly floods and droughts. The National Strategy for Climate Change Adaptation and Disaster Risk Reduction in Public Health is currently under development and will align the strategies for disaster risk reduction with the climate change adaptation plans.

1.3.2 Institutional context

The Ministry of Health is responsible for health system planning, development and service delivery. Within the Ministry, the Directorate General for Health manages 24 provincial health departments. The provincial health departments encompass 81 health operational districts and operate the provincial hospitals. Each operational district covers 100 000–200 000 people and operates a referral hospital and health centres. Each health centre covers 10 000–20 000 people. The health centres provide a minimum package of activities, mainly preventive and basic curative services, and the referral hospitals provide a complementary package of activities, mainly

secondary care. Provincial and national hospitals provide the highest-level complementary package. National hospitals include general hospitals and specialist hospitals for paediatrics, maternal and child health, and tuberculosis. Less formal health posts provide services in remote areas.

The Ministry of Health faces several capacity and finance gaps, and the urban–rural distribution of resources disproportionately favours urban areas. Government funding for health care is only 1.4% of GDP, and development assistance accounts for 15–20% of health expenditure. Out-of-pocket expenditure accounts for almost two-thirds of total health expenditure, and most of this is paid to private providers. The private sector is extensive and insufficiently regulated, but it provides the majority of curative care (the type of care most needed to treat climate-sensitive diseases). According to the 2014 Cambodian Demographic and Health Survey, only 22% of unwell or injured patients sought care first in the public sector, while 67% sought care for their last episode from private providers. Staffing and equipment capacity are limited. The Ministry of Health employs just under 20 000 staff, but it hopes to increase the public health workforce to 32 000 people by 2020. As shown in Table 3, the Ministry will need to recruit over 16 000 staff by 2020 in order to achieve its desired staffing levels. Diagnostic equipment such as magnetic resonance imaging and computed tomography is largely unavailable, and maintenance is an issue. The equipment that is available is concentrated in the private sector.

Professional category	2012		2020		2012–2020		
	Total existing staff	Per 10 000 pop.	Total need	Per 10 000 pop.	Total gap	Attrition years	Total required
Specialist doctor	259	0.18	367	0.23	108	21	129
Medical doctor	2 157	1.51	2 679	1.66	522	345	867
Medical assistant	778	0.54	584	0.36	-194	124	0
Dentist	223	0.16	324	0.20	101	18	119
Dental assistant	65	0.05	18	0.01	-47	5	0
Pharmacist	487	0.34	668	0.41	181	78	259
Pharmacist assistant	79	0.06	106	0.07	27	6	33
Secondary nurse	5 698	3.99	7 577	4.69	1 879	912	2 791
Primary nurse	3 281	2.30	5 739	3.55	2 458	1 050	3 508
Secondary midwife	2 475	1.73	4 495	2.78	2 020	396	2 416
Primary midwife	2 188	1.53	2 376	1.47	188	350	538
Secondary laboratory technician	462	0.32	649	0.40	187	37	224
Primary laboratory technician	69	0.05	21	0.01	-48	6	0
Physiotherapist	147	0.10	259	0.16	112	12	124
X-ray technician	22	0.02	230	0.14	208	4	212
Administrative officer	58	0.04	372	0.23	314	0	314
Accountant	137	0.10	226	0.14	89	0	89
Information technology staff	68	0.05	186	0.12	118	0	118
Facility maintenance staff	82	0.06	352	0.22	270	0	270
Driver	56	0.04	153	0.09	97	0	97
Other	666	0.47	4 687	2.90	4 021	320	4 341
Total	19 457	13.62	32 070	19.86	12 613	3 683	16 448

Table 3. Cambodian Ministry of Health workforce projection plan, 2012–2020.

Some services that would typically fall under a ministry of health are the responsibility of other ministries in Cambodia. Water and sanitation are governed by the Ministry of Industry and Handicraft in urban areas and by the Ministry of Rural Development in rural areas. The majority of piped water is provided by private companies rather than public utilities. Drinking water quality guidelines for rural communities are set forth by the Ministry of

Rural Development. Drinking water quality standards for urban areas were recently established by the Ministry of Industry and Handicraft, but government enforcement has not yet begun.

1.4 Baseline analysis

Cambodia has numerous overlapping surveillance systems. The health information system was established in 2010 (Figure 5). Data flow in both directions, with all government facilities reporting on a monthly basis, and operational districts receiving monthly reports of analysed data. The system is web-based, but facilities without an internet connection or a computer can report using paper. The Global Fund to Fight AIDS, Tuberculosis and Malaria is anticipated to fund several hundred computers and internet access in the coming years, but insufficient digitization still presents a barrier to timely data collection and analysis. The health information system has begun rolling out forms to enable nongovernmental organizations and private providers to feed data into the system, but the low completeness and quality of these data are significant gaps in the system.

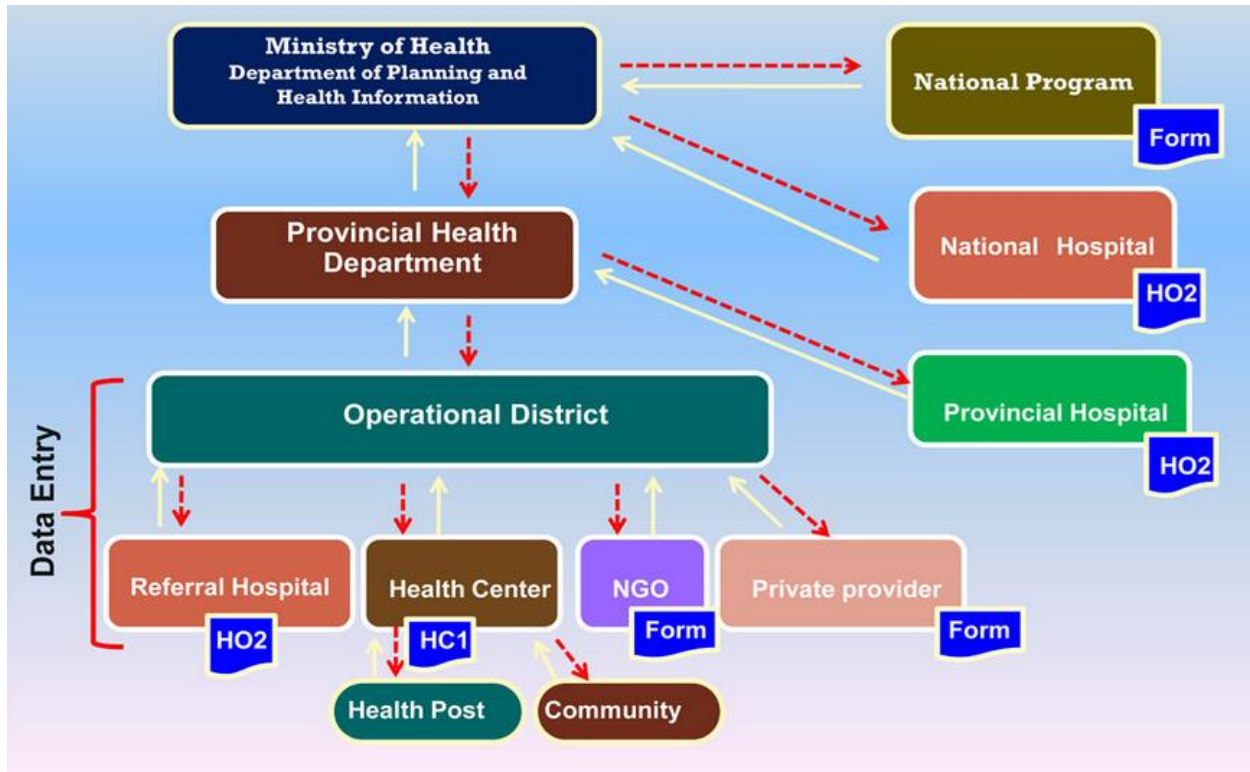


Figure 5. Health management information system reporting flow.

Data quality for climate-sensitive diseases has some limits. The monthly reporting for dengue cases relies on dipstick rapid diagnostic tests, which are not approved in Cambodia and are used only by some private-sector providers. Some facilities may report based on clinical diagnoses, but the accuracy of these diagnoses is unknown. The reporting for diarrhoeal disease uses overlapping categories with poorly understood case definitions. The reporting form includes options for cholera, unspecified cholera, diarrhoea with severe dehydration, diarrhoea with moderate dehydration, and diarrhoea without dehydration. Reports for malaria are of higher quality and can be based on dipsticks or slides.

The Centers for Disease Control and Prevention collect a Zero Report on a weekly basis. This system surveys high-impact causes of mortality and morbidity. The climate-sensitive diseases it collects data on are cases of severe diarrhoea and suspected dengue fever. Since case definitions are different from those used in the health information system, the data can not be easily combined.

Certain diseases have separate surveillance systems. For dengue, sentinel surveillance is conducted by the National Centre for Parasitology, Entomology and Malaria Control (National Centre for Parasitology, Entomology and Malaria Control). This system was established in mid-2001 to collect high-quality surveillance data from a small number of facilities to monitor dengue trends in Cambodia and rapidly detect large-scale epidemics. It relies on national, referral and non-profit-making hospitals that have the capacity and willingness to participate in a sentinel surveillance system. The participating hospitals are shown in Table 4.

Hospital	Province	Year joined
Kantha Bopha Hospital 1 and Kantha Bopha Hospital 2	Siem Reap	2001
National Paediatric Hospital	Phnom Penh	2001
Angkor Children's Hospital	Siem Reap	2003
Kampong Cham Referral Hospital and	Kampong Cham	2005

Kampong Cham Provincial Hospital		
Daukeo Referral Hospital and Takeo Provincial Hospital	Takeo	2005
Jayawaraman VII	Siem Reap	2008
Kampot Provincial Hospital	Kampot	2009

Table 4. Hospitals participating in the dengue sentinel surveillance system.

Participating hospitals report dengue cases based on the discharge diagnosis made using clinical symptoms based on a surveillance standard operating procedure and dengue case management guidelines. A subset of these clinically confirmed cases is subject to serological polymerase chain reaction (PCR) testing. From 2017, samples are tested by the National Centre for Parasitology, Entomology and Malaria Control. About 10% of the clinically confirmed dengue samples that undergo PCR testing come back negative for dengue. The reporting flow is shown Figure 6.

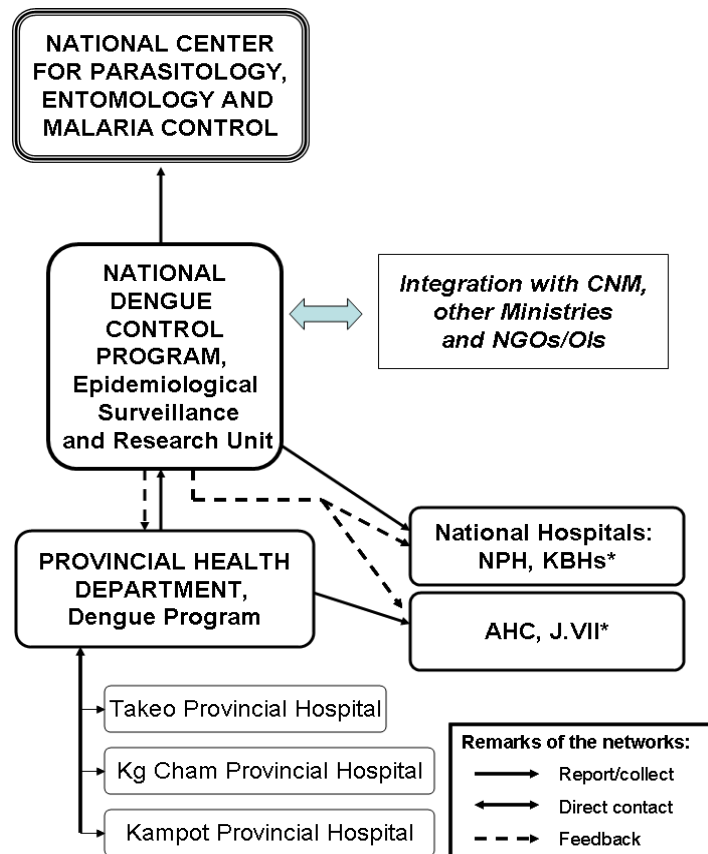


Figure 6. Dengue sentinel surveillance reporting flow.

Data are collected on a weekly basis using a paper-based system. Once data are submitted to National Centre for Parasitology, Entomology and Malaria Control they are entered manually into a database for analysis. The manual nature of the system introduces opportunities for clerical errors and increases the lead time between the onset of an epidemic and the identification and response. The preponderance of paediatric hospitals means the system has limited ability to detect cases in people aged over 15 years.

Separate project-based dengue surveillance is also conducted by the Cambodia Climate Change Alliance, which performs annual entomological surveillance of the *Aedes* population and the number carrying dengue; IPC, which is conducting serological surveillance for a dengue vaccine study; and the United States Naval Medicine Research Unit No. 2 (NAMRU-2), which conducts surveillance of febrile illnesses.

Separate malaria surveillance is conducted by National Centre for Parasitology, Entomology and Malaria Control. National Centre for Parasitology, Entomology and Malaria Control collects data on malaria diagnosis and clinical features using village malaria workers employed in 40 high-prevalence malaria-endemic operational districts. These data are entered into the malaria information system.

In addition to the disease-specific systems, data are also collected in the Commune Database, which reports annually the number of dengue and malaria deaths and the numbers of families and individuals affected by flood or drought. The Cambodia Climate Change Alliance 2 project is working to define which information will be collected by the CamDi system in disaster responses. Proposed indicators have been submitted by Department of Preventive Medicine and are awaiting approval.

1.5 Barriers

Numerous barriers to climate change adaptation in the health sector in Cambodia have been identified, and are outlined below.

1.5.1 Insufficient government capacity

The relevant government agencies lack the capacity to adapt to climate change effectively. Stakeholder knowledge assessments show that health professionals and other key stakeholders have low levels of understanding of the risks posed by climate change on water-sensitive diseases (10).

Understanding of the effects of climate change on other pathways is likely to be low. Although a national adaptation plan and a health national adaptation plan exist, climate change adaptation is not mainstreamed into regular health programming. There is limited capacity to price and finance adaptation activities, and so access to climate finance is relatively low.

1.5.2 Limited epidemic prediction and response capabilities

There are significant gaps in the existing surveillance systems. The resulting lack of data inhibits epidemic prediction and response. Some research has been done to identify the link between weather and disease incidence, but meteorological and disease surveillance data are not shared across departments and ministries. Without data-sharing, it is not possible to develop the epidemic early-warning systems necessary to target outbreak prevention activities.

1.5.3 Service delivery vulnerability

Health-care providers and community members have limited knowledge of the prevention, diagnosis and treatment of climate-sensitive diseases.

Health-care providers often do not have access to treatment guidelines for climate-sensitive diseases, and households do not have the knowledge or resources to prevent these diseases or to seek treatment when they become ill. Access to improved water and sanitation facilities, which is protective of many climate-sensitive diseases, is low in rural areas. Where individuals do have access to improved water and sanitation, they are often vulnerable to the floods and droughts that are expected to become more frequent with climate change. Health-care facilities are vulnerable to extreme weather events and may become inoperable during disasters, when their services are needed urgently.

1.5.4 Insufficient knowledge-sharing and scale-up

South-East Asian countries face similar risks and adaptation challenges from climate change, but south-south collaboration is limited. In the absence of cooperation, limited resources are allocated to duplicative efforts, including cost-effectiveness assessments, training and guideline development. Cross-border collaboration is also necessary to address the growing insecticide and larvicide resistance challenges facing vector-control efforts and the emerging drug-resistance challenges facing disease treatment strategies, especially in malaria.

2. Strategy

The barriers inhibiting climate change adaptation in Cambodia are described in the above. The relationships between the barriers and the targets for the project intervention are illustrated in Figure 7. The project aims to remove the identified barriers to achieving long-term solutions, namely to build capacity for effective climate change adaptation planning, decision-making and service delivery. These barriers will be removed through the implementation of a suite of activities, whose results will contribute towards the accomplishment of a series of project outputs, which in turn will achieve the four main project outcomes described in Section 3. The project activities are described in detail in Section 3. The project activities are informed by the no-regrets adaptation strategy recommended by the Intergovernmental Panel on Climate Change (IPCC), and they will benefit Cambodia regardless of the extent to which the climate changes.

2.1 Assumptions

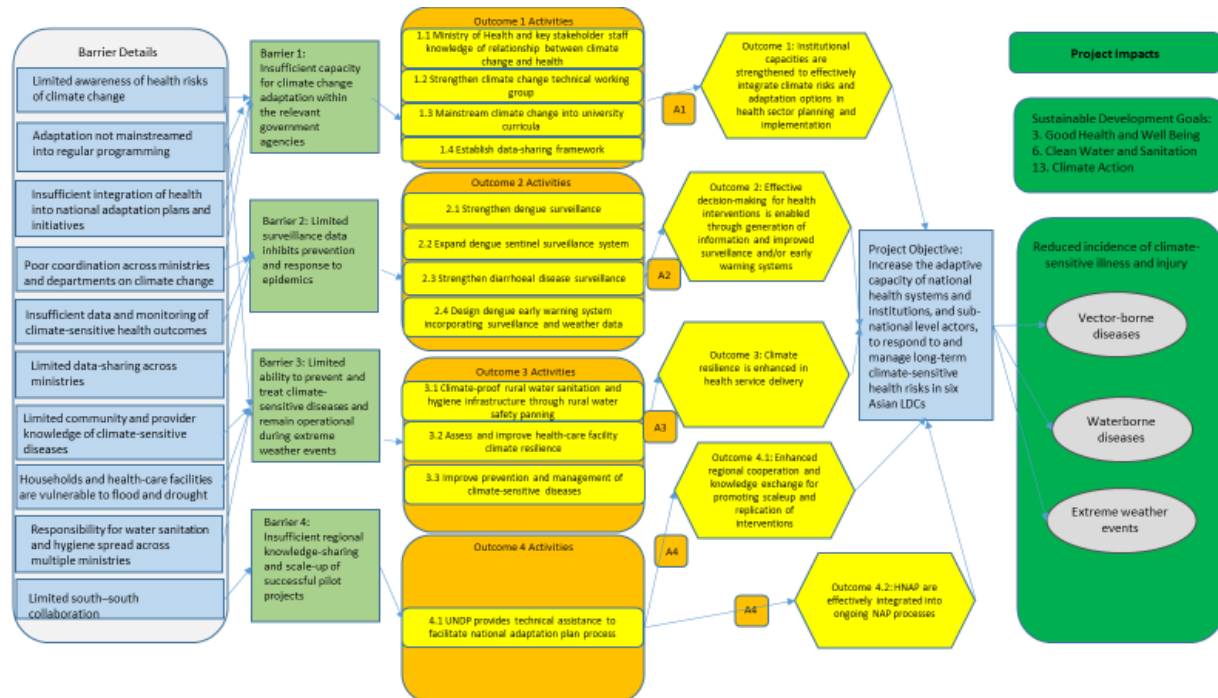


Figure 7. Theory of change.

The assumptions in Figure 7 apply to the if ... then logic of the results framework. Assumptions have been identified for the logical connections between the project outputs and outcomes, and between the outcomes and the project objective, as follows:

2.1.1 Assumption 1: high willingness exists between relevant agencies to cooperate at national and subnational levels to mitigate the health impacts of climate change

Interagency collaboration for climate change adaptation is a recognized weakness in the governance system that this project aims to address. Some interagency cooperation already occurs in Cambodia, and the project aims to build on this foundation. The Climate Change Technical Working Group

membership comprises multiple ministries, including the Ministry of Health, the Ministry of Agriculture, Forestry and Fisheries, and the Ministry of Water Resources and Meteorology. The Ministry of Health's Preventive Medicine Department, which has a mandate for climate change adaptation for health and chairs the Climate Change Technical Working Group, has been closely engaged through the project development process. As described in Section 3.3, a broad range of ministries participated in the stakeholder engagement workshop and were enthusiastic about the project. Therefore, the project has the support of the most significant ministries' coordinating bodies to enable such intersectoral and interagency collaboration.

2.1.2 Assumption 2: sufficient capacity exists to accurately diagnose disease and to collect and analyse data to strengthen surveillance and early-warning systems for climate-sensitive diseases

Consultations with representatives from the National Centre for Parasitology, Entomology and Malaria Control have indicated that the rainfall, temperature and precipitation data are of sufficient quality to generate dengue prediction models. The Centre does not have the capacity to create the models, but it does have the capacity to operate models created by consultants. Diagnostic capacity varies within the country and across diseases, but polymerase chain reaction (PCR) testing results indicate that clinical dengue diagnoses at sentinel surveillance sites have a positive predictive value of around 90%. The project aims to develop guidelines for the use of dengue rapid diagnostic

tests, which will improve diagnosis accuracy further and enable lower-capacity hospitals to conduct sentinel surveillance and generate high-quality data. Therefore, sufficient capacity either exists or can be augmented by project activities.

2.1.3 Assumption 3: communities and health-care facility operators are willing to participate in climate-proofing activities, and risk mitigation is possible

Rural water safety planning has been conducted in some communes in Cambodia. Although individual communes likely do not prioritize climate change adaptation, the rural water safety planning process will help identify community water, sanitation and hygiene priorities and incorporate adaptation efforts into work on those priorities. A similar mechanism will support the participation of health-care facility staff. Since 2015 health-care centres have been given an allowance of 12 million riel, but many health-care staff do not know how to access these funds. The project will build staff capacity to use these funds and prioritize adaptation activities. Overall, the project will leverage the “no regrets” approach to climate change adaptation to unite risk-mitigation activities and community priorities.

3. Results and partnerships

3.1 Define and describe project objectives, outcomes and outputs

The project objectives are to improve the underlying health and therefore resilience of the population to the adverse health impacts of climate change and to strengthen systems and capacity to respond to these impacts, including for prevention and treatment of climate-sensitive health risks.

3.1.1 Outcome 1.1: institutional capacities are strengthened to effectively integrate climate risks and adaptation options in health sector planning and implementation

Activity 1.1

Conduct a baseline assessment of the knowledge of Ministry of Health and other key ministry staff at national and provincial levels regarding relationships between climate change and health and climate-sensitive diseases. Adapt existing WHO training materials and deliver training sessions based on these findings to address knowledge and capacity gaps in the Ministry of Health and other key ministries.

Activity 1.2

Expand and strengthen the Climate Change Technical Working Group by updating the group's terms of reference, establishing internal and external communications plans, improving members' knowledge of relationships between climate change and health, updating and developing budgets and implementation plans for the National Strategy for Climate Change

Adaptation and Disaster Risk Reduction, and ensuring all ministries that impact health adaptation activities are members.

Activity 1.3

Support the development of university curricula to incorporate climate change into public health and medical programmes. This may include the production materials for a “micro-module” in climate change and health that can be incorporated across different disciplines. This unit could also be used to train various ministry staff in climate change and health as part of Activity 1.1. The project will also work with members of the Climate Change Technical Working Group who teach at local universities to help them incorporate the latest climate science into their courses.

Activity 1.4

Support the Ministry of Health and other agencies to establish an interagency cooperation framework to share relevant information. For example, weather data from the Ministry of Water Resources and Meteorology can be shared with the Ministry of Health and the Ministry of Agriculture, Fisheries and Forestry, while undernutrition data from the Ministry of Health can be shared with the Ministry of Agriculture, Fisheries and Forestry.

3.1.2 Outcome 2.1: effective decision-making for health interventions is enabled through generation of information and improved surveillance or early-warning systems

Activity 2.1

Improve dengue sentinel surveillance diagnosis and reporting mechanisms, including revising case definitions to include adult cases, to reduce lead time in identifying epidemics and improve capacity for prevention and response. Improving diagnosis may include clinical review of the efficacy and cost-effectiveness of dipsticks for diagnosis for dengue and the electronic dissemination of treatment guidelines in Khmer and English.

Activity 2.2

Increase the scope of the dengue sentinel surveillance system to include four additional provincial or referral hospitals.

Activity 2.3

Strengthen diarrhoeal disease surveillance by revising case definitions and eliminating potential duplicate indicators in the health management information system (based on the 10th revision of the International Statistical Classification of Diseases and Related Health Problems), zero reporting system, and maternal and child health surveillance system. Train health-care providers on the new case definitions and reporting.

Activity 2.4

Build dengue early-warning systems based on meteorological and surveillance data for dengue in high-incidence provinces to facilitate timely preventive measures and enable better preparedness by health-care

facilities. This system would rely on there being good quality and good coverage in data collection and reporting (for both climate and health data), and it would require data-sharing between organizations such as the Ministry of Water Resources and Meteorology and the National Dengue Control Programme. The project will work with the Ministry of Health to build a prediction dissemination standard operating procedure at the national level and work with high-incidence provinces to build a preparedness and response plan at the local level. Once established, an early-warning system for dengue could be expanded to include other important climate-sensitive health outcomes such as malaria or diarrhoeal disease.

This activity will build on the meteorological early warning system capacity built under the Strengthening Climate Information and Early Warning Systems in Cambodia to Support Climate Resilient Development and Adaptation to Climate Change GEF project.

3.1.3 Outcome 3.1: climate resilience is enhanced in health service delivery

Activity 3.1

Pilot climate-proofing community water, sanitation and hygiene infrastructure in Ratanakiri, using rural water safety plans to prepare for flood, drought, increased pathogen load, and increased mosquito breeding in water collection and storage containers. Improve infrastructure as identified in safety plans to protect against climate-sensitive waterborne diseases and extreme weather events. Promote vector control for water collection and

storage as necessary, using guppy fish and education to protect against climate-sensitive vector-borne diseases. Document and share pilot results to inform future scale-up.

This activity will build on the recently completed WHO regional water safety planning project. Following the completion of the project, the Cambodian government has adopted a Water and Sanitation for Health Sector Strategic Plan and National Action Plan including guidelines and training manuals.

Activity 3.2

Assess and report on climate resilience of health-care facility infrastructure in Ratanakiri. Build on the rural water safety planning process to pilot improving water, sanitation and hygiene infrastructure in health-care facilities to ensure continued functionality during and after floods and droughts and resilience to climate-sensitive diseases. Document and share pilot results to inform future scale-up.

Activity 3.3

Improve community and health-care provider knowledge of the prevention, recognition and management of climate-sensitive health risks associated with food-, water- and vector-borne diseases. At the local level, this will include conducting a behaviour change communication campaign in Ratanakiri that can serve as a model for scale-up in other provinces. Nationally, the project will develop a section of the Ministry of Health website

to post the existing diagnosis and treatment guidelines for climate-sensitive diseases in Cambodia in Khmer and English.

3.1.4 Outcome 4.1: enhanced regional cooperation and knowledge exchange for promoting scale-up and replication of interventions

3.1.5 Outcome 4.2: health-specific components of the national adaptation plan are effectively integrated into ongoing national adaptation plan processes

Activities under outcomes 4.1 and 4.2 are discussed in the Overall Proposal

3.2 Partnerships

The overall coordination of the GEF project will be led by the Ministry of Health and the Ministry of Rural Development as the implementing partners for the project. In view of the relatively broad scope covered by this project, it will engage with a wide range of government agencies and other stakeholders at all levels, and it will build on the results of and intersect with several significant initiatives.

The project will ensure complementarity with other projects that are currently in the appraisal and scoping stage, including the national adaptation plan, line ministries' climate change adaptation plans and strategies, and donor-led projects. All the project preparations were coordinated with the Climate Change Technical Working Group, which leads Cambodia's climate change and health adaptation activities. The Climate Change Technical Working Group will lead collaboration between the

Department of Preventive Medicine, the National Centre for Parasitology, Entomology and Malaria Control, the Department of Hospital Services, the Department of Preventive Medicine, the Ministry of Water Resources and Meteorology, the Ministry of Agriculture, Forestry and Fisheries, and any other Cambodian Government agencies that become involved in the project.

The project will also coordinate with the following donor-led projects:

The Cambodia Climate Change Alliance Phase 2 (CCCA-2) project, Strengthening Country Capacity to Deal Effectively with Climate-sensitive Vector-borne and Waterborne Diseases and Reducing the Health Impacts of Disasters, runs through 2018 and has a similar scope to the GEF project.

The CCCA-2 project has the following aims:

- to improve understanding of health professionals regarding climate change and health risks – particularly those posed by vector-borne diseases, water-related diseases, and hydrometeorological disasters such as droughts and floods – and to increase capacity to prevent, diagnose and manage these high-priority climate-sensitive diseases;
- to strengthen national institutional capacity to conduct integrated, climate-based, community, vector and epidemiological surveillance of climate-sensitive diseases;

- to enhance capacity of the health sector to reduce disaster risk, build resilience and manage the health impacts of disasters;
- to increase community and stakeholder awareness of the health risks posed by climate change on extreme weather events and vector-borne and water-related diseases, and to improve understanding and use of health-protective behaviours.

These aims overlap with Outcomes 1, 2 and 3 of the GEF project, and so coordination is critical to avoid duplication and achieve synergy between the two projects.

CCCA-2 is also funding the Vulnerability and Impact Research Targeting Usability and Effectiveness (VIRTUE) project. VIRTUE aims to improve understanding of climate-sensitive risks to health in Cambodia and to facilitate effective health adaptation responses targeted at vulnerable groups. The results of this project will inform climate change and health projects currently under way, guide future health adaptation planning in Cambodia, and aid adaptation implementation in the setting of resource constraints. The GEF project will coordinate with VIRTUE on Outcome1.

The Gesellschaft für Internationale Zusammenarbeit (GIZ) Climate Finance Readiness Programme is building the capacity of the Cambodian Government to access and make effective use of international climate finance funds such as the Green Climate Fund. GIZ will work with the Ministry of Health in

2017, and the GEF project will build on its work in component one when strengthening the capacity of the Climate Change Technical Working Group. The Asian Development Bank's Strengthening Resilience to Climate Change in the Health Sector in the GMS Region project provides technical assistance to conduct vulnerability and adaptation assessments at national and provincial levels in 2017 and 2018. The GEF project will incorporate these assessments into the capacity-building activities under Outcome 1 and into the health-specific component of the national adaptation plan process under Outcome 4. The Asian Development Bank's project is also building data management and analysis capacity; the GEF project will coordinate the activities under Outcome 2 with the Asian Development Bank's activities to minimize duplication and optimize results.

The GEF-funded Strengthening Climate Information and Early Warning Systems in Cambodia to Support Climate Resilient Development and Adaptation to Climate Change project is improving the climate-observing infrastructure and increasing capacity to use climate and environmental information to respond to climate hazards and plan adaptation to climate change. These activities will impact the data available for the disease early-warning system developed under Outcome 2, and coordination will take place between the two projects to ensure the system incorporates the new data.

The project will draw upon lessons learnt, and from the tools and methods developed under the range of projects list above, to reduce duplication and avoid pitfalls during implementation, and, where appropriate, adopt successful approaches that are complementary to this project. In this context, the project will invite key partners for various knowledge exchange dialogues, such as annual review workshops, to learn from emerging good practices and lessons learnt from key partners and mutually inform the partners of the knowledge generated within the GEF project.

The project will delegate considerable resources and decision-making to local administrations at the provincial, district and commune levels in order to enhance their implementing ability and knowledge base. The project will thus strengthen local-level structures through capacity-building, formation and support of community-based rural water safety planning groups, and close collaboration between the national-level Ministry of Health and provincial health department staff.

The partnerships to be formed between these different structures and entities are key to the delivery and achievement of project goals and objectives. The role of the project board and the project management unit in ensuring the partnerships work and the interactions kept functional is therefore key. As a key national implementation partner, support from various divisions within the Ministry of Health is needed to facilitate coordination. WHO and UNDP, in their project oversight roles, and as both

implementing agencies for this project and as development partners to the Cambodian Government, will play a central role in ensuring these partnerships work, and will liaise at the highest level with the Cambodian Government to ensure the project delivers the development results as agreed between GEF, WHO, UNDP and the Cambodian Government.

3.3 Stakeholder engagements

Project implementation will be based on extensive engagement with stakeholders at all levels across the project outcomes (see annex 5 for participants of consultations). Table 3 outlines the various project stakeholders at all levels and their main roles and responsibilities during project implementation. At a broad level, participation and representation of stakeholders will be conducted through the governance structures put in place by the project (see Section VII) and through the existing structures at national and local levels (such as central departments and agencies, provincial departments, and district- and commune-level governance structures). Stakeholders will be consulted and engaged throughout the project implementation phase to (i) promote understanding of the project's outcomes; (ii) promote stakeholder ownership of the project through engagement in planning, implementation and monitoring of the project interventions; (iii) communicate to the public in a consistent, supportive and effective manner; and (iv) maximize linkage and synergy with other ongoing projects.

Outcome/output	Stakeholder	Key responsibilities
Outcome 1: institutional capacities are strengthened to effectively integrate climate risks and adaptation options in health sector planning and implementation		
Activity 1.1: strengthen institutional capacity	Department of Preventive Medicine	Oversight, coordination and facilitation of process; mobilization of intersectoral and sectoral participation and inputs
	Various departments and agencies within and outside Ministry of Health	Participation in planning process and institutional capacity assessment; staff attendance at training sessions
	WHO	Technical support and guidance
Activity 1.2: strengthen Climate Change Technical Working Group	Climate Change Technical Working Group and Department of Preventive Medicine	Technical inputs to process; implementation of policy and curricula
	WHO	Technical support and guidance
Activity 1.3: mainstream climate change in education	Climate Change Technical Working Group and Department of Preventive Medicine	Oversight, coordination and facilitation of process; instatement of policy and curricula
	Ministry of Education	Technical inputs to process; implementation of policy and tools
	WHO	Technical support and guidance
Activity 1.4: establish data-	Climate Change Technical Working	Oversight, coordination and facilitation of process;

sharing agreements	Group, Department of Preventive Medicine, Ministry of Water Resources and Meteorology, and Ministry of Agriculture, Forestry and Fisheries	mobilization of participation and inputs from relevant agency departments
	WHO	Technical support and guidance
Outcome 2: effective decision-making for health interventions is enabled through generation of information and improved surveillance or early-warning systems		
Output 2.1: improve dengue sentinel surveillance	National Centre for Parasitology, Entomology and Malaria Control	Oversight, coordination and facilitation of process; implementation of new policies
	Department of Hospital Services	Implementation of new surveillance process in sentinel hospitals
	WHO	Technical assistance and training support for policy implementation
Output 2.2: expand dengue sentinel surveillance	National Centre for Parasitology, Entomology and Malaria Control	Oversight, coordination and facilitation of process; implementation of data collection at new sites
	Department of Hospital Services	Implementation of surveillance process in new sentinel hospitals
	WHO	Technical assistance and training support for policy implementation

Output 2.3: strengthen diarrhoeal disease surveillance	Department of Preventive Medicine	Oversight, coordination and facilitation of process; mobilization of intersectoral and sectoral participation and inputs
	Communicable Diseases Control Department, maternal and child health departments, and other surveilling departments	Participation in planning process and institutional capacity assessment; staff attendance at training sessions
	WHO	Technical support and guidance
Output 2.4: establish dengue early-warning system	National Centre for Parasitology, Entomology and Malaria Control	Oversight, coordination and facilitation of development; operationalization of system and mechanisms
	Ministry of Water Resources and Meteorology	Provide meteorological data based on agreement negotiated in Outcome 1
	Provincial health departments	Develop dengue preparedness standard operating procedures to respond to predictions of increase in dengue from National Centre for Parasitology, Entomology and Malaria Control
	WHO	Technical support and guidance
Outcome 3: climate resilience is enhanced in health service delivery		
Output 3.1: climate-proof community water, sanitation and hygiene	Ministry of Rural Development (Department of Rural Water Supply, Department of	Oversight, coordination, facilitation and monitoring of implementation of project interventions, such as ensuring interventions are implemented in a

	Rural Health Care), Department of Preventive Medicine	participatory manner involving all segments of the local community, particularly women, children and poor people
	District and commune councils	Implementation of project interventions in the field; provision of extension services to local communities
	Local communities	Implementation of project interventions at household and village levels
	WHO	Technical support and guidance
Output 3.2: assess and strengthen health-care facility climate resilience	Department of Preventive Medicine and Department of Hospital Services	Oversight, coordination and facilitation of process; implementation of new policies
	WHO	Technical support and guidance
Output 3.3: improve prevention and treatment of climate-sensitive diseases	Department of Preventive Medicine and provincial health departments	Oversight, coordination and facilitation of process
	WHO	Technical support and guidance
Outcome 4: enhanced regional cooperation and knowledge exchange for promoting scale-up and replication of interventions		
Activities under outcomes 4.1 and 4.2 are discussed in the Overall Proposal		

Table 3. Engagement of stakeholders in project implementation.

UNDP, United Nations Development Programme; WHO, World Health Organization.

Activity 3.1 will focus on engaging the community through the rural water safety planning process. Rural water safety plans are participatory plans that address local situations and focus on the highest-priority actions to reduce or prevent health problems caused by poor water quality and related issues concerning hygiene and sanitation. Rural water safety plans contribute to improving the health and well-being of rural communities, economic security, equity and inclusiveness, and help to reduce poverty, especially among poor people and other marginalized groups who often lack access to improved water supply services.

Extensive consultations with stakeholders took place during the project development phase through bilateral consultations with central government agencies, nongovernmental organizations and relevant development partners; consultation meetings with the Climate Change Technical Working Group; and a national-level stakeholder consultation workshop (see Annex 5). Besides the inputs for project development, these stakeholder consultations have helped raise the awareness of the project concept and logic, the project components and what they seek to achieve. This is expected to have developed a platform for further engagement of the stakeholders during project implementation.

In most communities, climate change will have a disproportionately greater effect on women, because women are often poorer, are less educated, have fewer assets, and rely more heavily on natural resources than men. Gender-based stakeholder engagement in project implementation will be pursued to ensure activities address the impacts of climate change equitably. The project will promote active participation across genders and ensure the perspectives and needs of women and girls are incorporated into key decisions, especially those regarding resource allocation, planning and monitoring of the rural water safety planning process. Additionally, a gender element will be embedded into the monitoring and evaluation plan to include both men's and women's perspectives and sex-disaggregated data.

4. Feasibility

The project takes the approach of addressing barriers to the achievement of effective climate change adaptation for health, as noted in the theory of change. This approach is cost-effective in that it will have broad applicability at local and national levels, with potential for replication throughout the country in the long term. As such, the project will contribute directly towards national policy, planning, and fiscal and communications goals in support of Cambodia's adaptation priorities. The project strategy also focuses on demonstrating, documenting and sharing best practices for climate change adaptation for water, sanitation and hygiene, and sharing other experience from elsewhere in Cambodia for replication and upscaling, which is highly cost-effective and low risk. Implementation will be undertaken almost exclusively by existing government structures. This approach is believed to be particularly cost-effective, as it reduces costs that would need to be spent on nongovernmental organization-driven implementation, and it builds capacity of the government system for ongoing and more widespread implementation of similar adaptation activities.

To reduce costs and avoid duplication, the project will pursue an active partnership strategy with other ongoing and planned initiatives, as described in Section 3. Through these collaborations, the project will build on the lessons learnt and best practices from past and current projects and ensure

cost-effectiveness is included as a selection criteria or in the identification of appropriate adaptation practices and implementation protocols.

The project manager will monitor risks quarterly and report on the status of risks to the WHO Country Office. Risks will be reported as critical when the impact and probability are high (impact rated as 5, or impact rated as 4 and probability rated at 3 or higher). Management responses to critical risks will also be reported to GEF in the annual project implementation review.

Table 4 describes the project risks and mitigation measures.

Description	Type	Probability (p) and impact (I)	Mitigation measures	Owner	Status
Risk 1: climatic: Potential hazards caused by extreme climatic effects may harm adaptation efforts in target communities and health-care facilities	Environmental	<p>P = 3, I = 3</p> <p>There is potential for extreme conditions, resulting in local natural disasters (droughts, floods) and disease outbreaks as a result of climate change, and overwhelming the health system or negating project-supported interventions such as climate-proofing water, sanitation and hygiene</p>	Effectively harness climate information and early-warning system to be strengthened for design and scheduling of field interventions. Consider range of potential climate change scenarios and expected frequency and intensity of extreme weather events in the studies and plans to be developed for climate-proofing of essential health facilities, and adjusting preparedness and contingency measures and associated regulatory and institutional frameworks and processes	Project manager	Possibly increasing
Risk 2: technical capacity. Stakeholders are not able to distinguish vulnerability to climate change from baseline weaknesses in disease control practices and	Organizational	<p>P = 3, I = 2</p> <p>While project is pursuing “no regrets” approach to adaptation, it is critical to address climate change vulnerabilities. If Cambodia’s vulnerabilities are not incorporated into project activities, the</p>	Maintain proactive awareness-raising and communication programmes, coupled with technical training and application of health information and early warnings to help differentiate climate and non-climate drivers for implementation of integrated adaptation interventions	Project manager	No change

management of environmental determinant of health (especially related to food and water security)		project results may not be resilient to future climate change. Failing to use a forward-looking approach may cause project to miss key adaptation opportunities			
Risk 3: institutional. Poor collaboration between national project partners delays project implementation, considering cross-sectoral nature of health	Operational	P = 3, I = 4 This is a key sustainability risk for the project as almost all activities require collaboration between ministries or departments. Insufficient collaboration could cause significant delays to all four outcomes	Address institutional arrangements for cross-agency cooperation during project formulation and implementation inception phases; harness existing national and subnational coordination mechanisms	Project manager	No change
Risk 4: high turnover of government staff who will be managing various project components	Operational	P = 4, I = 2 Rapid turnover of government staff leading implementation activities results in loss of capacity and institutional knowledge; disrupts	This is a common risk in many governments. To reduce negative impacts of staff turnover, the project will appoint supporting project management unit staff to ensure continuity and smooth transition. The project will focus on institutionalization of all	Project manager	No change

		progress, and potential changes in direction of activities	outputs and outcomes to ensure sustainability of project products and achievements		
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Table 4. Project risks and mitigation measures.

5. Project results framework

	Objective and outcome indicators	Baseline ^a	Mid-term target ^a	End-of-project target ^a	Assumptions ^b
Project objective: increase adaptive capacity of national health systems and institutions and subnational level actors to respond to and manage long-term climate-sensitive health risks in six Asian least developed countries	Scaled-up action on climate change adaptation and mitigation across health care that is funded and implemented (Output 1.4 – UNDP strategic plan)	Limited programmatic understanding of incorporating climate change adaptation and mitigation measures into budgets and resources	Health-specific component of national adaptation plan framework developed, and review of capacity of budgets and resources under way within line ministries relating to climate change adaptation	Percentage of budget identified specific to address climate change adaptation and health measures in line with health-specific component of national adaptation plan	Dependency on development of health-specific component of national adaptation plan, and acceptance of allocation of budgets by all stakeholder ministries

<p>Component/outcome 1: institutional capacities are strengthened to effectively integrate climate risks and adaptation options in health sector planning and implementation</p> <p>Maximum three indicators</p>	<p>Percentage of key staff trained on relationship between climate change and health and climate-sensitive diseases</p>	<p>N/A: this is a new training</p>	<p>40% of key government staff trained; training modules developed</p>	<p>80% of key government staff trained</p>	<p>Staff engaged and available for training sessions; training modules to mainstream climate change adaptation into health and water, sanitation and hygiene education are created for training staff</p>
<p>Outcomes are short- to medium-term results that the project makes a contribution towards, and that are designed to help achieve longer-term objective. Achievement of outcomes will be influenced by project outputs and additional factors that may be outside direct control of project</p>	<p>Updated National Strategy for Climate Change Adaptation and Disaster Risk Reduction for long-term capacity-building is developed</p>	<p>National Strategy for Climate Change Adaptation and Disaster Risk Reduction needs implementation of coordination mechanisms for sharing of information</p>	<p>Draft memorandum of understanding and standard operating procedures (supporting awareness training and optimal use) developed for coordination mechanism</p>	<p>Application results trialled in four provinces with key parameters and standard operating procedures defined for relating</p>	<p>Includes national coordination mechanism established between meteorological (Ministry of Water Resources and Meteorology), environmental, water, sanitation and hygiene, and health (Ministry of Health) sectors</p>
<p>Component/outcome 2: effective</p>	<p>Number of new</p>	<p>None</p>	<p>Two</p>	<p>Four</p>	<p>Hospitals identified by National Centre for</p>

<p>decision-making for health interventions is enabled through generation of information and improved surveillance or early-warning systems</p>	<p>hospitals performing active dengue surveillance in addition to existing seven</p>				<p>Parasitology, Entomology and Malaria Control for expansion are able to participate in sentinel surveillance</p>
<p>Maximum three indicators</p>	<p>Improvements in diarrhoeal disease surveillance</p>	<p>N/A</p>	<p>Report on assessment of key staff understanding of surveillance</p>	<p>75% of key staff in intervention area trained in diarrhoeal disease surveillance</p>	
<p>Component/outcome 3: climate resilience is enhanced in health service delivery</p> <p>Maximum three indicators</p>	<p>Number of communes reaching target levels in the rural water safety planning recognition system (see annex 6)</p>	<p>None</p>	<p>50% of piloted communes reach level 3</p>	<p>20% of piloted communes reach level 5</p>	<p>Assumes villages are willing to participate in rural water safety planning process and hazard mitigation is feasible</p>

	Number of health-care facilities with climate-proofed improved water and sanitation facilities	Unknown	Report published of climate change vulnerability assessment for health-care facilities in Ratanakiri province	50% of health-care facilities in Ratanakiri province have mitigated reported vulnerabilities in their water, sanitation and hygiene infrastructure	Assumes health-care workers are willing to participate in process and hazard mitigation is feasible
<p>Component/outcome 4.1: enhanced regional cooperation and knowledge exchange for promoting scale-up and replication of interventions</p> <p>4.2: health-specific components of national adaptation plan are effectively integrated into ongoing national adaptation plan processes</p> <p>Knowledge management and monitoring and evaluation</p>	Indicators under outcomes 4.1 and 4.2 are discussed in the Overall Proposal				

<p>4.2: health-specific components of national adaptation plan are effectively integrated into ongoing national adaptation plan processes</p> <p>Knowledge management and monitoring and evaluation</p>					

Table 5. Project Results Framework.

^aBaseline, mid-term and end-of-project levels must be expressed in the same neutral unit of analysis as the corresponding indicator.

^bRisks must be outlined in the "Feasibility" section of this project document.

6. Monitoring and evaluation plan

Project monitoring and evaluation will be conducted in accordance with established GEF procedures and will be provided by the project steering committee, with support from WHO. The logical framework provides performance and impact indicators for project implementation along with their corresponding means of verification. These form the basis on which the project's monitoring and evaluation system will be built. The following sections outline the principle components of the monitoring and evaluation plan and indicative cost estimates related to monitoring and evaluation activities (Table 6). The project's monitoring and evaluation plan will be presented and finalized at the project's inception report following collective fine-tuning of indicators, means of verification, and full definition of project staff monitoring and evaluation responsibilities.

At the start of the project, a project inception workshop will be conducted with the full project team, relevant government counterparts, WHO and UNDP. A fundamental objective of this inception workshop is to assist the project team to understand and take ownership of the project's goals and objectives, and to finalize preparation of the project's first annual workplan on the basis of the project's log-frame matrix. This includes reviewing the log-frame (indicators, means of verification, assumptions), imparting additional detail as needed, and, on the basis of this exercise, finalizing the annual workplan with precise and measurable performance indicators in a manner consistent with the expected outcomes for the project.

The purpose and objective of the inception workshop is to (i) introduce project staff with the WHO and UNDP/GEF expanded team that will support the project during its implementation; (ii) detail the roles, support services and complementary responsibilities of WHO, UNDP and regional coordinating unit staff; and (iii) provide a detailed overview of GEF reporting and monitoring and evaluation requirements, with particular emphasis on the annual project implementation reviews and related documentation, tripartite review meetings, and mid-term and final evaluations. The inception workshop provides an opportunity to inform the project team on project-related budgetary planning, budget reviews and mandatory budget rephasing.

The inception workshop also provides an opportunity for all parties to understand their roles, functions and responsibilities within the project's decision-making structures, including reporting and communication lines and conflict resolution mechanisms. The terms of reference for project staff and decision-making structures will be discussed again, as needed, to clarify each party's responsibilities during the project's implementation phase.

Implementation of the proposed activities will be monitored quarterly by implementers using the annual workplan and its output indicators.

An annual workplan and report will be developed by the project steering committee and implementers. Annual reports will measure progress of output and outcome indicators.

Regular monitoring visits will be done by central government and WHO Country Office staff to provide on-site technical support and advice and to monitor progress of the implementation of the project activities at selected provincial

hospital, water supplier and village community levels, according to quarterly and annual workplans. Monitoring visits are done when necessary, together with follow-up visits for planned activities, including timely technical advice and support.

A mid-term review meeting will be organized in the country with participation of all stakeholders. Best experiences and model climate-resilient communes and health-care facilities will share their experiences with other communes and health-care facilities. Lessons learnt and recommendations for further implementation and improvement will be discussed. Some activities, such as dengue surveillance, WASH FIT and vulnerability assessment, will be done with close collaboration and coordination with other technical areas of the WHO programme in the WHO Country office. An internal meeting with other WHO Country Office programmes in collaboration with the project steering committee and secretariat will be arranged at the mid-term of the project. The mid-term review report will be written by WHO and submitted to GEF/UNDP.

Evaluation and a final review meeting will be carried out three months before the project end. All stakeholders, including community leaders and youth and women's representatives, will be invited to the final review meeting. Project implementers will give presentations on implemented activities, results, and achieved outputs and outcomes against indicators. The final technical report will be developed by WHO in collaboration with the project steering committee and secretariat and submitted to GEF/UNDP.

Results from the project will be disseminated within and beyond the project intervention zone through existing information-sharing networks and forums. A

detailed plan for disseminating results will be developed within the first two months of implementation of the project, in consultation with relevant parties. The project will identify, when appropriate and relevant, scientific, policy-based and any other networks that may be of benefit to implementation of the project through lessons learnt. The project will identify, analyse and share lessons learnt that may be beneficial in the design and implementation of future similar projects. Finally, there will be a two-way flow of information between this project and other projects of similar focus.

Type of monitoring and evaluation activity	Responsible parties	Budget (excluding project team staff time)	Timeframe
Inception workshop	Project implementation unit, national project coordinator, WHO, UNDP	US\$ 2000	Within first two months after project team recruited
Inception report	Project team	None	Immediately following inception workshop
Project implementation review	Project team, WHO, UNDP	None	Annually
Tripartite review and report	Government counterparts, project team, WHO and UNDP regional coordinating units	None	Every year, upon receipt of project implementation review
Steering committee meetings	National project coordinator, project implementation unit	US\$ 6000 (6 meetings at US\$ 1000 each)	Following project inception workshop and then at least twice a year
Periodic status reports	Project team	None	Mid-point

Technical reports	Project team, government counterparts, WHO	US\$ 3750 (3 reports at US\$ 1250 each)	Annually
Final external evaluation	Project team, global full-sized project	Provided by full-sized project	End of project implementation
Terminal report	Project team, WHO, UNDP	None	At least one month before end of project
Lessons learnt	Project team	None	Annually
Audit	UNDP Country Office, project team	US\$ 15 000 (3 audits at US\$ 5000 each)	Annually
Total indicative cost (excluding project team staff time, WHO and UNDP staff and travel expenses)		US\$ 26 750	

Table 6. Indicative monitoring and evaluation workplan and corresponding budget.

7. Governance and management arrangements

The implementing partners or the national authorities for this project will be the Ministry of Health and the Ministry of Rural Development. Within the Ministry of Health, the Department of Preventive Medicine and the National Centre for Parasitology, Entomology and Malaria Control, will manage the project with support from WHO. A project manager will support the implementing partners.

A project board will be established to provide high-level guidance and oversight to the project. The project board is responsible for making consensus management decisions when guidance is required by the project management unit, including recommendation for WHO and implementing partner approval of project plans and revisions. In order to ensure UNDP's ultimate accountability, project board decisions should be made in accordance with standards that ensure management for development results, best value for money, fairness, integrity, transparency and effective international competition. If a consensus can not be reached within the board, the final decision rests with the WHO programme manager.

The project board comprises senior officials from various agencies representing the following categories:

- executive, representing project ownership, including the chair of the project board;
- senior supplier, representing the interests of the parties that provide specific cost-sharing projects or technical expertise to the

project. The senior supplier's primary function within the project board is to provide guidance regarding the technical feasibility of the project;

- senior beneficiary, representing the interests of those who ultimately benefit from the project. The senior beneficiary's primary function within the project board is to ensure the realization of project results from the perspective of project beneficiaries.

UNDP and WHO are active partners in the project's management and implementation. WHO will support the project's implementation by maintaining the project budget and project expenditures, contracting project personnel, experts and subcontractors, undertaking procurement, and providing other assistance on request of the national executing agency. WHO will also monitor the project's implementation and achievement of project outcomes, and will ensure the proper use of UNDP/GEF funds. Financial transactions, reporting and auditing will be carried out in compliance with national regulations and established UNDP and WHO rules and procedures for national project execution.

Figure 8 shows the project organization structure in detail.

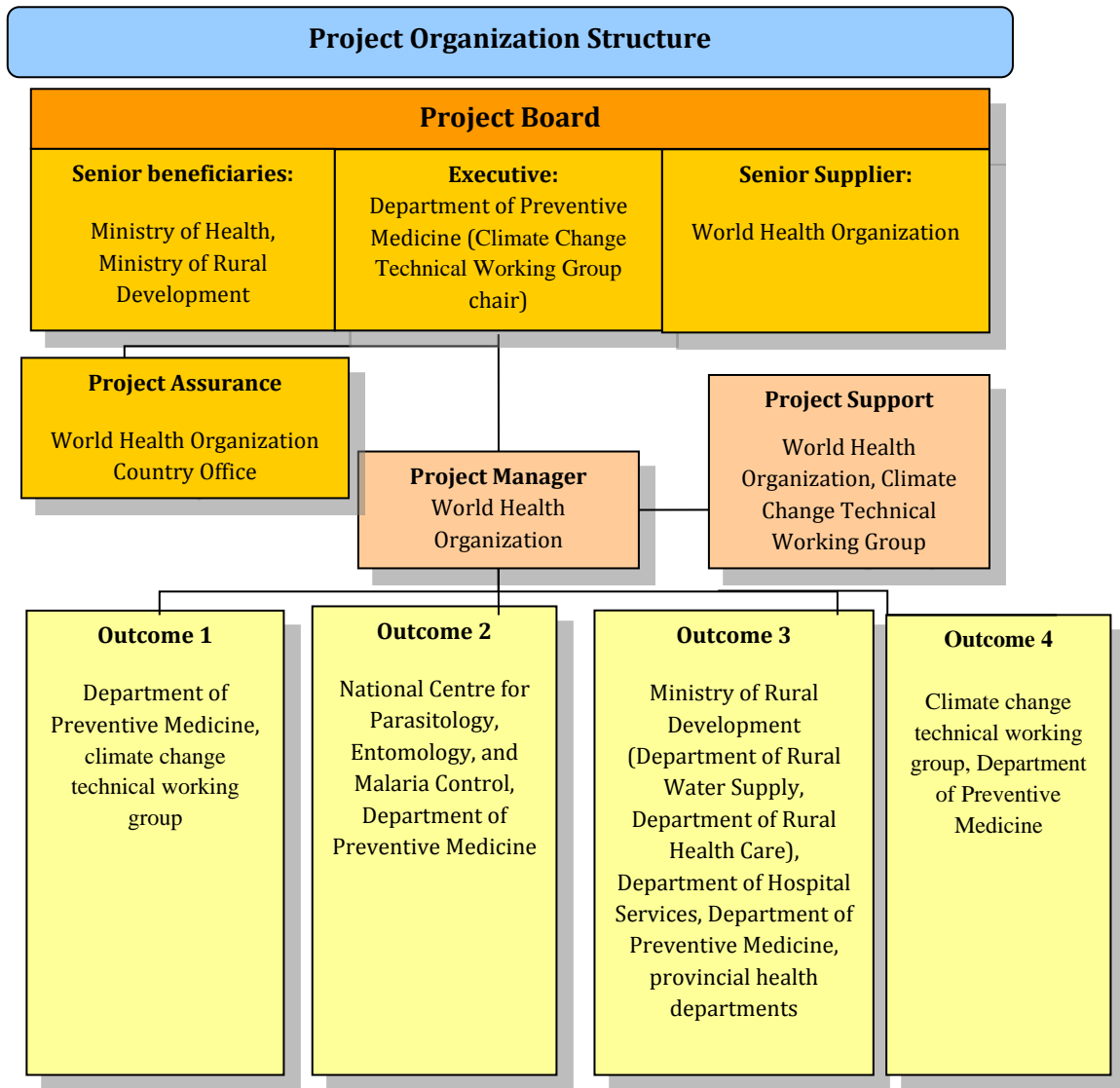


Figure 8. Project Organization

8. Financial planning and management

Table 7 shows the planned parallel co-financing for the project.

Outcome	Co-financing type	Department of Preventive Medicine	National Centre for Parasitology, Entomology and Malaria Control
<p>Outcome 1:</p> <p>Activity 1.1: conduct baseline assessment of national and provincial level Ministry of Health and other key ministry staff's knowledge of relationships between climate change and health and climate-sensitive diseases; develop training based on these findings to address knowledge and capacity gaps in Ministry of Health and other key ministries</p> <p>Activity 1.2: expand and strengthen Climate Change Technical Working Group by updating group's terms of reference, establishing communications plan, improving members' knowledge of relationships between climate change and health, and ensuring all ministries that impact on health adaptation activities are members</p> <p>Activity 1.3: support development of university curricula to incorporate climate</p>	In kind	US\$ 62 500/year	US\$ 62 500/year

<p>change into public health and medical programmes, e.g. material for "micro-module" in climate change and health that can be incorporated across different disciplines; this unit could also be used for training of various ministry staff in climate change and health as part of Activity 1.1</p> <p>Activity 1.4: support Ministry of Health and other agencies to establish interagency cooperation framework to share relevant information; for example, the Ministry of Water Resources and Meteorology weather data will be shared with the Ministry of Health and the Ministry of Agriculture, Fisheries, and Forestry</p>			
<p>Outcome 2: activity 2.1: improve dengue sentinel surveillance diagnosis and reporting mechanisms, including revising case definitions if necessary to reduce lead time in identifying epidemics and improve capacity for treatment; improving diagnosis may include clinical review of efficacy and cost-effectiveness of</p>	<p>In kind</p>	<p>US\$ 62 500/year</p>	<p>US\$ 62 500/year</p>

<p>dipsticks versus polymerase chain reaction for diagnosis for dengue and electronic dissemination of treatment guidelines in Khmer and English</p> <p>Activity 2.2: increase scope of dengue surveillance system to include more provincial and referral hospitals and adult cases</p> <p>Activity 2.3: strengthen diarrhoeal disease surveillance by revising case definitions and eliminating potential duplicate indicators in health management information system (based on 10th revision of the International Statistical Classification of Diseases and Related Health Problems), and training health-care providers on establishing simple case definitions and reporting</p> <p>Activity 2.4: build dengue early-warning systems based on meteorological and surveillance data for dengue in high-incidence provinces, to facilitate timely preventive measures and enable better preparedness by health-care facilities</p>			
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<p>Outcome 3: Activity 3.1: climate-proof community water, sanitation and hygiene infrastructure using rural water safety plans to prepare for flood, drought, increased pathogen load and increased mosquito breeding in water collection and storage containers; improve infrastructure as identified in safety plans to protect against climate-sensitive waterborne diseases and extreme weather events; promote vector control for water collection and storage using guppy fish and education to protect against climate-sensitive vector-borne diseases</p> <p>Activity 3.2: assess and report on climate resilience of health-care facility infrastructure; build on rural water safety planning process to improve water, sanitation and hygiene infrastructure in health-care facilities to ensure continued functionality during and after floods and droughts</p> <p>Activity 3.3: improve community and health-care provider knowledge of prevention, recognition and</p>	<p>In kind</p>	<p>US\$ 62 500/year</p>	<p>US\$ 62 500/year</p>
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management of climate-sensitive health risks associated with food-, water- and vector-borne diseases			
Outcome 4	In kind	US\$ 62 500/year	US\$ 62 500/year
Total	In kind	US\$ 1 000 000 (US\$ 250 000/year)	US\$ 1 000 000 (US\$ 250 000/year)

Table 7. Co-financing.

The actual realization of project co-financing will be monitored during the mid-term review and terminal evaluation process and will be reported to GEF.

9. Sustainability of results

Activities under the project will contribute to the sustainability of results by improving the system within which adaptation is conducted. The long-term capacity-building under Outcomes 1 and 4 will enable the Cambodian Government to conduct and advocate for climate change adaptation. Similarly, the strengthening of climate change education at the university level will ensure that future graduates enter the workforce with an understanding of climate change adaptation. Upon completion of the project, the Climate Change Technical Working Group will have sufficient capacity to advocate for adaptation funding domestically, mobilize international climate change adaptation financing, and mainstream climate change adaptation into regular activities.

Outcome 2 is also designed to produce sustainable changes. The activities streamlining dengue and diarrhoeal disease surveillance aim to simplify and improve existing systems and processes rather than create new systems that must be maintained. Creation of the dengue early-warning system will result in a new system, but it will be designed by the Cambodian Government to leverage existing resources more efficiently in order to maximize sustainability. Stakeholders at national and subnational levels, including the National Centre for Parasitology, Entomology and Malaria Control and provincial health departments, will determine the system's design and maintenance to ensure ongoing operations are feasible following completion of the GEF project.

Outcome 3 is similarly sustainable. The creation of a page for climate-sensitive disease treatment guidelines on government websites is a one-time activity

that will enhance access to information on a permanent basis. Hosting the guidelines on the Ministry of Health website enhances government ownership, and there will be minimal costs to update the hosted file when guidelines are updated. The rural water safety planning portion of Outcome 3 is also sustainable. The rural water safety planning process builds the capacity of the participating villages and communes to identify and manage their own water and sanitation risks and needs. The project will fund the creation of water safety planning committees designed to be self-sustaining following completion of the project.

Outcome 4 is discussed in the Overall Proposal.

10. Legal context

Discussed in the Overall Proposal

11. Total budget and workplan

Atlas ^a proposal or award ID	000xxxxx	Atlas primary output project ID	000xxxxx
Atlas proposal or award title	XXXXXXXXXXXXXXXXXXXX		
Atlas business unit	Xxx10		
Atlas primary output project title	XXXXXXXXXXXXXXXXXXXX		
UNDP/GEF PIMS no.	Xxxx		
Implementing partner	UNDP/WHO		

^aSee separate guidance on how to enter the TBWP into Atlas.

GEF Component/Atlas Activity	Responsible Party/(Atlas Implementing Agent)	Fund ID	Donor Name	ATLAS Budget Description	Atlas Budgetary Account Code	Amount Year 1 (USD)	Amount Year 2 (USD)	Amount Year 3 (USD)	Amount Year 4 (USD)	Total (USD)	See Budget Note:
COMPONENT/ OUTCOME 1: (as per the results framework)	PMD/CCTWG/ WHO	62000 (62160)	GEF (LDCF)	International Consultants	71200	\$7,650	\$5,100	\$1,600	\$1,600	\$15,950	1, 2, 3
				Local Consultants	71300	\$15,000	\$3,750	\$1,875	\$1,875	\$22,500	1, 2, 3
				Contractual Services - Individ	71400	\$20,000	\$20,000	\$10,000	\$10,000	\$60,000	1, 2, 3
				Travel	71600	\$5,500	\$5,500	\$2,750	\$2,750	\$16,500	1, 2, 3
				Contractual Services-Companies	72100	\$5,000	\$20,000	\$10,000	\$10,000	\$45,000	1, 2, 3
				Supplies	72500	\$1,200	\$1,200	\$600	\$600	\$3,600	1, 2, 3

COMPONENT/ OUTCOME 2: (as per the results framework)	PMD/CCTWG/ WHO	62000 (62160)	GEF (LDCF)	Information Technology Equipmt	72800	\$1,000				\$1,000	1, 2, 3
				Professional Services	74100	\$10,000	\$10,000	\$10,000	\$10,000	\$40,000	1, 2, 3
				Training, Workshops and Confer	75700	\$2,000	\$19,000	\$10,000	\$7,000	\$38,000	1, 2, 3
				Total Outcome 1:		\$67,350	\$84,550	\$46,825	\$43,825	\$242,550	1, 2, 3
				International Consultants	71200	\$13,600	\$13,600	\$6,800	\$6,800	\$40,800	4, 5, 6
				Local Consultants	71300	\$3,750			0	\$3,750	4, 5, 6
				Contractual Services - Individ	71400	\$20,400	\$20,400	\$10,200	\$10,200	\$61,200	4, 5, 6
				Travel	71600	\$5,500	\$5,500	\$2,500	\$2,500	\$16,000	4, 5, 6
				Contractual Services- Companies	72100	\$10,000			\$10,000	\$20,000	4, 5, 6
				Supplies	72500	\$1,200	\$1,200	\$600	\$600	\$3,600	4, 5, 6
				Information Technology Equipmt	72800	\$1,000				\$1,000	4, 5, 6
				Professional Services	74100	\$9,000	\$9,000	\$9,000	\$9,000	\$36,000	4, 5, 6
				Training, Workshops and Confer	75700	\$26,000	\$28,000	\$5,000	\$5,000	\$64,000	4, 5, 6
Total Outcome 2:		\$90,450	\$77,700	\$34,100	\$44,100	\$246,350	4, 5, 6				
COMPONENT/ OUTCOME 3: (as per the results framework)	PMD/CCTWG/ WHO	62000 (62160)	GEF (LDCF)	International Consultants	71200	\$7,367				\$7,367	7, 8, 9
				Local Consultants	71300	\$44,583				\$44,583	7, 8, 9
				Contractual Services - Individ	71400	\$40,800	\$40,800	\$20,400	\$20,400	\$122,400	7, 8, 9
				Travel	71600	\$3,000	\$8,500	\$4,250	\$4,250	\$20,000	7, 8, 9
				Contractual Services- Companies	72100	\$35,000	\$18,000	\$28,000	\$27,000	\$108,000	7, 8, 9

COMPONENT/ OUTCOME 4: (as per the results framework)	PMD/CCTWG/ WHO	62000 (62160)	GEF (LDCF)	Supplies	72500	\$800	\$800	\$800	\$755	\$3,155	7, 8, 9
				Grants	72600	\$75,000	\$105,000	\$52,500	\$52,500	\$285,000	7, 8, 9
				Information Technology Equipmt	72800	\$3,000				\$3,000	7, 8, 9
				Professional Services	74100	\$9,000	\$9,000	\$9,000	\$9,000	\$36,000	7, 8, 9
				Miscellaneous Expenses	74500		\$2,500	\$20,500	\$20,500	\$43,500	7, 8, 9
				Total Outcome 3:		\$218,550	\$184,600	\$135,450	\$134,405	\$673,005	7, 8, 9
				Local Consultants	71300	\$1,250	\$1,250	\$1,250	\$1,200	\$4,950	10, 11, 12, 13
				Contractual Services- Companies	72100	\$4,000	\$4,000	\$4,000	\$4,000	\$16,000	10, 11, 12, 13
				Supplies	72500					\$-	10, 11, 12, 13
				Miscellaneous Expenses	74500					\$-	10, 11, 12, 13
				Training, Workshops and Confer	75700	\$4,000	\$2,000	\$2,000	\$2,000	\$10,000	10, 11, 12, 13
				Total Outcome 4:		\$9,250	\$7,250	\$7,250	\$7,200	\$30,950	10, 11, 12, 13
PROJECT MANAGEMENT UNIT	PMD/CCTWG/ WHO	62000 (62160)	GEF (LDCF)	Supplies	72500	\$357	\$357	\$357	\$357	\$1,428	14
				Professional Services	74100	\$15,000	\$20,000	\$10,000	\$10,000	\$55,000	14
				Miscellaneous Expenses	74500	\$5,000	\$5,000	\$2,500	\$2,500	\$15,000	14
				Total Management:		\$20,357	\$25,357	\$12,857	\$12,857	\$71,428	14
Project Total:						\$405,957	\$379,457	\$236,482	\$242,387	\$1,264,283	14

Summary of funds:

	Amount Year 1	Amount Year 2	Amount Year 3	Amount Year 4	Total
GEF	\$463,373.67	\$438,873.67	\$295,898.67	\$301,853.67	\$1,500,000
Government in kind contribution	\$500,000	\$500,000	\$500,000	\$500,000	\$2,000,000
TOTAL	\$963,374	\$938,874	\$795,899	\$801,854	\$3,500,000

Budget notes:

No.	Description	Comments
1	<p>4 weeks: international consultant to identify key national and provincial staff at Ministry of Health and other key ministries and assess knowledge of climate change and health (Activity 1.1)</p> <p>5 weeks: international consultant to conduct Climate Change Technical Working Group terms of reference workshop (Activity 1.2)</p> <p>6 weeks: local consultant to determine necessary data-sharing and develop and negotiate agreements (Activity 1.4)</p> <p>3 weeks: local consultant to assess existing climate change curricula and courses taught by Climate Change Technical Working Group members and add or update courses (Activity 1.3)</p> <p>1 week: local consultant to build Ministry of Health data analysis capacity (Activity 1.4)</p> <p>2 weeks: local consultant for Climate Change Technical Working Group meetings (Activity 1.2)</p>	Outcome 1, year 1

	<p>One special services agreement to support all activities under Outcome 1</p> <p>Consultant travel costs for all activities under Outcome 1</p> <p>Climate change website for Department of Preventive Medicine/Climate Change Technical Working Group (Activity 1.2)</p> <p>US\$ 100/month for supplies for all activities under Outcome 1</p> <p>Laptop and other information technology for special services agreement supporting all activities under Outcome 1</p> <p>WHO technical support for all activities under Outcome 1</p> <p>Two Climate Change Technical Working Group meetings at US\$ 1000 each</p>	
2	<p>3 weeks: international consultant to develop training to address knowledge and capacity gaps (Activity 1.1)</p> <p>1 week: local consultant to build Ministry of Health data analysis capacity (Activity 1.4)</p> <p>2 weeks: local consultant for Climate Change Technical Working Group meetings (Activity 1.2)</p> <p>One special services agreement to support all activities under Outcome 1</p> <p>Consultant travel costs for all activities under Outcome 1</p> <p>Nongovernmental organization to conduct Climate Change Technical Working Group external communications (Activity 1.2)</p> <p>US\$ 100/month for supplies for all activities under Outcome 1</p> <p>WHO technical support for all activities under Outcome 1</p>	Outcome 1, year 2

	<p>Three Climate Change Technical Working Group meetings at US\$ 1000 each, and eight climate change and health training sessions at US\$ 2000 each</p>	
3	<p>2 weeks: international consultant to assess staff knowledge post-training (Activity 1.1)</p> <p>1 week: local consultant to build Ministry of Health data analysis capacity (Activity 1.4)</p> <p>2 weeks: local consultant for Climate Change Technical Working Group meetings (Activity 1.2)</p> <p>One special services agreement to support all activities under Outcome 1</p> <p>Consultant travel costs for all activities under Outcome 1</p> <p>Nongovernmental organizations to conduct Climate Change Technical Working Group external communications (Activity 1.2)</p> <p>US\$ 100/month for supplies for all activities under Outcome 1</p> <p>WHO technical support for all activities under Outcome 1</p> <p>Three Climate Change Technical Working Group meetings at US\$ 1000 each, and seven climate change and health training sessions at US\$ 2000 each</p>	<p>Outcome 1, years 3 and 4</p>

Outcome 2, year 1

4 weeks: international consultant to develop dengue rapid diagnostic test usage guidelines (Activity 2.1)

4 weeks: international consultant to select two pilot provinces and develop dengue predictive models (Activity 2.4)

3 weeks: local consultant to map diarrhoeal disease surveillance stakeholders and data requirements

1 week: local consultant to update case definitions and indicators (Activity 2.3)

One special services agreement to support all activities under Outcome 2

Consultant travel costs for all activities under Outcome 2

Diarrhoeal disease baseline assessment (Activity 2.3)

US\$ 100/month for supplies for all activities under Outcome 2

Laptop and other information technology for special services agreement supporting all activities under Outcome 2

WHO technical support for all activities under Outcome 2

One rapid diagnostic test usage guideline meeting (US\$ 1000) (Activity 2.1)

One sentinel dengue surveillance site training (US\$ 2000) (Activity 2.2)

One annual dengue surveillance system review (US\$ 2000) (Activity 2.1)

Develop dengue surveillance expansion plans at two sites (US\$ 5000 x2) (Activity 2.2)

One meeting to update diarrhoeal disease case definitions and surveillance indicators (US\$ 2000) (Activity 2.3)

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	<p>Two training of trainers sessions on diarrhoeal disease reporting (US\$ 2000 x2) (Activity 2.3)</p> <p>One meeting to develop dengue prediction and dissemination standard operating procedure (US\$ 1000) (Activity 2.4)</p> <p>Two meetings to develop response standard operating procedures in early-warning provinces (US\$ 2000 x2) (Activity 2.4)</p>	
5	<p>8 weeks: international consultant to expand dengue predictive model to four additional provinces (2 weeks per province) (Activity 2.4)</p> <p>One special services agreement to support all activities under Outcome 2</p> <p>Consultant travel costs for all activities under Outcome 2</p> <p>US\$ 100/month for supplies for all activities under Outcome 2</p> <p>WHO technical support for all activities under Outcome 2</p> <p>One annual dengue surveillance system review (US\$ 2000) (Activity 2.1)</p> <p>Four meetings to conduct reporting training sessions at each dengue surveillance expansion site (US\$ 2000 x4) (Activity 2.2)</p> <p>Develop dengue surveillance expansion plans at two sites (US\$ 5000 x2) (Activity 2.2)</p>	Outcome 2, year 2

	<p>Two meetings to develop response standard operating procedures in dengue early-warning provinces (US\$ 2000 x4) (Activity 2.4)</p>	
6	<p>8 weeks: expand dengue predictive model to four additional provinces (2 weeks per province) (Activity 2.1)</p> <p>One special services agreement to support all activities under Outcome 2</p> <p>Consultant travel costs for all activities under Outcome 2</p> <p>Diarrhoeal disease final assessment (Activity 2.3)</p> <p>US\$ 100/month for supplies for all activities under Outcome 2</p> <p>WHO technical support for all activities under Outcome 2</p> <p>One annual dengue surveillance system review (US\$ 2000) (Activity 2.1)</p> <p>Two meetings to develop response standard operating procedures in dengue early-warning provinces (US\$ 2000 x4) (Activity 2.4)</p>	Outcome 2, years 3 and 4
7	<p>1 month: international consultant to develop behaviour change communication campaign on climate-sensitive diseases (Activity 3.3)</p> <p>8 months: local consultant to develop a behaviour change communication campaign on climate-sensitive diseases (Activity 3.3)</p> <p>1 week: local consultant to assemble existing treatment and diagnosis guidelines for climate-sensitive diseases (Activity 3.3)</p>	Outcome 3, year 1

	<p>Two special services agreements based in Ratanakiri to support all activities under component 3</p> <p>Guideline translation (US\$ 15 x300 pages) (Activity 3.3)</p> <p>Website development (US\$ 4000) (Activity 3.3)</p> <p>Behaviour change communication campaign development (US\$ 20 000) (Activity 3.3)</p> <p>Health-care facility climate-resilience assessment (US\$ 20 000) (Activity 3.2)</p> <p>US\$ 100/month for supplies for all activities under Outcome 3</p> <p>Rural water safety planning costs for three districts (US\$ 1000 x75 villages) (Activity 3.1)</p> <p>Laptop and other information technology for special services agreement supporting all activities under Outcome 2</p> <p>WHO technical support for all activities under Outcome 3</p> <p>Meeting to disseminate findings of the health-care facility climate resilience assessment (Activity 3.2)</p>	
8	<p>Two special services agreements based in Ratanakiri to support all activities under Outcome 3</p> <p>Travel to and within Ratanakiri for all activities under Outcome 3</p> <p>Conduct behaviour change communication campaign (US\$ 3000 per commune over 2 years) (Activity 3.3)</p> <p>US\$ 100/month for supplies for all activities under Outcome 3</p> <p>Climate-proof rural water safety planning and water, sanitation and hygiene in health-care facilities improvements (US\$ 2000 per village and US\$ 60 000 for health-care facilities over 2 years) (Activities 3.1 and 3.2)</p>	Outcome 3, year 2

	<p>WHO technical support for all activities under Outcome 3</p> <p>Publicize guidelines and monitor guideline website traffic (Activity 3.3)</p>	
9	<p>Two special services agreements based in Ratanakiri to support all activities under Outcome 3</p> <p>Travel to and within Ratanakiri for all activities under Outcome 3</p> <p>Final evaluation (US\$ 20 000) (all activities)</p> <p>Conduct behaviour change communication campaign (US\$ 3000 per commune over 2 years) (Activity 3.3)</p> <p>Knowledge, attitudes and practices survey of diarrhoeal disease and water treatment, including water quality testing (US\$ 30 000) (Activities 3.1 and 3.3)</p> <p>US\$ 100/month for supplies for all activities under Outcome 3</p> <p>Climate-proof rural water safety planning and water, sanitation and hygiene in health-care facilities improvements (US\$ 2000 per village and US\$ 60 000 for health-care facilities over 2 years) (Activities 3.1 and 3.2)</p> <p>WHO technical support for all activities under Outcome 3</p> <p>Promote WASH FIT for health-care facilities (US\$ 1500 per facility) (Activity 3.2)</p> <p>Publicize guidelines and monitor guideline website traffic (Activity 3.3)</p>	Outcome 3, years 3 and 4

10	Activities under outcomes 4.1 and 4.2 are discussed in the Overall Proposal	Outcome 4.1, year 1
11	Activities under outcomes 4.1 and 4.2 are discussed in the Overall Proposal	Outcome 4.1, year 2
12	Activities under outcomes 4.1 and 4.2 are discussed in the Overall Proposal	Outcome 4.1, years 3 and 4
13	Activities under outcomes 4.1 and 4.2 are discussed in the Overall Proposal	Outcome 4.2, all years
14	WHO Country Office supplies, WHO Country Office management costs, regional office and headquarters costs placeholder	Project management all years

Annex 1 Multi-year workplan

Expected outputs and result indicators	Planned activities	Timeframe				Responsible party	Planned budget		
		Year 1	Year 2	Year 3	Year 4		Funding source	Budget description	Amount (US\$)
Activity 1.1: Strengthen institutional capacity See Section V for indicators and targets	Identify key national and provincial staff at Ministry of Health and other key ministries and assess knowledge of climate change and health	X				Department of Preventive Medicine	GEF	See Section XI	16 257
	Develop training to address knowledge and capacity gaps		X			Department of Preventive Medicine	GEF		14 507
	Deliver 15 training sessions		X	X	X	Department of Preventive Medicine	GEF		39 257
	Assess staff knowledge post-training				X	Department of Preventive Medicine	GEF		3500
Activity 1.2 Strengthen Climate Change Technical	Climate Change Technical Working Group terms of reference workshop	X				Climate Change Technical Working Group and Department of Preventive Medicine	GEF		875

Working Group capacity	Meetings on climate change and health, including alignment document, financing opportunities x5	X	X	X	X	Climate Change Technical Working Group and Department of Preventive Medicine	GEF		8750
	Annual meeting to review workplan, develop internal and external communications strategy for climate change and health in year 1 (US\$ 1000 x3 meetings)	X	X	X	X	Climate Change Technical Working Group and Department of Preventive Medicine	GEF		6750
	Nongovernmental organization carries out external communication		X	X	X	Climate Change Technical Working Group and Department of Preventive Medicine	GEF		40 000
	Climate change website for Department of Preventive Medicine	X				Climate Change Technical Working Group and Department of Preventive Medicine	GEF		14 257
Activity 1.3: mainstream climate change in education	Identify existing climate curricula and courses taught by Climate Change Technical Working Group members	X				Climate Change Technical Working Group and Department of Preventive Medicine	GEF		3750

	Add or update climate change information used in these courses	X	X			Climate Change Technical Working Group and Department of Preventive Medicine	GEF		9257
	Monitor courses to ensure micro-modules are used and functioning well		X	X	X	Climate Change Technical Working Group and Department of Preventive Medicine	GEF		9257
Activity 1.4: establish data-sharing agreements	Determine necessary data-sharing (weather data with National Dengue Control Programme)	X				Climate Change Technical Working Group and Department of Preventive Medicine	GEF		2500
	Identify data-sharing mechanisms and determine costs	X				Climate Change Technical Working Group and Department of Preventive Medicine	GEF		2500
	Negotiate data-sharing agreements		X			Climate Change Technical Working Group and Department of Preventive Medicine	GEF		2500

	Build data analysis capacity		X	X	X	Climate Change Technical Working Group and Department of Preventive Medicine	GEF		3750
	Monitor agreements to ensure data are shared; update agreements as necessary		X	X	X	Climate Change Technical Working Group and Department of Preventive Medicine	GEF		9257
Activity 2.1: improve dengue sentinel surveillance	Develop rapid diagnostic test usage guidelines	X				National Centre for Parasitology, Entomology and Malaria Control	GEF		9100
	Revise reporting standard operating procedures to reduce time lag	X				National Centre for Parasitology, Entomology and Malaria Control	GEF		8100
	Train sentinel sites and analysts on new standard operating procedures – one training session		X			National Centre for Parasitology, Entomology and Malaria Control	GEF		10 100
	Monitor revisions and update as needed – annual review			X	X	National Centre for Parasitology, Entomology and Malaria Control	GEF		14 100

Activity 2.2: expand dengue sentinel surveillance	Select 4 expansion hospitals	X				National Centre for Parasitology, Entomology and Malaria Control	GEF		8100
	Develop expansion plan with selected sites including site-specific reporting standard operating procedures; procure any necessary equipment	X	X			National Centre for Parasitology, Entomology and Malaria Control	GEF		28 100
	Conduct reporting trainings at each site		X			National Centre for Parasitology, Entomology and Malaria Control	GEF		16 100
	Monitor new sites and update standard operating procedures as needed			X	X	National Centre for Parasitology, Entomology and Malaria Control	GEF		8100
Activity 2.3: strengthen diarrhoeal disease surveillance	Map surveillance stakeholders and data requirements	X				Department of Preventive Medicine	GEF		2500
	Update case definitions and surveillance indicators	X				Department of Preventive Medicine	GEF		3250

	Train health-care providers on reporting – 2 training of trainers sessions	X	X			Department of Preventive Medicine	GEF		4000
	Baseline assessment monitor revisions and update as needed – National Institute of Public Health	X	X	X	X	Department of Preventive Medicine	GEF		20 000
Activity 2.4 Establish dengue early warning system	Select 2 pilot provinces and develop predictive models	X				National Centre for Parasitology, Entomology and Malaria Control	GEF		5000
	Develop prediction and dissemination standard operating procedures	X				National Centre for Parasitology, Entomology and Malaria Control	GEF		1000
	Develop response standard operating procedures in early-warning province	X				National Centre for Parasitology, Entomology and Malaria Control	GEF		4000
	Monitor system usage and update standard operating procedures as needed		X	X	X	National Centre for Parasitology, Entomology and Malaria Control	GEF		10 000

	Expand to eight additional provinces		X	X	X	National Centre for Parasitology, Entomology and Malaria Control	GEF		26 000
Activity 3.1: climate-proof community water, sanitation and hygiene	Identify target districts (3) and communes (15)	X				Ministry of Rural Development (Department of Rural Water Supply, Department of Rural Health Care)	GEF		26 200
	Develop rural water safety planning (5 villages per commune, US\$ 1000 per village)	X	X			Ministry of Rural Development (Department of Rural Water Supply, Department of Rural Health Care)	GEF		91 200
	Improve water, sanitation and hygiene infrastructure (US\$ 2000 per village)		X	X	X	Ministry of Rural Development (Department of Rural Water Supply, Department of Rural Health Care)	GEF		166 200
	Outcome 3 programme evaluation			X		Ministry of Rural Development (Department of Rural Water Supply, Department of Rural Health Care)	GEF		36 200

Activity 3.2: assess and strengthen health-care facility climate resilience	Assess facility climate resilience from group discussion from national standards	X				Department of Hospital Services and Department of Preventive Medicine	GEF		36 200
	Disseminate findings	X				Department of Hospital Services and Department of Preventive Medicine	GEF		19 200
	Leverage Activity 3.1 to improve water, sanitation and hygiene infrastructure (26 facilities)	X	X			Department of Hospital Services and Department of Preventive Medicine	GEF		76 200
	Promote WASH FIT for health centres		X	X		Department of Hospital Services and Department of Preventive Medicine	GEF		55 200
Activity 3.3: improve prevention and treatment of climate-	Develop behaviour change communication campaign (includes formative research, strategy and material design)	X				Department of Preventive Medicine and provincial health departments	GEF		64 850

sensitive diseases	Community behaviour change communication campaign (US\$ 3000 per commune)		X	X	X	Department of Preventive Medicine and provincial health departments	GEF		45 000
	Knowledge, attitudes and practices survey – diarrhoeal disease among health-care providers and community; include water quality testing				X	Department of Preventive Medicine and provincial health departments	GEF		30 000
	Assemble treatment guidelines for climate-sensitive diseases	X				Department of Preventive Medicine and provincial health departments	GEF		1250
	Translate if necessary (US\$ 15 per page)	X				Department of Preventive Medicine and provincial health departments	GEF		4500
	Post treatment guidelines on Ministry of Health website	X				Department of Preventive Medicine and provincial health departments	GEF		4000

	Publicize guideline availability and monitor web traffic		X	X	X	Department of Preventive Medicine and provincial health departments	GEF		5000
Outcome 4.1: enhanced regional cooperation and knowledge exchange for promoting scale-up and replication of interventions	Activities under outcomes 4.1 and 4.2 are discussed in the Overall Proposal								
Total									1 500 000

	achieve low-emission and climate-resilient development objectives has improved						
Component/outcome 1: institutional capacities are strengthened to effectively integrate climate risks and adaptation options in health sector planning and implementation	Percentage of key staff trained on relationship between climate change and health and climate-sensitive diseases	Assess completion of training	Training attendance records	Once per training	Project manager	Annual project report	Staff engaged and available for training sessions Training modules to mainstream climate change adaptation into health and water, sanitation and hygiene education created for training staff
	Updated National Strategy for Climate Change Adaptation and Disaster Risk Reduction for	Assesses updates to and approval of National Strategy document	Reports from Climate Change Technical Working Group	Annually	Project manager	Annual project report	Includes national coordination mechanism established between meteorologica

	long-term capacity-building developed						I (Ministry of Water Resources and Meteorology), environmental , water, sanitation and hygiene, and health sectors (Ministry of Health)
Component/Outcome 2: effective decision-making for health interventions enabled through generation of information and improved surveillance or early-warning systems	Number of new hospitals performing active dengue surveillance in addition to existing seven	Measures expansion of sentinel surveillance system	National Centre for Parasitology , Entomology and Malaria Control routine surveillance data	Quarterly	National Centre for Parasitology, Entomology and Malaria Control	Annual project report	Hospitals identified by National Centre for Parasitology, Entomology and Malaria Control for expansion able to participate in sentinel surveillance
	Improvements in diarrhoeal disease surveillance	Measures changes and their rollout	Project records, training attendance	Once per training	Project manager	Annual project report	Staff engaged and available for training sessions
Component/outcome 3: climate resilience	Number of communes reaching target	Measures access to climate-	Community assessments	Annually	Project consultant and special	Annual project report	Assumes villages are willing to

is enhanced in health service delivery	levels in rural water safety planning recognition system (see annex 6)	proof improved water and sanitation at commune level			services agreement		participate in rural water safety planning process and hazard mitigation is feasible
	Number of health-care facilities with climate-proofed improved water and sanitation facilities	Measures access to climate-proof improved water and sanitation at health-care facility level	Community assessments	Annually	Project consultant and special services agreement	Annual project report	Assumes health-care workers are willing to participate in process and hazard mitigation is feasible
Component/Outcome 4.1: enhanced regional cooperation and knowledge exchange for promoting scale-up and replication of interventions 4.2: health-specific components of national adaptation plan are effectively integrated into ongoing national	Indicators under outcomes 4.1 and 4.2 are discussed in the Overall Proposal						

adaptation plan processes							
Mid-term GEF tracking tool	N/A	N/A	baseline GEF tracking tool included in Annex	After second project implementation review submitted to GEF	Project manager	Annual project report	N/A
Final GEF tracking tool	N/A	N/A	Baseline GEF tracking tool included in Annex 4	After final project implementation review submitted to GEF	Project manager	Annual project report	N/A
Mid-term review (if FSP project only)	N/A	N/A	Independent evaluators	Submitted to GEF same year as third project implementation review	Project manager	Annual project report	N/A

^aRisks must be outlined in the "Feasibility" section of this project document.

Annex 3 Evaluation plan

Evaluation title	Planned start date (month/year)	Planned end date (month/year)	Included in Country Office evaluation plan	Management response	Budget for consultants (US\$) ^a	Other budget (e.g. travel, site visits)	Budget for translation
Component 2 baseline assessment	Year one	Year one	Yes	Yes	10 000	Included	included
Component 2 final assessment	Year four	Year four	Yes	Yes	10 000	Included	Included
Component 3 baseline assessment/behaviour change communication campaign research	Year one	Year one	Yes	Yes	17 000	Included	Included
Component 3 final assessment	Year four	Year four	Yes	Yes	20 000	Included	Included
Total evaluation budget					57 000		

^aThe budget will vary depending on the number of consultants required (full-size projects required two consultants), the number of project sites to be visited, and other travel-related costs. The average total number of working days per consultant (not including travel) is 22–25.

Annex 4. GEF tracking tool

Project identification						
Project title	Building resilience of health systems in Asian least developed countries to climate change					
Country	Cambodia	GEF project ID		6984		
GEF agency	UNDP	Agency project ID		5400		
Executing partner(s)	UNDP and WHO	Council/CEO approval date		1 March 2016		
Project status at submission		Tool submission date				
Project baselines, targets and outcomes						
Indicator	Unit of measurement	Baseline at CEO endorsement	Target at CEO endorsement	Actual at mid-term	Actual at completion	Comments (e.g. specify unit of measurement)
Objective 1: reduce vulnerability of people, livelihoods, physical assets and natural systems to adverse effects of climate change						
Indicator 1: number of direct beneficiaries	Number of people					N/A: institutional strengthening does not produce direct beneficiaries
	% female					N/A: institutional strengthening does not produce direct beneficiaries
	Vulnerability assessment (yes/no)	Yes	Yes			National assessment was conducted in 2010; it will be updated and provincial level assessments conducted in 2017 under an Asian Development Bank project

Outcome 1.1: vulnerability of physical assets and natural systems reduced

Indicator 2: type and extent of assets strengthened or managed better to withstand effects of climate change	Land (ha)					N/A
	Coast (km)					N/A
	Roads (km)					N/A
	Other					N/A

Outcome 1.2: livelihoods and sources of income of vulnerable populations diversified and strengthened

Indicator 3: population benefiting from adoption of diversified climate-resilient livelihood options	Number of people					N/A
	% female					N/A
	% of targeted population					N/A

Outcome 1.3: climate-resilient technologies and practices adopted and scaled up

Indicator 4: extent of adoption of climate-	Number of people	Unknown	183 699			Climate-proof water, sanitation and hygiene at health-care facility level for all of Ratanakiri (2013 census numbers)
	% female	Unknown	50%			

resilient technologies and practices	Number of people	9976	61 233			Climate-proof improved sanitation at household level for estimated population of three districts in Ratanakiri; baseline = population x percentage with access to improved sanitation reported in 2015 commune database
	% female	Unknown	50%			
	Number of people	30,075	61 233			Climate-proof improved water at household level for estimated population of three districts in Ratanakiri; baseline = population x percentage with access to improved water reported in 2015 commune database
	% female	Unknown	50%			
	% of targeted					N/A
	Number of ha					N/A
	% of targeted					N/A
Objective 2: strengthen institutional and technical capacities for effective climate change adaptation						
Outcome 2.1: increased awareness of climate change impacts, vulnerability and adaptation						
Indicator 5: Public awareness activities carried out	Yes/no	No				N/A: awareness efforts are focused on government employees
	Number of people					N/A

and population reached	% female					N/A
Outcome 2.2: access to improved climate information and early-warning systems enhanced at regional, national, subnational and local level						
Indicator 6: risk and vulnerability assessments and other relevant scientific and technical assessments carried out and updated	Number of relevant assessments and knowledge products	0	3			Project will create knowledge products related to dengue early-warning system, climate-proofing water, sanitation and hygiene, and behaviour change communication campaign
Indicator 7: number of people per geographical area with access to improved climate information services	Number of people					N/A
	% female					N/A
	% of targeted area (e.g. % of country's total area)					N/A
Indicator 8: number of people per geographical area with	Number of people	0	6 965 081			Dengue early-warning system for 10 highest incidence provinces (2013 census population estimate)
	% female	0	50%			

access to improved, climate-related early-warning information	% of targeted area (e.g. % of country's total area)					N/A
Outcome 2.3: Institutional and technical capacities and human skills strengthened to identify, prioritize, implement, monitor and evaluate adaptation strategies and measures						
Indicator 9: number of people trained to identify, prioritize, implement, monitor and evaluate adaptation strategies and measures	Number of people	0	80% of key government staff			Total number of key government staff to be identified during project implementation
	% female	0	1			
Indicator 10: capacities of regional, national and subnational institutions to identify, prioritize, implement, monitor and	Number of institutions	4	4			Department of Preventive Medicine, Climate Change Technical Working Group, National Centre for Parasitology, Entomology and Malaria Control, and Ministry for Rural Development
	Score	2	5			(If scoring methodology is different from the recommended, please describe)

evaluate adaptation strategies and measures

Objective 3: integrate climate change adaptation into relevant policies, plans and associated processes

Outcome 3.1: institutional arrangements to lead, coordinate and support integration of climate change adaptation into relevant policies, plans and associated processes established and strengthened

Indicator 11: institutional arrangements to lead, coordinate and support integration of climate change adaptation into relevant policies, plans and associated processes	Number of countries	Yes				
	Score	3	5			(If scoring methodology is different from the recommended, please describe)

Outcome 3.2: policies, plans and associated processes developed and strengthened to identify, prioritize and integrate adaptation strategies and measures

Indicator 12: regional, national and sector-wide	Number of policies, plans and processes	2	2			Health-specific components of national adaptation plan will be integrated into national adaptation plan
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policies, plans and processes developed and strengthened to identify, prioritize and integrate adaptation strategies and measures	Score	3	6			(If scoring methodology is different from the recommended, please describe)
Indicator 13: subnational plans and processes developed and strengthened to identify, prioritize and integrate adaptation strategies and measures	Number of plans and processes					N/A
	Score					N/A
Outcome 3.3: Systems and frameworks for continuous monitoring, reporting and review of adaptation established and strengthened						
Indicator 14: countries	Number of countries					N/A

with systems and frameworks for continuous monitoring, reporting and review of adaptation	Score					N/A
Reporting on GEF gender indicators						
Q1: has a gender analysis been conducted during project preparation?	No	N/A	N/A			Gender considered but no separate gender analysis conducted
Q2: does the project results framework include gender-responsive indicators and sex-disaggregated data?	Yes					
Q3: of the policies, plans, frameworks and processes supported (see Indicators 12 and 13), how many incorporate gender dimensions?	1	2				
Q4: at mid-term and completion, does the mid-term review and terminal evaluation assess progress and results in terms of gender equality and women's empowerment?	N/A					

Annex 5. Stakeholder consultations

Consultations were held with the Climate Change Technical Working Group on 11 November and 19 December 2016. The meetings were chaired by Dr Kol Hero. All members of the group were invited, including representatives from the Department of Preventive Medicine, the National Centre for Parasitology, Entomology and Malaria Control, the Department of Hospital Services, the Communicable Diseases Control Department, the Department of Drugs and Food, the Department of Planning and Health Information, the Ministry of Education, the Ministry of Water Resources and Meteorology, and the Ministry of Agriculture, Forestry and Fisheries. Representatives from WHO, the Asian Development Bank and Malteser International were also in attendance.

A broader consultation was held on 25 November 2016. The list of attendees is as follows:

Name	Position	Organization
Keo Chandara	Chief of technical bureau	Kampong Cham provincial health department
Sok Touch	Consultant	Asian Development Bank
NHEK Sophoeun	Technical officer	Kompong Thom provincial health department
Khath Davy	Technical officer	Cambodian Water Supply Association
Sor Sothy	Chief of technical bureau	Siem Reap provincial health department
Pen Rotha	Vice chief of technical bureau	Communicable Diseases Control Department, Ministry of Health

Rin Ravuth	Chief of technical bureau	Ministry of Health
Hong Phella	Vice chief of Technical bureau	Kratie provincial health department
Suo Pinreak	Coordinator	Asian Development Bank
Hap Selavuth	Technical bureau	Ministry of Health
Tep Phollarath	Vice chief of technical bureau	Ministry of Water Resources and Meteorology
Sam Sophy	Vice chief of technical bureau	Ministry of Rural Development
Ir Por	Chief of technical bureau	National Institute of Public Health
Uaniko Yangoli	Community development partner	Unicef
Soth Kim Kolmony	Director	National Committee for Disaster Management
Chim Vun	Officer, National Dengue Control Programme	National Centre for Parasitology, Entomology and Malaria Control
Nong Sokra	Clinical management	National Centre for Parasitology, Entomology and Malaria Control
Yves Bourny	Country director	Malaria Consortium
Sok Srun	Director, Department of Hospital Services	Ministry of Health
Hirary Banbrick	International consultant	WHO
Ravi	International consultant	WHO
So Socheat	Humanitarian and Emergency Affairs manager	World Vision
Sok Kanha	Deputy director, Department of Planning and Health Information	Ministry of Health

Keo Vicheka	Program coordinator	RainWater Cambodia
Rechard	Project manager	Malteser international
Chhorn Sophea	International Relations head	University of Health Sciences
Phum Thol	Facilitator	
Sokhatevy	Deputy chief officer	Ministry of Rural Development
Kang Vanda	Officer	DCC/Ministry of Education
Kim Sanh	Assistant	
Nop Sokhai	Advisor	Gesellschaft für Internationale Zusammenarbeit
Rim Chanra	Vice chief of bureau	Ministry of Women's Affairs
Khlok Vichet ratha	Vice director, Department of Climate Change	Ministry of Education
Lek Pomborin	Interpreter	
Sam ol channa		Water Aid
Peng Vanny	Deputy	Gesellschaft für Internationale Zusammenarbeit
Chan Vibol	Climate change and health coordinator	WHO
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Annex 6. Rural water safety planning recognition levels

The Ministry for Rural Development's Guidance for Rural Water Safety Planning in Cambodia document establishes the following verification and recognition guidelines:

Recent experience suggests that local-level (village and commune) rural water supply, sanitation and hygiene campaigns benefit from having clear targets and verification and recognition processes to ensure transparency and to provide motivation to communities and households. For rural water safety planning, it is recommended that performance be measured and recognized according to the desired high-level outcomes:

- Community drinking water sources are free of chemical and microbiological contamination to the extent practicable.
- Water collection, storage and handling practices do not introduce or lead to recontamination of drinking water.
- Drinking water at the point of consumption meets national rural drinking water quality guidelines. Appropriate, effective water treatment methods are used if needed.
- The community environment is clean (liquid and solid waste is managed hygienically).
- Water sources are resilient to natural disasters and climate change to the extent practicable.

It is assumed that few rural villages or communes will have equitable and sustained access to improved water sources by 100% of the population at the

start of the rural water safety planning process. The starting point for a rural water safety planning should therefore also include a plan to achieve universal access by all village and commune residents to improved water sources within a reasonable timeframe.

The desired end-state of universal rural access to improved water supplies, safe water at all points of consumption, and resilience of water sources to natural disasters and climate change will be challenging to achieve, except over the medium to long term. It is necessary to establish step-wise or interim rural water safety planning targets in order to appropriately mark and recognize progress towards these ultimate objectives. Therefore, a five-tiered recognition system is recommended for village and commune rural water safety planning:

- Level 1 (clear glass):
 - The rural water safety planning process has been initiated, and a village or commune) rural water safety planning team is established.
 - Rural water safety planning steps 1, 2 and 3 are completed.
 - The water supply hazard and risk assessment are completed, and control measures have been identified.
 - Community awareness campaigns have been initiated.
- Level 2 (blue glass):
 - Rural water safety planning step 4 is completed, and an “improvement plan” is completed and filed with the commune

council (for villages) or the district administration (for communes).

- The commune council or district administration accepts and supports the rural water safety planning improvement plan.
- The commune or district and/or other support agencies allocate finances to the village or commune to carry out safe water improvements and campaigns.
- Level 3 (silver glass):
 - The village or commune prepares and files a plan to achieve equitable, sustained access to improved water supplies for 100% of its residents.
 - Progress continues on the village (commune) rural water safety planning, and step 5 (monitoring and communicating results) is well under way.
 - Two of the five intermediate outcomes (improvement plan actions) are achieved.
- Level 4 (gold glass):
 - Progress continues on the rural water safety planning, and step 6 (review and updating of the rural water safety planning) has been carried out.
 - Four of the five intermediate outcomes are achieved.
 - Progress continues on achieving 100% access to improved water supplies by all residents.
- Level 5 (diamond glass):

- 100% access to improved water supplies is achieved.
- All five of the rural water safety planning outcomes are achieved (for communes, this is true for all villages)
- The rural water safety planning has been revised and updated, and the process of monitoring water safety and raising awareness is actively continued.

It is essential that credible village and commune rural water safety planning verification processes be established at the national level, similar to those used for certifying open defecation-free villages and communes. These verification processes should be administered by provincial departments of rural development and, wherever possible, delegated to district or commune governments.

Recognition of the five levels of rural water safety planning accomplishment should be marked publicly to the extent practicable, through local ceremonies and celebrations. Signs or banners that acknowledge the rural water safety planning status, particularly at the village level, should be posted.

The desired end-state of level 5 ("diamond glass") can be acknowledged further by calling the village or commune a "*Phum Teuk Sowathapheap*" ("safe water village") or "*Khum Teuk Sowathapheap*" ("safe water commune"). This final state of community safe water recognition should be awarded publicly and announced in the provincial and national media.

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