Review of CLIMATE CHANGE and HEALTH ACTIVITIES in SEARO MEMBER STATES

Synthesis Report

World Health Organization
Regional Office for South-East Asia

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1 German Development Corporation

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Introduction

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1.1 Terms of Reference for review

Introduction

It has been scientifically proven that climate is changing and that the impact on health is real. Health injuries, illnesses and deaths caused by extreme weather events such as heatwaves, hurricanes and floods are obvious. Climate change also is affecting the geographic range and incidence of infectious diseases, such as diarrhoeal disease and malaria, and undernutrition. Further, climate change has more subtle and sustained impacts on human health by affecting the three basic pillars of life: air, water and food. Climate change induced mainly by human activities is occurring, with major effects on human health. The *World Health Report 2002* estimated that about 82 000 persons died due to climate change and its consequences in South-East Asia in 2000. Among WHO regions, South-East Asia had the highest estimated deaths due to climate change.

The most vulnerable populations of South-East Asia (Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Indonesia, Maldives, Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste) consist of small-scale and marginal farmers dependent on rain-fed agriculture, the rural poor, urban slum dwellers, mountain people, the populations of small islands and those living on the seacoast. The pre-existing high burdens of climate-sensitive diseases (particularly malnutrition, vectorborne diseases

and diarrhoeal diseases), weak public health systems, and limited access to primary health care contribute to the vulnerability of millions of people in South-East Asia. Extreme weather events may further disrupt frail health infrastructure.

For more than 10 years, WHO has been advocating, supporting and guiding Member States to address climate change impacts on health. Regional meetings, high level conferences and national meetings have been conducted. Countries such as Bangladesh, Bhutan, Nepal, Indonesia and India (two districts) carried out health vulnerability and adaptation assessments. Regional and national trainings on the subject have been provided. Since 2010, Bhutan has been implementing a health adaptation to climate change project. Two new projects to adapt to climate change focusing on resilient water and sanitation services were started in Bangladesh and Nepal in 2013. Retrospective studies on vectorborne and waterborne diseases and climate change were commissioned in Bangladesh, Myanmar, Nepal and Sri Lanka. Six least-developing countries from the region prepared National Adaptation Programmes of Actions (NAPA) and submitted them to the UNFCCC Secretariat. All countries have developed some sort of national plan and strategy for addressing the health risks of climate change.

A review of the work on climate change and health was conducted for all Member States, exploring awareness levels, capacity and impacts of climate change on Member States. Case studies on health adaptation and mitigation measures were prepared.

Objectives

The objective of the review is to further strengthen the work of climate change and health in the South-East Asia Member States.

The assessment will:

1. Review the adaptive capacity of the health sector to climate change risks, via the following objectives:
    (i) Measure **awareness** levels of MoH decision-makers and implementers about the risks of climate change on health and the measures that need to be taken to address them; this was accomplished through interviews with selected key informants.

(ii) Review if climate change considerations are **mainstreamed** into public health programmes, via an analysis of the extent to which health is included in climate change plans.

(iii) Review the **partnerships** between health and the environment through interviews with selected key informants.

(iv) Review the **level of priority** given to health adaptation and mitigation in national climate change action plans

(v) **Assess** health adaptation and mitigation measures at a selected number of countries and prepare case studies

(vi) **Identify gaps** in current country plans, policies and strategies based on interviews and review of documents

(vii) **Recommend strategic action** at country and regional levels.

The review was carried out for 10 of the 11 Member States of the WHO South-East Asia Region (Democratic People's Republic of Korea was not included for operational reasons).

Outputs

1. A regional synthesized report detailing the status of climate change and health adaptation status for each country, level of awareness, capacity and cross-sectoral collaboration to address climate change risks to health.
2. Recommendations for further strengthening work in each country and as a Region.

This report is a companion document to the Regional Strategy for Protecting Health from Climate Change (2012), produced by WHO SEARO.

Timeliness and usefulness of the report

This report has been written in a year where three major international agreements relevant to responding to the health risks of climate change were or are planned to be agreed and adopted: i) The Sendai Framework for Disaster Risk Reduction (2015–2030), ii) the Sustainable Development Goals (expected to be adopted in September this year) and iii) the Conference of the Parties' 21st yearly session (COP21) of the United Nations Framework Convention on Climate Change (UNFCCC), the objectives of which include to achieve a legally binding and universal agreement on climate change action on mitigation.

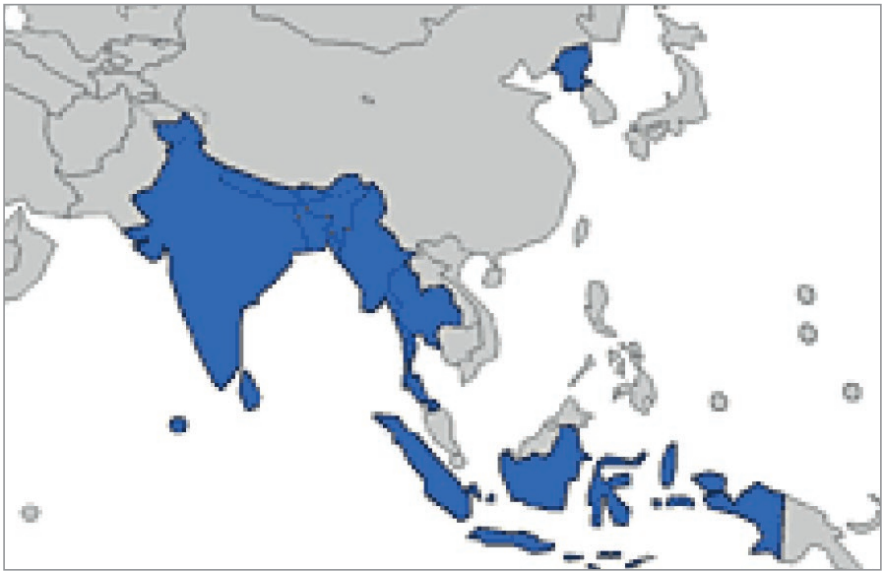
The potential for action arising from the adoption of these three key agreements is vitally important for the health sector. It is crucial that the sector be in a position to engage with international discussion around these themes and contribute with its ideas and suggestions for action. This report aims to provide material for such a purpose, and it is envisaged that WHO SEARO and Member States of the SEARO Region can use this synthesis report, and their respective country reports, to design and implement next steps and activities to prepare for and better manage the health risks arising from a changing climate.

Regional overview

2

2.1 Physical geography, demographics, economy and health status

Figure 1: South-East Asia Region Member States (shaded in blue)



The South-East Asia region has 11 Member States – Bangladesh, Bhutan, Democratic People's Republic of Korea, India, Indonesia, Maldives,

Myanmar, Nepal, Sri Lanka, Thailand and Timor-Leste. The Region is home to approximately one fourth of the world's population.

The physical geography of the region is incredibly diverse and varied – from long coastal stretches in India and Thailand, to landlocked mountainous ranges in Bhutan and Nepal.

The economic status of the Region is almost as diverse as its physical geography; India and Indonesia are in the top 20 of the global GDP rankings (10 and 16 respectively), while Nepal, Maldives, Bhutan and Timor-Leste are much lower on this (much-debated) GDP ranking (109, 165, 168, 174 respectively) (World Bank, 2015). India and Indonesia are members of the G20, which comprises a mix of the world's largest advanced and emerging economies. The G20 identified climate change finance as one of its priorities in 2015.

In addition, Indonesia and Thailand are members of the Asia-Pacific Economic Partnership (APEC) group – the goal of which is to support economic growth and prosperity in the Asia-Pacific Region. This group has many areas of focus, including health and sustainable development. Climate change is not explicitly mentioned as a topic of focus. Also, six of the countries in the South-East Asia Region (Bangladesh, Bhutan, India, Maldives, Nepal and Sri Lanka) are members of the South Asian Association for Regional Cooperation (SAARC); SAARC is both an economic grouping and involved in important initiatives connected to climate change such as the SAARC Disaster Management Centre (SDMC).

Table 1 presents the health profiles of each member country included in this review, illustrating the diversity the Region extends to health indicators. As would be expected, the top five causes of death among those countries with higher GDP typically are chronic diseases, except for India, which has high burdens of communicable and chronic diseases.

2.2 Climate change in the Region

The Asia chapter of the Intergovernmental Panel on Climate Change 5th Assessment Report concluded that it is very likely that mean annual temperature increased over the past century over most of the Asian Region (Hijioka et al. 2014). It is likely that the numbers of cold days and nights decreased, and the numbers of warm days and nights increased since the middle of the 20th century. Figure 2 shows the observed and projected changes in annual average temperature and precipitation over Asia. For

Table 1: Country health profiles

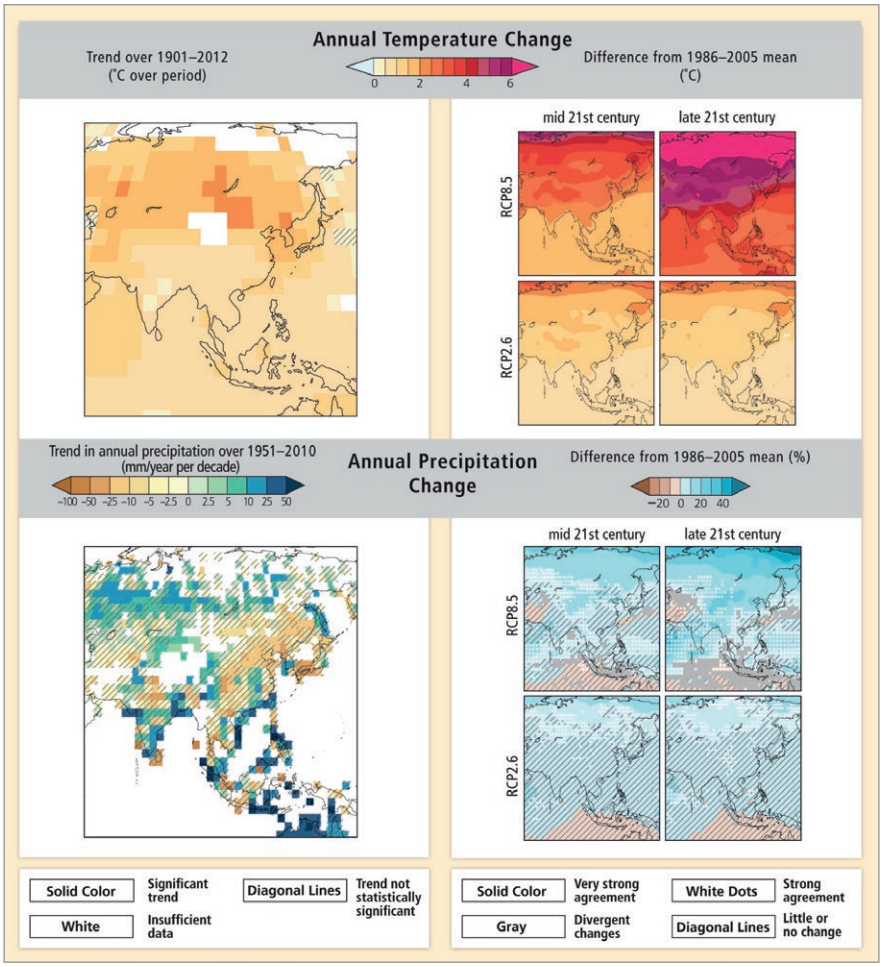
	Bangladesh	Bhutan	India	Indonesia	Maldives	Myanmar	Nepal	Sri Lanka	Thailand	Timor-Leste
Population	156.6 million	< 700 000	1.2 billion	249.8 million	330 000	53.2 million	28 million	20.5 million	67.0 million	1.2 million
% Urbanization	30	>70% by 2020	31	52	27	30	17	38	49	30
Infant mortality rate per 1000 live births	33	40.1	44	24.5	10	40	32	6	11	48
Age-standardized death rate per 100 000	864	822	1097	867	440	1185	832	620	663	872
Life expectancy at birth	69.0	69.4	65.2	69.7	78.8	63.9	69.2	75.5	74.1	68.7
Top five causes of death:	Preterm birth complications Lower respiratory infections Neonatal encephalopathy Drowning Chronic obstructive pulmonary disease (COPD)	Lower respiratory infections Preterm birth complications Poisonings Neonatal encephalopathy Ischemic heart disease	Preterm birth complications Lower respiratory infections Diarrhoeal diseases Ischemic heart disease COPD	Stroke Tuberculosis Road injury Diarrhoeal diseases Ischemic heart disease	Ischemic heart disease Stroke Neonatal encephalopathy Preterm birth complications Congenital anomalies	Lower respiratory infections Stroke HIV/AIDS Diarrhoeal diseases Tuberculosis	Lower respiratory infections Diarrhoeal diseases Neonatal encephalopathy Preterm birth complications Tuberculosis	Ischemic heart disease Self-harm Stroke Diabetes Lower respiratory infections	HIV/AIDS Ischemic heart disease Road injury Lower respiratory infections Stroke	Lower respiratory infections Diarrhoeal diseases Preterm birth complications Congenital anomalies Ischemic heart disease

Source: World Bank, *World Development Indicators*. Updated 2015.

most of South-East Asia, annual temperatures over the past 100 years increased approximately 1°C per decade. Projected temperature in the middle and at the end of the century depends on the emission pathway (RCP or Representative Concentration Pathway 2.6 is a low emission pathway and RCP 8.5 is a high emission pathway), with an upper range up to 6°C.

The pattern for precipitation is more mixed and uncertain (Figure 2). Most areas of Asia lack sufficient observational records to determine trends in annual precipitation over the past century. Within this overall trend, heavy precipitation events are increasing and light rainfalls are

Figure 2: Observed and projected changes in annual average temperature and precipitation over Asia



Source: Hijioka et al. 2014.

decreasing. In south Asia, seasonal mean rainfall has declined, with more frequent deficit monsoons. Projected changes in precipitation are highly variable, with increasing and decreasing trends observed in different parts and seasons of Asia. Precipitation extremes related to the monsoon are projected to increase in south and south-east Asia, with precipitation likely to become more extreme near the centres of tropical cyclones making landfall.

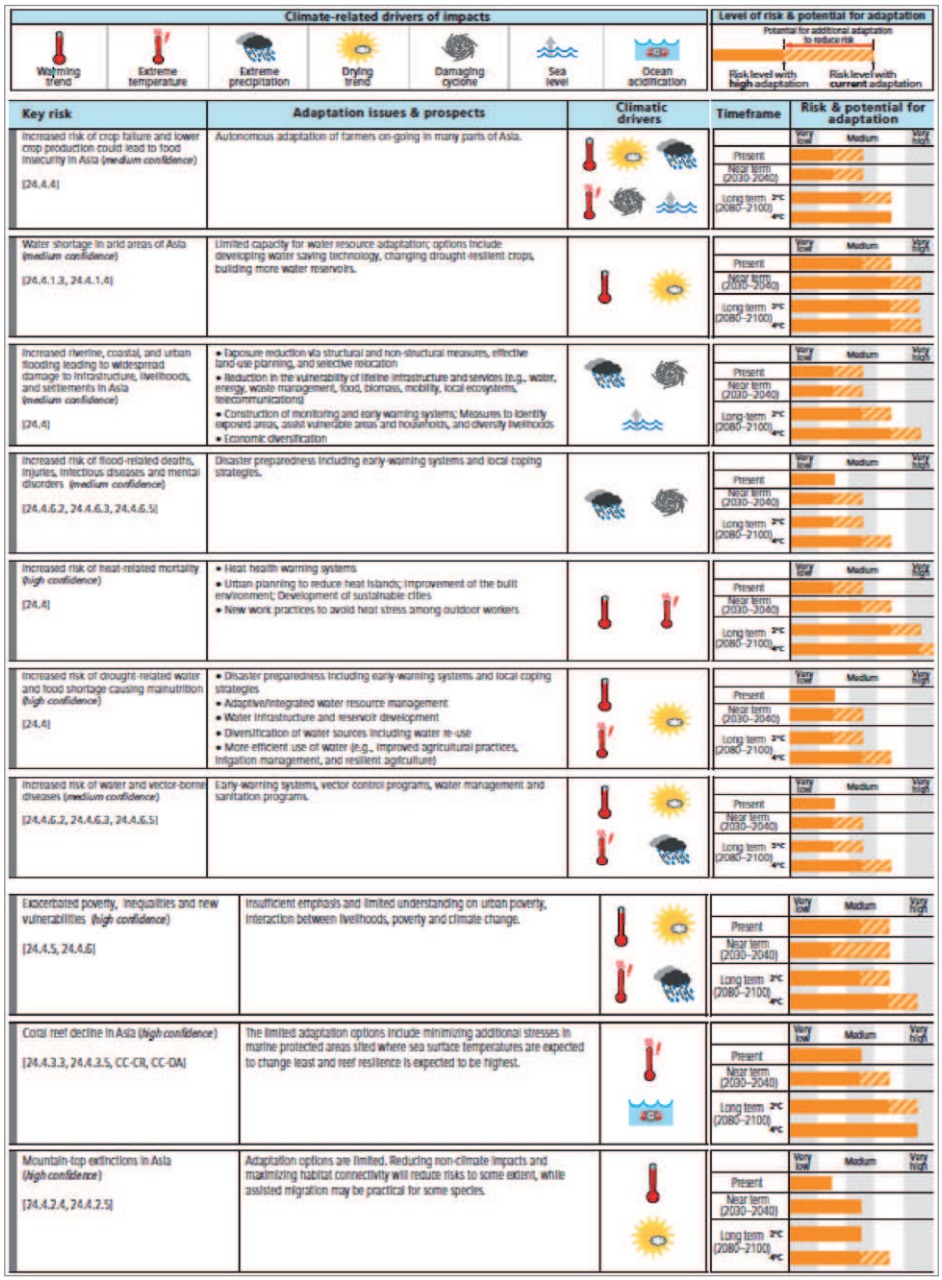
2.3 Climate change and expected health risks in the Region

Across the Asia Region, the IPCC assessment of the current health risks of climate variability and change focused on flooding, drought and waterborne and vectorborne diseases.

- Epidemics have been reported after floods and storms as a result of decreased drinking water quality, mosquito proliferation and exposure to rodentborne pathogens. Contaminated urban floodwaters have caused exposure to pathogens and toxic compounds, in India, for example. Mental disorders including post-traumatic stress disorder were observed in disaster-prone areas and, in India, were linked to age and gender.
- Dust storms result in increased hospital admissions and worsen asthmatic conditions, as well as causing skin and eye irritations. Droughts may also lead to wildfires and smoke exposure, with increased morbidity and mortality. Drought can also disrupt food security, increasing undernutrition and susceptibility to infectious diseases.
- A greater incidence of diarrhoeal diseases is associated with higher temperatures and heavy rainfall. Cholera outbreaks in coastal populations in South Asia are associated with increased water temperatures and the El Nino Southern Oscillation.
- Increasing temperatures can increase vector populations and enhance disease transmission. Dengue outbreaks are correlated with temperature and rainfall with varying time lags.

Further more frequent and intense heatwaves are projected to increase mortality and morbidity in vulnerable groups in urban areas. Warmer water temperatures and altered rain patterns and water flows are expected to further affect the transmission of infectious diseases. It is expected that climate change will facilitate changes in the geographical distribution of

Figure 3: Key risks from climate change in Asia and the potential for risk reduction through mitigation and adaptation



Source: Hijioka et al. 2014.

vectorborne diseases, as vector species that carry and transmit diseases migrate to more hospitable environments.

Figure 3 summarizes the key risks from climate change in Asia and the potential for risk reduction through mitigation and adaptation. Levels of risk are presented for (1) the near-term era of committed climate change (2030–2040), in which projected levels of global mean temperature increase do not diverge substantially across emissions scenarios. Risk levels also are presented for the longer-term era of climate options (2080–2100), for global mean temperature increases of 2°C and 4°C above pre-industrial levels. For each timeframe, risk levels were estimated for the current state of adaptation and for a hypothetical highly adapted state. Adaptation issues and prospects are indicated for each key risk. Relevant climate variables are indicated by symbols. The key risks for health include flood-related injuries, infectious diseases, death, mental disorders and heat-related mortality. While adaptation can reduce health risks, considerable residual risk is expected mid- and end of the century.

2.4 History of climate change and health activity in the Region

Several countries in the South-East Asia Region are or have been involved in multi-national adaptation projects, including those funded by the Global Environment Facility, the World Bank and the Rockefeller Foundation.

- Bhutan was part of the WHO/UNDP – Global Environment Facility (GEF) project "*Pilot Program on Climate Change Adaptation to Protect Human Health*." This was the first full-size health adaptation project funded by the Special Climate Change Fund administered by the GEF. The project was designed to build capacity and provide lessons, globally and nationally, in the design, implementation, monitoring and evaluation of specific health adaptation policies and measures. The overall objective was to increase the adaptive capacity of national health system institutions, including field practitioners, to prepare for, respond to, and recover from the health risks of climate variability and change. The Bhutan project focused on developing and improving integrated surveillance for the additional health risks from malaria, diarrhoeal disease and other infectious diseases in a changing climate; improving the capacity of community and health sector institutions to respond to climate-sensitive health risks; and enhancing emergency

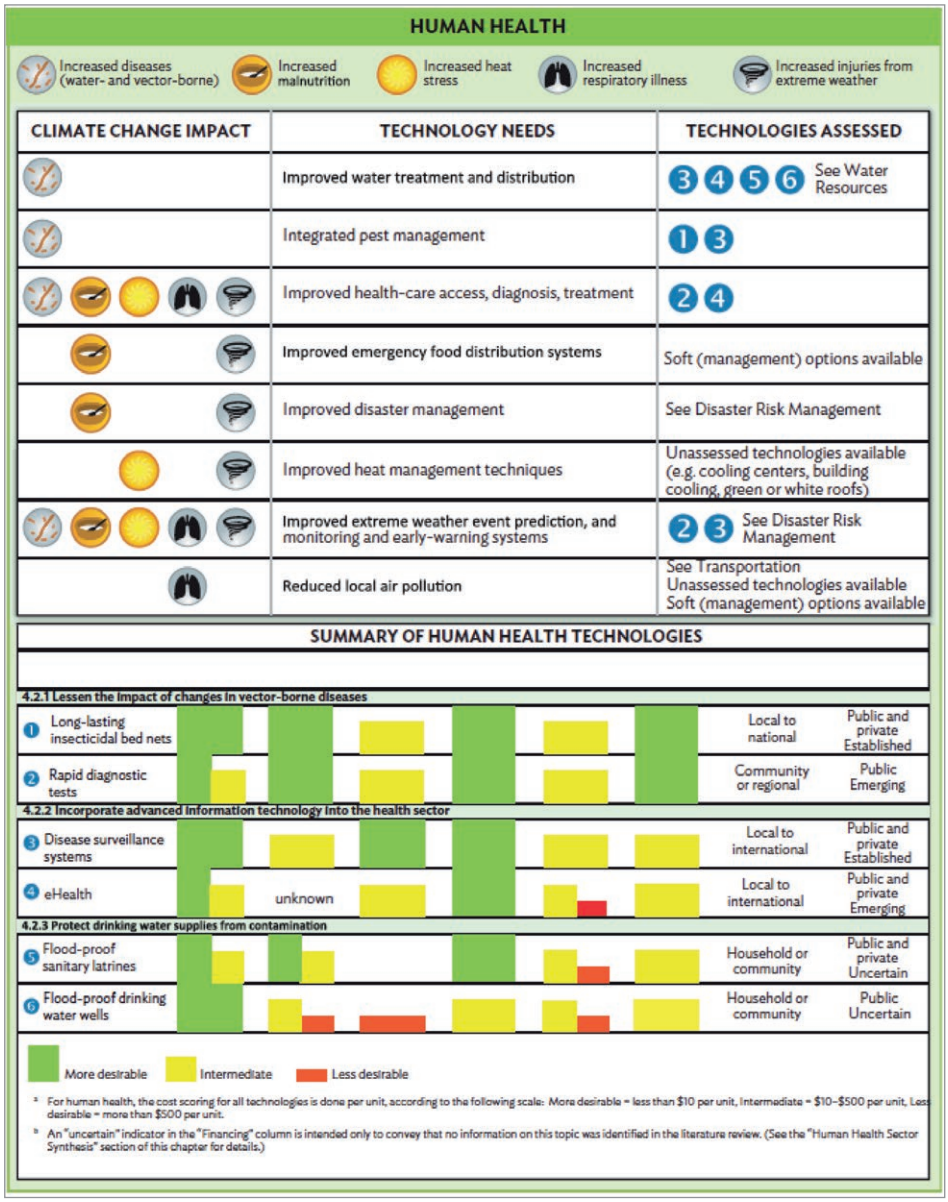
preparedness and disease prevention measures. The project was completed in May 2015.

- Bangladesh and Nepal are part of the Pilot Program for Climate Resilience (PPCR) funded by the World Bank, the Asia Development Bank, the Inter-American Development Bank, the European Bank and the African Development Bank Group. The PPCR is designed to assist low- and middle-income countries in integrating climate resilience into development planning. Building on the country NAPAs and other efforts, the PPCR also offers funding to pilot public and private sector solutions to pressing climate-related risks. Bangladesh is focusing on improving climate-resilient agriculture and food security, strengthening the security and reliability of fresh water supply, sanitation and infrastructure, and enhancing the resilience of coastal communities and infrastructure. Nepal is focusing on enhancing water resources management, climate information systems and disaster risk, and agriculture and landscapes management.
- The Rockefeller Foundation pioneered a Framework for Articulating City Resilience that underpins and reinforces a city's resilience. The framework is an inclusive method for articulating city resilience, underpinning and reinforcing the City Resilience Index's full suite of indicators and variables. It is being used by 100 cities participating in the Resilient Cities Challenge, including Bangalore, Chennai, Bangkok, Surat, Mandalay and Semarang.

2.5 Results of an assessment of technology needs to manage health risks of climate change for the Asia Region

The Asia Development Bank (ADB) recently assessed the technology needs to manage the health risks of climate change for the Asia Region. As shown in Table 2, a range of technologies is needed to increase resilience to climate variability and change. The six technologies evaluated were long-lasting insecticidal bednets, rapid diagnostic tests, disease surveillance, systems, e-Health, flood-proof sanitary latrines and flood-proof drinking water wells, with most of these technologies associated with relatively modest costs. The columns on the summary are Technology, Effectiveness, Relative Cost, Co-Benefits, Co-Costs, Barriers, Feasibility of Implementation, Scale of Implementation and Financing.

Table 2: Summary of adaptation technology needs in the health sector in the Asia Region



Source: Asian Development Bank 2014.

3 Regional findings – strengths and opportunities

The country reports were analysed to i) identify common themes and points of difference and ii) highlight areas of strength and opportunities for improvement. This information was synthesized to develop key regional results. The summaries below provide a brief synthesis of the country reports; further detailed information can be found in each relevant country report.

3.1 Awareness levels

Awareness levels of stakeholders were assessed for the following areas: weather events; the links between health and weather events; how climate change might occur over the next 25 years in each country; and the associated health risks. Stakeholders were only requested to respond to their country's context.

All stakeholders strongly indicated that their countries were vulnerable to weather events, and most agreed that these weather events would become severe in the next 25 years. A small number indicated a degree of specificity in terms of how weather patterns could change, such as increases in the frequency and intensity of particular extreme and climate events.

The majority of stakeholders could nominate at least one climate-sensitive health outcome in their respective countries, and many accurately identified the full range of health outcomes of concern. A small number could identify direct and indirect health risks, such as deaths directly resulting from landslides and heatwaves, and health outcomes arising from threats to food security due to extreme weather and climate events. Most stakeholders agreed that these health outcomes could increase over the next 25 years with climate change, although some noted that further research was needed to better understand the magnitude and pattern of possible increases in risks in their countries. There was some degree of optimism, with a small number of stakeholders indicating that effective health systems and programmes could reduce the health risks of a changing climate.

There was a low level of awareness among stakeholders of measures being taken to address the health risks from climate change. Few stakeholders could identify any projects being undertaken by their own or other organization/s. If stakeholders were aware of measures, their perception on the adequacy of these measures was assessed. In most cases, stakeholders indicated that current measures are inadequate and that additional and supportive measures are needed to prepare for any projected changes in health burdens due to climate change. Many countries highlighted the importance of implementing the health activities prioritized within the NAPA documents.

3.2 Mainstreaming of climate change into public health programmes

Currently, only a small number of national public health policies include climate change as a key consideration. This is concerning. Unless the health risks arising from climate change are clearly articulated, then it is difficult to (i) develop appropriate responses, (ii) garner the support from partner ministries (such as water, agriculture, etc.) for climate change and health activities, the bulk of which are inherently cross-sectoral and (iii) access funding for health and climate change activities.

Climate change issues were often identified indirectly in public health policies, such as via disaster risk management and food security measures; however, it is imperative that these concerns are linked (where possible) to issues of weather and projected climate change. Unless this is clear, then there are likely to be many missed opportunities to coordinate and

collaborate with such programmes to ensure that policies and programmes promote health and well-being, and to seek joint adaptation funding.

This report identifies a number of gaps for SEARO to consider addressing in relation to the mainstreaming of climate change into public health programmes, the clearest gap being that countries need to incorporate climate change issues in a robust manner – with detailed timelines, identification of required human and financial resources and partners – within their respective country health priorities and plans. Most countries noted additional capacity-building is needed within the Ministry of Health on climate change, and within other ministries on the health risks of climate variability and change. In addition, opportunities exist to support country partners to encourage the secondment of environment/climate change ministry officials within the Ministry of Health and its climate change/environment unit. There also appears to be opportunities to improve the visibility and representation of the health sector on national- and regional-level climate change working groups and committees. There is a lack of reporting frameworks to support all ministries to report on climate change and health activities; if such a mechanism existed, this would improve mainstreaming attempts and also have a large potential to develop and strengthen health activities, many of which are cross-sectoral and multidisciplinary.

Two case studies are presented here to demonstrate the efforts that the health sector is undertaking to directly incorporate climate change issues within public health activities.

Case study of good practice: Health Care Waste Management Center– Bir Hospital, Kathmandu, Nepal

The Health Care Waste Management Centre was established in 2011 at Bir Hospital, Kathmandu. The Centre was endorsed by WHO with technical assistance from the Nepal Public Health Foundation and Health Care Without Harm. The Centre is based on three pillars – waste management, injection safety, and mercury elimination. Prior to the Centre's development on hospital grounds, the site was used for dumping waste.

The Centre has three main functions – (i) recycling; (ii) biological treatment of food/human waste; and (iii) safe storage of mercury.

The waste that is able to be recycled (Figure 4), including plastics, paper, rubber and glass, is segregated and sold, while the non-recyclable

Figure 4: Recyclable materials after segregation at the Centre

Figure 5: Biogas plant at the Centre

infectious waste – including bandages and cotton – is treated in the autoclave for sterilization and then placed in the vermicomposter (worm farm). A trolley is fitted with colour-coded buckets for risk and non-risk waste collection within the hospital. Approximately 80–100 kilograms of waste is collected per day from the hospital.

The second function of the Centre (Figure 5) is a biogas plant that manages biodegradable waste, including food and human waste (e.g. from surgical operations). The plant then produces fertiliser (slurry) that will eventually be sold to farmers once safety tests are completed, and methane and carbon dioxide that are currently being used to run the Centre's kitchen and autoclaves. Future plans include the purchase of a generator for electricity to power the street lamps within the hospital compound.

The safe storage of mercury is the third function of the Centre. Mercury is found in thermometers, fluorescent lamps and batteries and other items, and exposure is a health risk. The items containing mercury are stored in a designated collection house pending the development of safe disposal options.

Many benefits are observable from the Centre's operation, ranging from climate change mitigation to capacity development. The total reduction of greenhouse gases within the hospital as a result of the Centre's activities was estimated to be 75.8 tonnes of carbon dioxide per annum, equating to US$ 531. In 2012, 79% of total waste is being recycled in the hospital. The cost of setting up the Centre was approximately US$ 6000, and it is expected that this cost will be paid back in three to

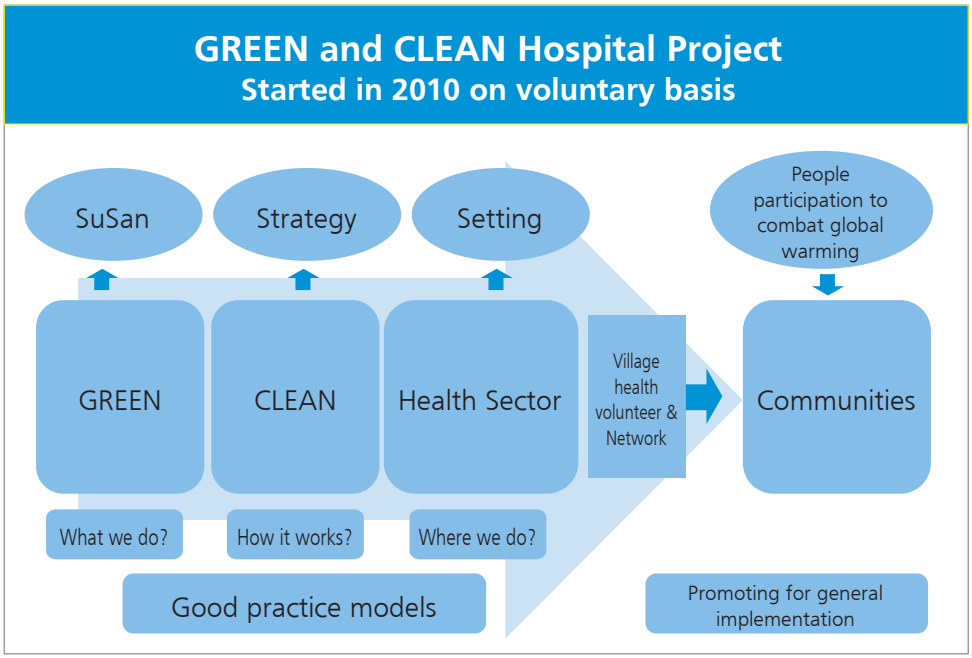
four years. An additional benefit of the Centre is that burn injury patients are trained to make handicrafts for purchase from the plastic waste.

This Centre is a highly commendable example of a sustainability project that focuses on mitigation of climate change that will, in turn, have positive health effects. It is pleasing to note that Centre staff participate in community education and training to share their experience and knowledge in areas beyond Kathmandu, and this type of dissemination and further implementation should be strongly encouraged.

Case study of good practice: Greening the health-care sector – Thailand

Hospitals and health-care facilities can be a significant source of greenhouse gas emissions because of their energy intensity. In 2010, the Ministry of Public Health implemented a policy to reduce the carbon footprint of the Government's 10 644 hospitals (835 hospitals and 9769 sub-district hospitals under the MoPH). Figure 6 shows the outline of the GREEN and CLEAN hospital project.

Figure 6: Thailand GREEN and CLEAN hospital project



The Green and Clean Hospital Project is designed to (1) campaign on sustainable sanitation; (2) increase awareness, knowledge, and

understanding of public health personnel of the health risks of climate change; and (3) develop a good practice model for hospitals. The project started on a voluntary basis. Activities of the GREEN components include: Garbage (solid waste management focusing on reduce, reuse and recycle); Restroom (management meets health, safety and accessibility standards); Energy (savings using alternatives such as wind, solar and biogas); Environment (management to reduce climate change and increase a health environment); and Nutrition (food safety and energy savings from food transportation). Examples are shown in the figures. Figure 7 shows some activities within selected GREEN components. The CLEAN components include: Communication; Leadership; Effectiveness; Activities; and Networking. The hospital's carbon footprint is one indicator of success.

Figure 7: Some activities within selected GREEN components

An example of best practice is the 17th Somdejphrasangkharaj Hospital in Suphanburi. This is a 250-bed hospital that services 1000 patients per day, including 200 inpatients and 800 outpatients (see Figure 8). The hospital has won national and international awards for its innovative programmes involving all departments, including the Thailand Energy Award and the ASEAN Energy Award in 2010, and the Shield of Honor on Green and Clean Hospitals in 2011. In 2011, the hospital reduced their emissions of carbon dioxide by 13.69% or 252.13 tonnes, which is the equivalent of planting 28 014 trees. The savings from electric energy, thermal energy and carbon dioxide were 5 230 605 baht, counting measures with (4 294 501) and without (936 104) costs. The average annual savings were 1 668 396 baht/year, including savings from water consumption (501 660) and EM usage (77 400). The actions taken also resulted in a healthier workplace, winning a Popular VOTE award on Health Environment in 2012.

Further, hospital staff are very engaged with the local community, providing education and capacity-building on energy efficiency, good health practices and other topics. As with the case study in Nepal, this is a highly commendable example of a sustainability project focusing on reducing greenhouse gas emissions that will have positive health effects. Providing further details on the design, implementation, and running of such programmes to other hospitals in the South-East Asia Region, including how to calculate greenhouse gas emissions from health-care facilities, would promote knowledge transfer across countries.

Figure 8: 17th Somdejphrasangkharaj Hospital

3.3 Partnerships between health and the environment (and other related sectors)

All countries demonstrated a large array of partnerships with different organizations, which is a positive finding and bodes well for future collaborations. The manner in which these partnerships are functioning in every country, or to what extent they are active, is unclear from this assessment, and could be investigated further. However, it is sufficient at this stage to see that partnerships are flourishing and engagement is occurring beyond sectoral and organizational silos. Partnerships were identified across different types of organizations, such as government ministries, NGOs, bilateral funding agencies, UN agencies and universities, as well as across different sectors, including the water, agriculture, disaster management and finance sectors.

Opportunities exist for workplace secondments between the Ministry of Health and the Ministry of Environment/Climate Change to strengthen partnerships between these sectors (as indicated above in the Mainstreaming section). The health sector could also be better represented at regional organizations to encourage partnerships and collaboration, and to share country-level health and climate change activities for the purposes of developing networks and mutual learning among countries.

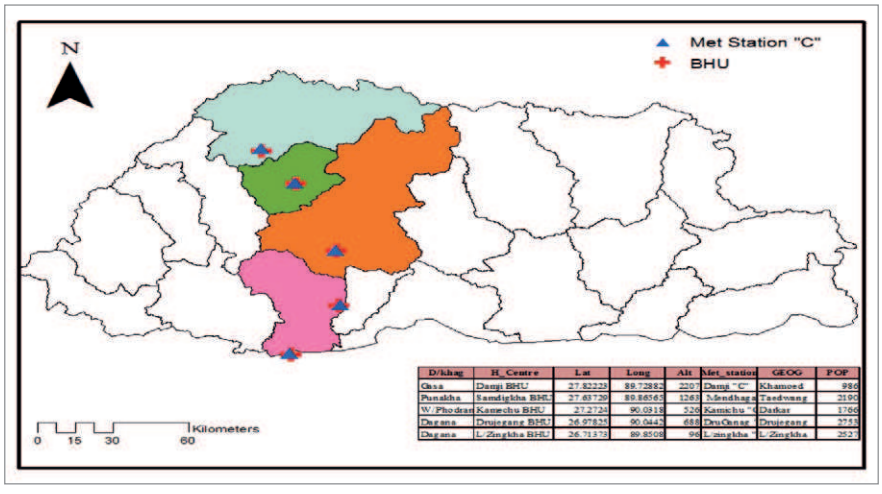
Two case studies of good practice are presented here to demonstrate the outcomes of successful and effective partnerships, at a government and community level.

Case study of good practice: Piloting Integrated Surveillance for Climate-Sensitive Diseases in Bhutan

Effective partnerships between the health, meteorology and environment sectors are evident in the project just completed in Bhutan to pilot integrated surveillance for climate-sensitive diseases.

The aim of the project is to monitor the risk factors (weather variables) along with the collection of routine epidemiological surveillance data for climate-sensitive diseases. Data from the following climate-sensitive diseases are collected – diarrhoea, acute respiratory infections, malaria, dengue, Japanese encephalitis, Kala-azar and dysentery. There are six of these adaptation systems being piloted in Bhutan (see Figure 9).

Figure 9: Location of integrated surveillance projects in Bhutan



D/khag	H_Centre	Lat	Long	Alt	Met_station	GEOG	POP
Gasa	Damji BHU	27.82223	89.72882	2207	Damji "C"	Khamoed	986
Punakha	Samdigkha BHU	27.68739	89.86563	1283	S/endhag a	Tandwang	2190
W/ Phodrang	Kamechu BHU	27.27234	90.0918	528	Kamichu "C"	Daskar	1766
Dagana	Drujegang BHU	26.97835	90.0442	688	Dru/Gang	Drujegang	2753
Dagana	L/Zingkha BHU	26.71373	89.8508	96	L/zingkha	L/Zingkha	2523

The case study selected was based at the Basic Health Unit (BHU) in Samdingkha, approximately 3 hours from the capital, Thimphu. The

Ministry of Health collaborates with the Department of Hydro-Met Services, Ministry of Economic Affairs (MoEA) , to conduct the project.

The Health Assistant at the BHU collects daily rainfall (Figure 10), humidity and maximum and minimum temperatures using the weather station alongside the BHU. Health data are sent monthly in excel format to Department of Public Health (DoPH and meteorological data are sent on paper to the Department of Hydrology and Meteorology.

Figure 10: Collecting and measuring rainfall data at BHU

In the short term, climate sensitivity analysis will be conducted, with a focus on temporal and spatial analysis or vulnerability mapping (risk mapping). In the longer term, the study aims to be able to develop disease forecast models, issue risk warnings and develop a response plan.

Staff noted that measuring meteorological data and collecting health data in another form (alongside the standard health information system) does not add to their workload. Staff also understood the importance of the weather data, and the potential for health workers to use the correlations to identify vulnerable groups. Monthly correlations of weather data and health data began in July, supported by a staff training workshop.

Case study of good practice: Climate-Resilient Villages, Indonesia

The Indonesian Government Ministry of Environment established a Climate Village Programme (Proklim) to award the public's active and integrated participation in addressing climate change. Its implementation involves formal and informal organizations in the community. The programme recognizes the active participation of local communities in implementing actions to achieve the national greenhouse gas reduction target and to increase community resilience to the risks of climate change, taking into consideration the local context.

An example is Kebon Kosong in Kemayoran Central Jakarta. The community designed an active composting programme in which all village members participate. Biological waste is composted and either sold or used to grow a variety of native plants for consumption by the village or for purchase (including seedlings, produce and products made from the plants, such as jam). Each village member volunteers a few hours per week to the composting programme. The programme has been very successful and continues to expand. The backdrop of Figure 11 shows some of the plants grown.

Recognition by the Ministry of Environment includes opportunities for representatives from other villages to visit Kebon Kosong, to learn from how they organized and run the composting programme, including practical activities such as bookkeeping. This village shows best practice in community-led activities, with strong village leadership.

Figure 11: Climate-resilient village Kebon Kosong in Kemayoran Central Jakarta

The Ministry of Environment plans to identify approximately 1000 Pilot Climate Villages. It is conducting training sessions to enhance the capacity of provinces, municipalities and villages to engage in adaptation and mitigation. Approximately 400 villages were identified between 2012 and mid-2014.

3.4 The level of priority given to health adaptation and mitigation in climate change action plans

Climate change action plans (including NAPAs) within countries identified health projects as one of their priorities, which shows that health is clearly on the agenda of national governments. However, there was generally very little information on crucial implementation processes, including; i) who was going to be involved as key implementers, ii) the timeframe of the projects, iii) responsibilities of different stakeholders and iv) how the projects were to be financed. These issues are vital to clarify to progress health and climate change activities. In addition, health projects were often quite generic; for example, eradicating malaria, or providing drinking water to coastal communities to respond to increasing salinity.

The urgent sourcing and securing of financial support and subsequent implementation of prioritized health and climate change projects identified in country NAPA plans is a priority to build resilience to the health risks of climate change in the Region. Related to this is the gap (at country and regional levels) in understanding of the main funding opportunities – with which organizations, to what degree health is a potential-funded sector, the mechanisms for applying for the funding and associated timelines.

Case study of good practice: Engaging in the National Adaptation Plan process – Sri Lanka

The Sri Lankan Ministry of Health engaged in several initiatives on climate change and health over the past few years within the context of national adaptation planning. The National Adaptation Plan will build on cross-ministerial assessments and strategies focused on managing the risks of climate variability and change, particularly the Technology Needs Assessment for Climate Change 2011, and the National Climate Change Adaptation Strategy (NCCAS) for Sri Lanka (2011–2016). The Climate Change Secretariat of Sri Lanka is leading these efforts. NAP will be finalized by the end of 2015.

The Technology Needs Assessment identified several needs relevant to health systems:

- Technology Action Plans for the Food Sector prioritizes (1) sustainable inland culture-based fisheries, (2) sustainable land management and (3) crop diversification and precision farming
- Technology Action Plans for the Health Sector prioritizes (1) early warning systems for extreme weather events, (2) transfer of knowledge and skills to health personnel and (3) technology for management of health-care waste.
- Technology Action Plans for the Water Sector prioritizes (1) restoration of minor tank networks, (2) rainwater harvesting and (3) boreholes and tube wells as a drought prevention measure for the domestic water supply (17).

Based on this assessment and other activities, the National Climate Change Adaptation Strategy (NCCAS) for Sri Lanka (2011–2016) was developed to serve as the framework for the Sri Lankan Government's climate change response. The strategy has five Strategic Thrusts, each with specific interventions and performance indicators:

1. Mainstream Climate Change Adaptation into National Planning and Development
2. Enable Climate-Resilient and Healthy Human Settlements
3. Minimize Climate Change Impacts on Food Security
4. Improve Climate Resilience of Key Economic Drivers
5. Safeguard Natural Resources and Biodiversity from Climate Change Impacts

Five companion documents—Sector Vulnerability Profiles—outline threats and priorities for agriculture and fisheries, water, health, urban development, human settlements, and economic infrastructure, and biodiversity and ecosystems services.

Despite the health risks of climate change being among the central concerns in the National Adaptation Planning process, stakeholders in the Ministry of Health, the National Department of Meteorology, and others, noted that awareness of the health risks of climate change was highly uneven across the Ministry of Health, and very low in the general

public. Stakeholders emphasized the need for and importance of advocacy to building awareness. The Ministry of Health would like to set up a dedicated climate change and health unit, but additional financial support would be needed. Other actions the Ministry of Health would like to undertake include strengthening research and development, developing more training materials for the Ministry of Health and for courses at the universities, developing videos for schools on climate change and health, and establishing a national forum on climate change and health where information can be shared across local to national levels.

4 Next steps for SEARO

Next steps are presented in relation to the key themes that were the initial focus of the review as well as those that emerged during the process of conducting the review. Many of the strategies align with more than one of the key themes.

To assist planning and resourcing, strategies are indicated as short-term [ST] – in the next 12 months to 2 years; mid-term [MT]– in the next 2–5 years; and longer-term [LT] – 5 years and beyond. Organizations responsible for managing and implementing the strategies are not nominated as it is preferable that this process is guided by national-level stakeholders to encourage ownership and sustainability of the strategies.

It is important to note that a number of these suggested strategies are relevant for sectors beyond health, given that many of the risks to health from climate change will arise via other sectors.

The main themes that emerged from this synthesis analysis of the country reports and their corresponding suggested next steps for SEARO are to:

Capacity development

- Explore opportunities to increase climate change and health training for professional staff in ministries of health and in sub-national public health and health-care organizations, college and university

staff, NGOs, and community leaders. This includes (i) identifying funding opportunities and suitable country candidates for Masters level programmes that focus on climate change and human health; (ii) securing the financial support to progress the regional roll out of the SEARO/WPRO Climate Change and Human Health Training Module that was substantially revised and updated in 2015, and (iii) promoting the availability of the soon-to-be-released UNITAR Interactive Learning Module on Climate Change and Human Health that can be studied concurrently and remotely. [ST]

- Develop climate change and health communication tools for high-risk communities (using vulnerability assessments to guide this where available). [MT]
- Develop guidance on calculating greenhouse gas emissions from health-care facilities, to use to advocate for mitigation projects. [ST]

Awareness

- Continue awareness-raising activities at regional and international fora, including highlighting the health risks of climate variability and change in the South-East Asia Region and the opportunities to manage and reduce those risks. [ST]
- Support the identification of funding and study opportunities for country officials to obtain postgraduate study on climate change and human health to strengthen and increase the cadre of climate change and health officials in SEARO countries. [ST]

Mainstreaming

- Assist Member States in revising and updating health strategies, policies and 5-year plans to incorporate considerations of the risks of and management responses to climate variability and change. [ST]
- Develop clear national priorities and targets for health adaptation based on NAPAs, national communications and additional vulnerability assessments, and integrate these into draft NEHAPs and H-NAPS and any future iterations of national environmental action plans. [ST]

Partnerships

- Support country partners to encourage the secondment of health ministry officials within the Ministry of Environment/Climate Change. [ST]

- Support country partners to encourage the secondment of environment/climate change ministry officials within the Ministry of Health and its climate change/environment unit. [ST]
- Facilitate the development of a regional Climate Change Health and Development Forum, to be held annually and to include all sectors, ministries, relevant UN agencies and development partners. The forum will showcase climate change activities (including those relevant to health) and encourage collaboration and partnerships. Peers to nominate awards for adaptation and mitigation projects in the country, as well as 'Climate Change Champions'. [ST/MT]
- Support the establishment of a community of practice among researchers and practitioners in the Region to enable better sharing of research findings and access to data on climate modeling, and the geographic distribution of climate-sensitive diseases. [ST]

Technical and financial resources

- Assist in securing the funding for and commence implementation of prioritized health and climate change projects as identified in country NAPA and national communication plans. [ST, MT]
- Identify sources of technical assistance in designing and conducting the health component of a National Adaptation Plan, including securing funding to support that assistance where needed. [ST]
- Identify sources of technical assistance for analyzing the health impacts of climate variability and recent climate change, and for projecting how risks could change with additional climate change under different development pathways.
- Assist the development of a 'Finance Compendium for Climate and Health' that outlines the main funding opportunities, providers, mechanisms and timelines. [ST, ongoing]

Infrastructure

- Develop a framework for incorporating climate-resilient design into future health infrastructure and system design, including providing guidance documents and technical assistance where needed [MT], and to identify sources of financial assistance for retrofitting existing infrastructure. [MT, LT]

Information/Knowledge

- Assist with the establishment of a Knowledge Network with membership from academics, practitioners, government officials, UN agencies and other development partners. The aims of the Knowledge Network would be to (i) act as a clearinghouse for all relevant climate and health information and resources in the region; (ii) support a mechanism for accessing experts to collaborate with and request advice from; and (iii) foster the development of cross-sectoral partnerships. [ST]
- Encourage countries within the region to link with each other for early warning systems, particularly around extreme weather and climate events to support a mutual early warning and system. [LT]
- Support the establishment of national and regional research agendas that build on and extend existing research into health vulnerability, the projected health risks of climate change and the effectiveness of adaptation responses. [ST/MT]

Governance

- Encourage country partners to explore the feasibility of health sector representation on national-level climate change committees where this does not exist. [ST]
- Support Member States to develop a reporting framework to support all ministries to report on climate change and health activities in a regular and cohesive manner, including identifying common indicators that can be used to compare progress across countries. The mechanism to support this (such as a Secretariat) should be located within a central ministry such as Finance or Treasury.
- Facilitate the health sector's representation on regional-level intergovernmental committees, including the Southeast Asia Network of Climate Change Focal Points (via UNEP). [ST]

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Appendix

Interview guide

Health and Climate Change in SEARO Member States: Evaluation of country activities and development of next steps

1. Stakeholder information - Position and Organization
2. Can you please describe the main ways your country is vulnerable to weather patterns, including extreme weather events and sea level rise? How do you think these could change over the next 25 years with climate change?
3. Can you please describe the health outcomes in your country that are sensitive to temperature, precipitation and other weather variables, including extreme events? Can you please describe the burden of these health outcomes?
4. Can you please indicate the policies and measures that your department/organization are taking (current and planned) to address these burdens? How effective are they?
5. Can you please describe how the climate-sensitive health outcomes in your country could change with climate change?
6. What do you think will be the adequacy of current and planned measures to address any changes in health burdens due to climate change? Are there any other measures that you think are needed? Yes/No
   (a) If yes, please explain in more detail
   (b) Which of these are the most important? Please prioritize
7. Does your organization partner with environmental/climate change departments or organizations? Yes/No
   (a) If yes, please indicate which ones.
   (b) How might these partnerships be strengthened?
8. In your opinion, what are the most important next steps (strategies, policies, measures) to respond to the health impacts of climate change in (Country X)?
9. Is there anything you would like to add?

A review of the work on climate change and health was carried in 10 member states of South-East Asia region between 2014 and 2015. The review explored awareness levels of the impact of climate change on health among key stakeholders and capacity of health sector to respond and adapt. The country findings were analyzed and synthesized into a regional report. The report details out status of work on climate change and health and provides directions for strengthening health adaptation to climate change in future. This report was supported by the Global Program Adaptation to Climate Change in the Health Sector implemented by the Deutsche Gesellschaft für Internationale Zusammenarbeit (GIZ) GmbH and commissioned by the Federal Ministry for Economic Cooperation and Development (BMZ).

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