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**REPORT**

# IMPACT ASSESSMENT OF CLIMATE CHANGE AND ENVIRONMENTAL DEGRADATION ON CHILDREN IN THAILAND

OCTOBER 2022



# Acknowledgements

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# Table of Contents

<b>Acknowledgements</b>	<b>iii</b>
<b>Table of Contents</b>	<b>iv</b>
<b>List of Tables</b>	<b>viii</b>
<b>List of Figures</b>	<b>ix</b>
<b>Acronyms</b>	<b>x</b>
<b>Executive Summary</b>	<b>xv</b>
<b>Chapter 1 Introduction</b>	<b>1</b>
1.1 Rationale of Study	1
1.2 Objectives	2
1.3 Conceptual Framework	3
1.4 Overview on Research Methodology	4
<b>Chapter 2 Review of impacts of climate change and environmental degradation on children</b>	<b>16</b>
2.1 Review of climate change impacts on children	17
2.1.1 Direct impacts of climate change on children	17
2.1.2 Indirect impacts of climate change on children	17
2.1.3 Impacts of climate change by hazard types	17

2.2	Review of environmental degradation impacts on children	19
2.2.1	Direct impacts of environmental degradation	19
2.2.2	Indirect impact of environmental degradation	21
2.3	Review of natural disaster impacts on children	23
2.3.1	Direct impacts of natural disaster	23
2.3.2	Indirect impacts of natural disasters	24
2.4	Review of case studies in Thailand and Southeast Asia on the effects of climate change and environmental degradation on children	26
2.4.1	Impacts of extreme events and climate change on children in Thailand	26
2.4.2	Impacts of pollution on children in Southeast Asia	27

## **Chapter 3 Assessment of Climate Change Risk on children in Thailand 29**

3.1	Development of child-sensitive climate risk map	29
3.1.1	Climate change projection	29
3.1.2	Hazard Index, Risk Index and Risk Maps	33
3.2	Linkages between climate change and child multidimensional poverty	48

## **Chapter 4 Review of Policies, Plans and Institutional Arrangements and Gap Analysis 58**

4.1	Review of key climate and environmental policies	58
4.1.1	Review of climate change policies	58
4.1.2	Review of environmental degradation policies	66
4.1.3	Review of natural disaster related policies and plans	72
4.1.4	Review of children related policies and plans	73
4.2	Summary of policy gaps	76
4.3	Review of international cooperation framework or agreements related to children, climate change and sustainability	78
4.3.1	Children's Rights to a Safe, Clean, Healthy and Sustainable Environment in the ASEAN Region	78
4.3.2	United Nations Sustainable Development Cooperation Framework	79

## Chapter 5 Child-sensitive Recommendations 81

5.1	Methodology, tools and data for identification, prioritization and selection of child-sensitive climate and environmental recommended actions	81
5.1.1	Desk research	82
5.1.2	Child-Sensitive Framework	82
5.1.3	Focus group discussion	84
5.1.4	Feasibility analysis	84
5.2	Policy recommendations for child-sensitive climate and environmental actions	86
5.2.1	Policy recommendations to reduce risks and impacts of climate change on children	87
5.2.2	Recommendations on the process and steps towards the formulation of child-sensitive climate policy	98
5.2.3	Recommendations to reduce the impacts of environmental degradation on children	99
5.3	Suggestions for future research	100

## Chapter 6 Green Jobs and Green Skills 102

6.1	Identification of green skills and potential jobs based on current policy scenarios and sectors that may be negatively affected by climate change	102
6.1.1	Definition of green jobs and green skills	102
6.1.2	Green jobs and green skills in the context of Thailand's climate change-related plans	103
6.1.3	Thai labour market, green jobs, and green skills	103
6.1.4	Education and training for green jobs and green skills	105
6.2	Evidence on green job trends from recruitment websites	106
6.2.1	Findings	111
6.2.2	Discussion of Results	113
6.2.3	Limitations of the empirical data	113
6.3	Policy recommendations on green jobs and green skills	114
6.3.1	Definition and classification of green jobs and green skills	114
6.3.2	National skills audit and responsible agencies	114
6.3.3	Education and training	115
6.3.4	Outlets for green jobs and equal-opportunities recruitment	115
6.3.5	Dialogue and partnership enhancement	115

## **Chapter 7 Stakeholder Mapping and Stakeholder Consultation** \_\_\_\_\_ **117**

7.1	Reasons for a multi-disciplinary and multi-stakeholder reference group	117
7.2	Multi-stakeholder and multi-disciplinary stakeholder consultation process	117
7.2.1	Transnational actors	119
7.2.2	Governmental organizations	120
7.2.3	Private sector	123
7.2.4	NGO and civil society organizations	123
7.2.5	Mass media	124
7.2.6	Youth groups	124
7.3	Stakeholder consultation process	125
7.4	Stakeholder mapping	126
7.5	Issues from stakeholder consultation meetings	128
7.5.1	First stakeholder consultation meeting	128
7.5.2	Second stakeholder consultation meeting	131

## **References** \_\_\_\_\_ **134**

## **Appendices** \_\_\_\_\_ **147**

# List of Tables

<b>Table 1.1</b>	General Circulation Models applied as the initial conditions and boundary conditions of RegCM4.7.1	5
<b>Table 1.2</b>	Configuration for RegCM4.7.1	6
<b>Table 1.3</b>	List of extreme precipitation indices	7
<b>Table 1.4</b>	List of extreme temperature indices	8
<b>Table 2.1</b>	Summary of environmental degradation impacts on children	22
<b>Table 2.2</b>	Summary of the impacts of natural disasters on children	25
<b>Table 3.1</b>	List of climate extreme indices used to develop the hazard maps	34
<b>Table 3.2</b>	Ten highest risk provinces under future climate change scenario RCP4.5	38
<b>Table 3.3</b>	Ten highest risk provinces under future climate change scenario RCP8.5	38
<b>Table 3.4</b>	Ten lowest risk provinces under future climate change scenario RCP4.5	39
<b>Table 3.5</b>	Ten lowest risk provinces under future climate change scenario RCP8.5	39
<b>Table 3.6</b>	Top ten provinces exposed to risk of high temperature under future climate change scenario RCP4.5	44
<b>Table 3.7</b>	Top ten provinces exposed to risk of flood under future climate change scenario RCP4.5	45
<b>Table 3.8</b>	Top ten provinces exposed to risk of drought under future climate change scenario RCP4.5	46
<b>Table 3.9</b>	Top ten provinces exposed to risk of low temperature under future climate change scenario RCP4.5	47
<b>Table 3.10</b>	Dimensions, Indicators, Cutoff, and Weights of Thailand's Child MPI	48
<b>Table 3.11</b>	Top 10 provinces with highest MPI	49
<b>Table 3.12</b>	Description of variables	51
<b>Table 3.13</b>	Summary statistics of respondents	52
<b>Table 3.14</b>	Results from the fractional logistic regression	53
<b>Table 3.15</b>	Marginal effects (dy/dx) after fractional logit	54
<b>Table 3.16</b>	Comparison of estimated coefficients under fractional logistic and OLS	55
<b>Table 4.1</b>	Strategies under the Climate Change Master Plan 2015-2050	60
<b>Table 4.2</b>	Adaptation measures under the National Adaptation Plan	62
<b>Table 5.1</b>	Examples of institutions actively engaged in providing education or raising awareness for out-of-school children in Thailand	90
<b>Table 5.2</b>	Summary of awareness raising on climate change implemented by each government agency, recommendations for government agencies and UNICEF	91
<b>Table 6.1</b>	Keywords used to collect job advertisement data	108
<b>Table 7.1</b>	Stakeholder mapping	126
<b>Table 7.2</b>	Participants in the first stakeholder consultation meeting	128
<b>Table 7.3</b>	List of participants in the second stakeholder consultation meeting	131



# List of Figures

<b>Figure 1.1</b>	Conceptual Framework	3
<b>Figure 1.2</b>	Steps to produce the risk maps	4
<b>Figure 1.3</b>	Steps to prepare the hazard index maps	10
<b>Figure 1.4</b>	Steps to prepare non-climate maps and risk maps	11
<b>Figure 2.1</b>	Global deaths in children attributed to pollution by age in 2016	19
<b>Figure 3.1</b>	Greenhouse gas emissions under different representative concentration pathways (RCPs)	30
<b>Figure 3.2</b>	Temperature projection of whole country under future climate	32
<b>Figure 3.3</b>	Hazard maps under climate change scenario RCP4.5	36
<b>Figure 3.4</b>	Hazard maps under climate change scenario RCP8.5	37
<b>Figure 3.5</b>	Maps of non-climate variables	40
<b>Figure 3.6</b>	Risk maps for selected non-climate variables under RCP4.5	41
<b>Figure 3.7</b>	Risk maps for selected non-climate variable under RCP8.5	42
<b>Figure 3.8</b>	Poverty Map for Thailand – Proportion of population living in poverty (outside municipality areas)	43
<b>Figure 4.1</b>	Total GHG emissions by sector (excluding LULUCF) in Thailand in 2016	64
<b>Figure 4.2</b>	Gaps of policies and institutional arrangements	77
<b>Figure 5.1</b>	Process for developing child-sensitive climate and environment recommended actions	82
<b>Figure 5.2</b>	Four guiding principles for developing child-sensitive actions	83
<b>Figure 5.3</b>	Key focuses of the feasibility analysis	85
<b>Figure 6.1</b>	Employment change in Thai labour market by industry, from 2015 to 2020	104
<b>Figure 6.2</b>	Process to identify trends in green jobs and green skills	106
<b>Figure 6.3</b>	Percentage of General green jobs and non-green jobs	111
<b>Figure 6.4</b>	Percentage of green jobs by sector	112
<b>Figure 7.1</b>	Main stakeholder types under this study	118
<b>Figure 7.2</b>	Stakeholder consultation process	125
<b>Figure 7.3</b>	Public Belief in the Climate Emergency Among Under-18s in Nine Countries in Asia and the Pacific	129

# Acronyms

ADHD	Attention deficit hyperactivity disorder
AR5	IPCC Fifth Assessment Report
ASEAN	Association of Southeast Asian Nations
BAU	Business as Usual
BUR	Biennial Update Report
CDD	Consecutive Dry Day or Maximum length of dry spell
CMIP5	Coupled Model Intercomparison Project Phase 5
CO	Carbon monoxide
CORDEX	Coordinated Regional Downscaling Experiment
CSDI	Cold spell duration index - Annual number of days with at least 6 consecutive days when $T_{min} < 10$ th percentile (days)
CSR	Corporate Social Responsibility
CWD	Maximum length of wet spell
CYCT	Children and Youth Council of Thailand
DCY	Department of Children and Youth
DEQP	Department of Environmental Quality Promotion
DOH	Department of Health
DTR	Diurnal temperature range - Mean difference between daily maximum and daily minimum temperature ( $^{\circ}$ C)
EC-Earth	European Consortium Earth System Model

EHS	Environment, Health and Safety
EIA	Environmental Impact Assessment
ESG	Environmental, social and governance
ETC	Electronic toll collection
EV	Electric vehicle
FD	Frost days - Number of frost days Annual number of days when $T_{min} < 0^{\circ}C$ (days)
GCMs	General Circulation Models
GCNT	Global Compact Network Thailand
GDP	Gross Domestic Products
GHG	Greenhouse gases
GRI	Global Reporting Initiative
GSL	Growing season length - Annual number of days between the first occurrence of 6 consecutive days with $T_{mean} > 5^{\circ}C$ and first consecutive 6 days with $T_{mean} < 5^{\circ}C$ (days)
GYBN	Global Youth Biodiversity Network
HadGEM2-ES	Hadley Centre Global Environment Model version 2 - Earth System Model
HNAP	Health National Adaptation Plan
ID	Icing days - Annual number of days when $T_{max} < 0^{\circ}C$ (days)
ILO	International Labour Organization
IPCC	Intergovernmental Panel on Climate Change
ISO	International Organization for Standardization
LGOs	Local Government Organizations
LULUCF	Land use, land use change and forestry
MICS	Multiple Indicator Cluster Survey
MOE	Ministry of Education
MOPH	Ministry of Public Health
MPI	Multidimensional Poverty Index
MPI-ESM-MR	Max Planck Institute Earth System Model, medium resolution
MSDHS	Ministry of Social Development and Human Security
NAP	National Adaptation Plan
NDC	Nationally Determined Contribution

## Acronyms

NESDC	National Economic and Social Development Council
NGO	Non-governmental organization
NRCT	National Research Council of Thailand
NSO	National Statistical Office
OBEC	Office of the Basic Education Commission
ONEP	Office of Natural Resources and Environmental Policy and Planning
OPHI	Oxford Poverty and Human Development Initiative
PAOs	Provincial Administration Offices
PCD	Pollution Control Department
PM2.5	Inhalable particles, with diameters that are generally 2.5 micrometers and smaller
PM10	Inhalable particles, with diameters that are generally 10 micrometers and smaller
PRCPTOT	Annual total precipitation on wet days
PSDHS	Provincial Social Development and Human Security Office
PV	Photovoltaic
QHSE	Quality, Health, Safety, and Environment
Rx1day	(Max 1-day precipitation) Maximum 1-day precipitation total (mm)
Rx5day	(Max 5-day precipitation) Maximum 5-day precipitation total (mm)
R10mm	Annual count of days when PRCP $\geq$ 10mm
R20mm	Annual count of days when PRCP $\geq$ 20mm
R95p	(Annual contribution from very wet days) Annual sum of daily precipitation > 95th percentile (mm)
R99p	(Annual contribution from extremely wet days) Annual sum of daily precipitation > 99th percentile (mm)
RCMs	Regional Climate Model
RCP	Representative Concentration Pathway
RU-CORE	Ramkhamhaeng University Center of Regional Climate Change and Renewable Energy
SAO	Subdistrict Administration Office
SD	Sustainable development
SDGs	Sustainable Development Goals
SDII	Simple daily intensity index – Annual total precipitation divided by the number of wet days (i.e., when precipitation $\geq$ 1.0 mm) (mm/day)

SEACLID	Southeast Asia Regional Climate Downscaling
SET	Stock Exchange of Thailand
SIDS	Sudden infant death syndrome
SU	Summer days - Annual number of days when $T_{max} > 25^{\circ}\text{C}$ (days)
TDRI	Thailand Development Research Institute
TEI	Thailand Environment Institute Foundation
TGO	Thailand Greenhouse Gas Management Organization
ThaiHealth	Thai Health Promotion Foundation
THSI index	Thailand Sustainability Investment Index
TLCA	Thai Listed Companies Association
TN10p	(Cool night) Percentage of days when TN < 10th percentile
TN90p	(Warm nights) Percentage of days when TN > 90th percentile
TNn	Minimum value of daily minimum temperature
TNx	Maximum value of daily minimum temperature
TR	-Tropical nights - Annual number of days when $T_{min} > 20^{\circ}\text{C}$ (days)
TSIC	Thailand Standard Industrial Classification
TSPs	Total suspended particulates
TX10p	(Cool days) Percentage of days when TX < 10th percentile
TX90p	(Warm days) Percentage of days when TX > 90th percentile
TXn	Minimum value of daily maximum temperature
TXx	Maximum value of daily maximum temperature
UNEP	UN Environment Programme
UNICEF	United Nations Children's Fund
UNFCCC	United Nations Framework Convention on Climate Change
WCRP	World Climate Research Programme
WSDI	Warm spell duration index (Annual number of days with at least 6 consecutive days when $T_{max} > 90\text{th percentile}$ (days))



# Executive Summary

From air pollution to flooding, from wildfires to increasingly severe heat waves, environmental degradation and climate change threaten the well-being of children all over the world. According to previous studies of climate and environmental impacts, the adverse impacts of climate change and pollution on children are wide ranging, affecting children physically, cognitively, psychologically, and socially. For instance, **high temperature or heat** can directly cause mortality in children through heat stroke and cardiovascular failure. **Floods** can injure and kill children, disrupt the food supply, increase the spread of disease, disrupt education as schools are damaged and closed as well as reduce access to healthcare services. **Drought** can cause water shortage and increase rate of malnutrition because of insufficient food. In addition, drought may trigger mass migration away from the drought-affected areas and may cause education disruption in school-age children. Lastly, children are more at risk from **low temperature** than adults because their bodies are smaller and tend to lose heat more quickly.

## Aims and methodology

This study aims to assess the impacts of climate change and environmental degradation on children and to assess the gaps in climate change and environmental policies in order to strengthen children's climate resilience and propose child-sensitive climate and environmental policy interventions.

This study began by reviewing related literature on the impacts of climate change and environmental degradation on children as well as related policies and plans on climate change and environmental degradation, followed by conducting a climate change impact assessment on children. This study developed climate risk maps by overlaying key climate indices and child-related non-climate indices to identify the areas within Thailand most exposed to climate impacts with high concentrations of children. The climate risk indices used to develop the risk maps were calculated from both climate and non-climate drivers. The climate drivers were based on high-resolution climate data from the downscaling of three General Circulation Models (GCMs) under two future climate change Representative Concentration Pathway (RCP) scenarios of greenhouse gas (GHG) emissions and atmospheric concentrations, air pollutant emissions and land use in the twenty-first century. While RCP4.5 is an intermediate scenario, RCP8.5 represents the scenario without additional efforts to constrain emissions. The non-climate drivers consisted of socio-economic variables closely associated with children. Once the child-sensitive climate risk indices were obtained, a regression analysis was conducted to investigate the linkages between the child-sensitive climate risk indices and child multidimensional poverty as reflected through the multidimensional

poverty index (MPI). Lastly, a multi-stakeholder consultation was conducted to engage different relevant stakeholder groups in the review of the child-sensitive policy recommendations developed for this study.

## Findings

The key results from the climate change impact assessment on children in Thailand illustrate that children living in different parts of Thailand are exposed and vulnerable to different types of climate hazard. In addition, the impacts of climate change on children are unevenly distributed across provinces, with some provinces at higher risks of climate change. This study found that the Northeastern and Southern regions of Thailand are the two regions that face the highest risk of climate change after incorporating children-related factors. The top ten provinces exposed to overall risk of climate change under the near-future time horizon and under the RCP4.5 scenario are Ubon Ratchathani, Nakhon Ratchasima, Si Sa Ket, Nakhon Si Thammarat, Narathiwat, Surin, Songkhla, Buriram, Khon Kean, and Surat Thani, respectively.

According to the regression analysis, which investigated the linkages between child-sensitive climate risk indices and child multidimensional poverty as reflected through the multidimensional poverty index (MPI), those living in the rural areas are likely to face higher risks of climate change. However, enhancing the adaptive capacity of households with children will play a crucial role in reducing their risk of climate change. Families who have more asset ownership, access to a closed piped water system, a robust housing structure, and access to banking account, tend to have higher adaptive capacity and thus facing lower overall risk of climate change.

Even though there are several policies and plans in place which aim to mitigate the risks and impacts of climate change and environmental degradation in Thailand, they do not contain measures to support climate change adaptation in the prioritized areas and lack specific measures to help reduce impacts of climate change on children. Children are treated as one of the vulnerable groups rather than a group with distinct needs of their own in relation to climate change impact.

## Recommendations

Given the key gaps and challenges highlighted above, it is important to propose policy recommendations to close these gaps. To reduce the risks of climate change on children, a good starting point might be to start with the prioritized or high-risk areas as highlighted in the child-sensitive risk maps presented in Chapter 3. The following are policy recommendations to reduce the risks and impacts of climate change on children.

- 1. Promote awareness-raising among children on climate change**
- 2. Climate-proof school, housing, and health facility infrastructure**
- 3. Develop child-friendly early warning systems**
- 4. Install essential infrastructure**
- 5. Improve access to finance to support adaptation**
- 6. Strengthen health systems and social protection**



With regards to the process and steps towards the formulation of child-sensitive climate policy, it is essential to align and coordinate climate change policies at the national and sub-national levels through a hybrid approach, i.e., a “top-down” and “bottom-up” approach. The top-down approach intends to bridge the gaps in climate and environmental policies, which rarely mention children and youth as a distinct vulnerable group. The top-down approach implies that the government agencies responsible for climate change and environmental policies, such as the Office of Natural Resources and Environmental Policy and Planning (ONEP) and the Pollution Control Department (PCD), should participate in platforms that engage children and youth so that climate change and environmental policies and plans are more child-sensitive. In addition, ONEP could utilize the information from the child-sensitive risk map in the development of measures to mitigate the risks of climate change on children and youth and in climate change planning. For instance, regions and provinces which are found to be high risk areas should receive special attention and priority. The possible channels for integrating child-sensitive recommended actions are through the process in which ONEP revises the national climate change plans, such as the Climate Change Master Plan 2015-2050 and the National Adaptation Plan. ONEP should then communicate with the related government agencies.

At the sub-national level, a bottom-up approach is crucial. Local Government Organizations (LGOs) – the Provincial Administration Offices (PAOs), Municipalities (MPs), and Subdistrict Administration Offices (SAOs) – shall play a key role in providing platform to organize stakeholders meeting to formulate the mitigation and adaptation plans that are suitable for each area to mitigate the risk of climate change, as well as to manage and implement such plans. The role of ONEP is to provide technical supports to the LGOs in analyzing the climate risk data and intervention necessary to tackle climate change risks. The Provincial Social Development and Human Security (PSDHS) in each province – the main government agency working with vulnerable groups – shall act as coordinator between provincial government agencies, and help identifying representatives of children and youth of diverse backgrounds in the individual areas to participate in the policy decision-making platforms and ensure that the child’s rights and the best interest of the child are considered and protected.

Lastly, the development of green skills is one of the mechanisms through which to prepare children and youth for future green jobs stemming from climate change mitigation and adaptation. These green skills will make today’s children and youth relevant in the future green economy, and ensure that children and youth gain, strengthen, and retain knowledge to live in the new and changing environment. Climate-change-related education and skills training – whether through formal, non-formal or informal education – are therefore crucial aspects for policy formation and implementation and should be mainstreamed. Detailed policy recommendations relating to green jobs and green skills can be found in Chapter 6.



# Chapter



# 1

## Introduction

### 1.1 Rationale of Study

From air pollution to flooding, from wildfires to increasingly severe heat waves, environmental degradation and climate change threaten the well-being of humans all over the world. Environmental degradation and climate change can have severe, far-reaching consequences on human life, affecting health, food security, and economies. While much research has been conducted on the impacts of climate change and environmental degradation in different contexts, it is becoming increasingly clear that these threats do not have equal impacts on different groups and communities, and specific policies for many vulnerable groups and communities are lacking. One such often overlooked vulnerable group is children. Climate change can have direct impacts on children and their families, causing displacement, illness and even loss of life. According to UNICEF (2021), climate and environmental shocks or stresses can also lead to the erosion of development progress, as well as the deepening of deprivation and/or humanitarian situations affecting children or vulnerable households and groups.

Due to a variety of factors which threaten children's well-being and development, they potentially face more serious consequences from climate change and environmental degradation than adults. Children are classified as a vulnerable population due to their physiological and cognitive immaturity, and dependency on caregivers for safety and protection. In addition, due to their smaller size, their bodies are physically less able to withstand and survive shocks such as floods, droughts, severe weather and heatwaves.

Children face worse outcomes due to their less developed organ and immune systems, underdeveloped cognitive function, and lower resistance to disease and toxins. Pongpiachan et al. (2015) found that, in preschool children, ingestion is a significant exposure to PM2.5-Bound Polycyclic Aromatic Hydrocarbons (PAHs) especially during a biomass burning because they often put their hands in their mouths. Ruchirawat et al. (2007) found that benzene, a carcinogenic compound found in motor vehicle exhaust emissions, is metabolized at a slower rate in children, suggesting that children are at higher risk of the toxic effects of air pollution. Furthermore, children have critical "windows of vulnerability" in which illness or other conditions can have devastating, lifelong impacts on their physical and neurological development. Another important consideration is that children will grow up in a world with worsening climate change and spend more of their lifetimes dealing with the consequences. This means children and future generations will bear the burden of actions, or inactions, taken now, without being included in the political processes shaping the policies that affect them. Lastly, children in developing countries

often face the most severe consequences of climate change, for two main reasons. First, even though climate change impacts agricultural systems globally, the effects are more acute in developing countries where the dominant source of income relies on agriculture and the natural environment, and where the nutritional status of children is insufficient to withstand changes in the price and quality of food (UNICEF, 2021). Second, while climate change impacts the health of children all around the world, the health impacts on children living in developing countries are more acute as, despite disease vectors being relatively more prevalent and widespread, these countries may lack the universal health systems required to protect children's health (UNICEF, 2021).

Based on a 2019 assessment by the National Economic and Social Development Council (NESDC) and UNICEF Thailand Country Office, with technical support from the Oxford Poverty and Human Development Initiative (OPHI), the percentage of children living in multidimensional poverty in Thailand was 21.5 per cent, with those between 0-4 being more likely to be in poverty (41.6 per cent) (OPHI, NESDC and UNICEF, 2019). The Child Multidimensional Poverty Index (MPI) for Thailand tracks deprivation according to four dimensions – education, child welfare, health and living conditions – made up of ten indicators.<sup>1</sup> Impacts of climate change and environmental degradation have the potential to worsen these dimensions, contributing to increased child poverty nationally.

Considering children's capacity in the fight against climate change, access to key essential services for children, such as health and nutrition, water and sanitation, education and social protection play a paramount role (UNICEF, 2021). Having inadequate access to health care, such as immunization, can increase a child's climate vulnerability. Moreover, children who lack adequate nutrition are more likely to face even more severe climate change impacts. With regards to water and sanitation, access to safe water, sanitation and hygiene (WASH), such as potable water supplies, effective drainage systems and working latrines can enhance children's ability to cope with the impacts of climate change. Education can also enhance children's adaptive capacity, reduce their vulnerability to climate change, and teach them the necessary skills in managing climate change risks.

Children in developing countries have less resources to prepare for and mitigate environmental damage, and their governments are less likely to respond to climate change or centre children's interests in their policies.

## 1.2 Objectives

The objectives of this research project are as follows.

1. To produce much needed data and evidence on the impacts of climate change and environmental degradation on children and fill the critical data, information and knowledge gaps in promoting child-sensitive climate and environmental policies and programmes in Thailand.
2. To assess both the current and projected impacts of climate change and environmental degradation and related climate/environmental policy measures on children in Thailand.
3. To provide actionable recommendations to the Government of Thailand and UNICEF, including possibilities for expanding public and private partnerships towards addressing the impact of climate change and environmental degradation on children and adolescents.

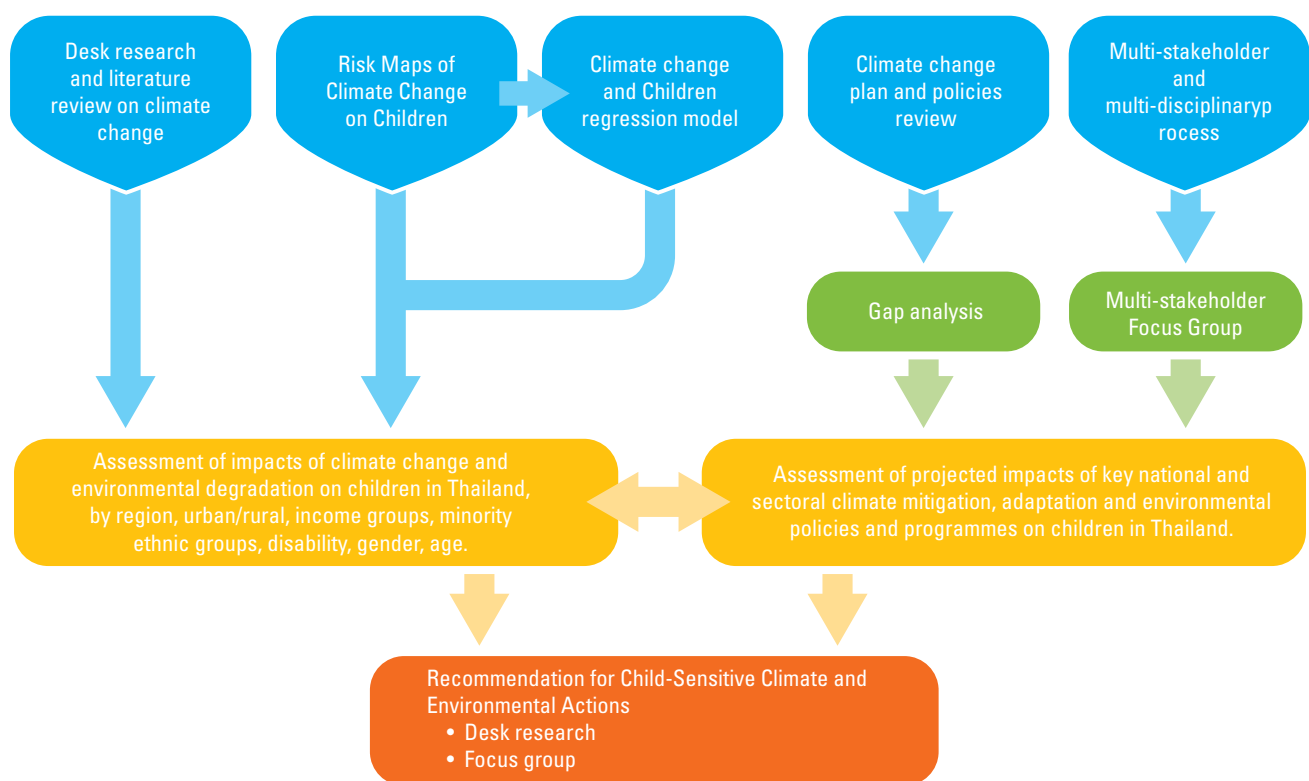
<sup>1</sup> The Child MPI has one indicator for education (learning), two indicators for child welfare (child protection and living conditions), three indicators for living standards (housing conditions, cooking fuel, asset ownership, bank account and safe drinking water), and two indicators for health (nutrition and health prevention) (OPHI, NESDC and UNICEF, 2019).

## 1.3 Conceptual Framework

This study employs a conceptual framework as shown in Figure 1.1 to assess the impact of climate change and environmental degradation on children and develop child-sensitive climate and environmental policies or policy recommendations for Thailand. This study began by reviewing related literature on the impact of climate change and environmental degradation (with a special focus on pollution) on children, followed by an assessment of climate risk, as well as analysis of climate hazard and risk indices and development of risk maps. The climate hazard and risk indices along with the risk maps are useful in identifying the high-risk provinces in Thailand. After the climate hazard and risk indices were developed, these indices were used as inputs into the regression model, which analyzed the impacts of climate change on child poverty indicators.

Estimating the regression model enabled us to investigate the impacts of climate change on selected dimensions of child multi-dimensional poverty. The above regression technique allowed analysis of whether the impacts of climate change on different dimensions of child poverty vary by region, urban/rural, income groups, gender and age of respondent.

**Figure 1.1 Conceptual Framework**



Source: TDRI

As shown in Figure 1.1, this research examined Thailand's climate change and environmental degradation plans and policies. Assessments of projected impacts of key national and sectoral climate mitigation, adaptation and environmental policies and programmes on children in Thailand were undertaken. Under this study, a multi-stakeholder consultation group was formed. Stakeholders played a crucial role in reviewing this study's policy recommendations, particularly the validity of the draft child-sensitive measures. The final output is policy recommendations focusing on child-friendly climate actions.

## 1.4 Overview on Research Methodology

This section presents an overview of methodologies used under this research project in accordance with the four tasks outlined in the Scope of Study section.

**Task 1:** Assessment of impacts of climate change and environmental degradation on children in Thailand, by region, urban/rural, income groups, minority ethnic groups, disability, gender, age.

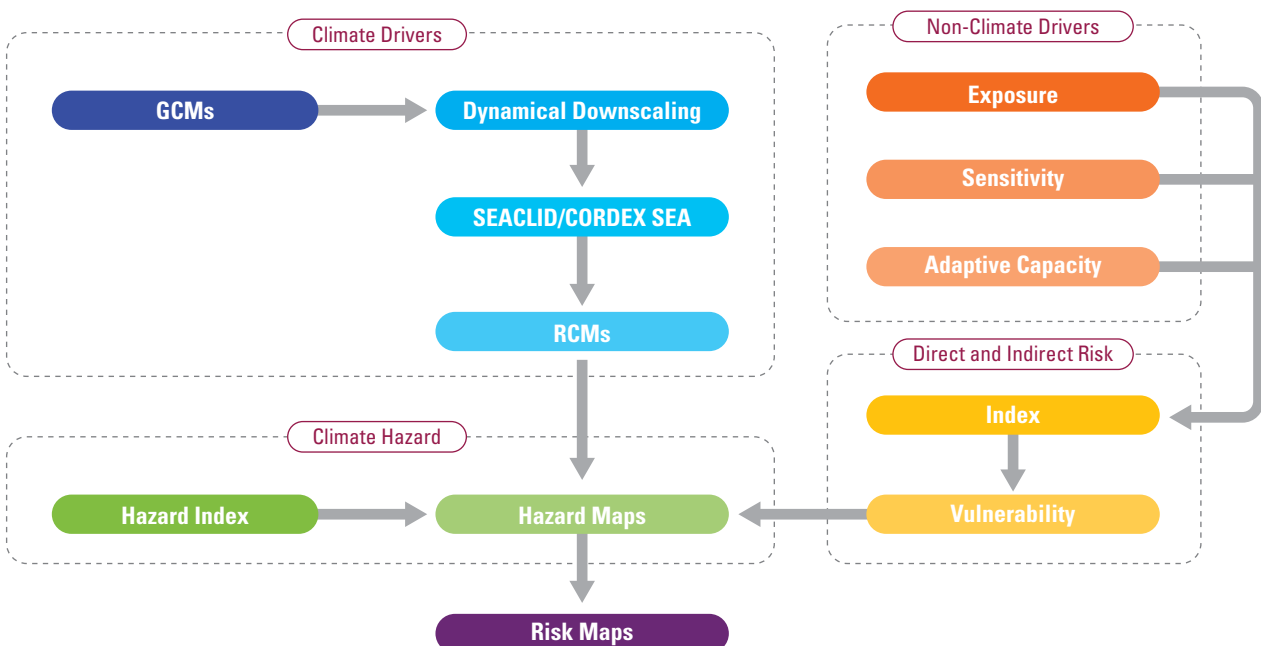
### Part 1.1 Hazard Index, Risk Index and Risk Maps

The first part of this task was to develop hazard and climate risk indices to capture the scale and severity of climate change at the provincial level in Thailand. The methodology used to produce the risk maps is similar to the recent ONEP study (<https://climate.onep.go.th/th/topic/database/riskmaps>) as illustrated in Figure 1.2.

In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change. In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards and the exposure and vulnerability of the affected human or ecological system to the hazards. Hazards, exposure, and vulnerability may each be subject to uncertainty in terms of magnitude and likelihood of occurrence, and each may change over time and space due to socio-economic changes and human decision-making (Reisinger et al., 2020).

To capture the dynamic interactions between climate-related hazards with the exposure and vulnerability, risk maps were produced. The risk maps illustrate risk indices calculated from the summation of climate hazard indexes and non-climate indices capturing exposure and vulnerability with equal weight. The climate hazard indexes and the non-climate indices were calculated from climate drivers and non-climate drivers respectively.

**Figure 1.2 Steps to produce the risk maps**



The high-resolution climate downscaling data set from the Southeast Asia Climate Downscaling/Coordinated Regional Climate Downscaling Experiment Southeast Asia (SEACLID/CORDEX Southeast Asia) Project Phase II: High-resolution Analysis of Climate Extremes over Key Areas in Southeast Asia (<http://www.rucore.ru.ac.th/seaclid-cordex-phase2>) was applied as climate drivers. The SEACLID/CORDEX-SEA simulations are based on several General Circulation Models (GCMs), Regional Climate Models (RCMs) and two representative concentration pathway (RCP) scenarios under the Coupled Model Intercomparison Project Phase 5 (CMIP5). RCP4.5 and RCP8.5 represent the medium stabilization and very high baseline GHG concentration scenario, respectively (van Vuuren et al., 2011). Most of the GCMs used in the SEACLID/CORDEX-SEA simulations were analyzed in terms of their ability to simulate basic climatology over the Southeast Asia region (Siew et al., 2014). Their output was downscaled onto a common CORDEX-SEA domain with a resolution of 25 km x 25 km. In this study, three ensemble members were selected from the SEACLID/CORDEX-SEA simulations. The three selected GCMs output applied as the initial conditions and boundary conditions of RegCM4.7.1 are listed in Table 1.1. The RegCM4.7.1 simulation used the configurations as shown in Table 1.2. The suitability of these optimal configurations was determined in an earlier sensitivity experiment involving countries in the Southeast Asia region (Juneng et al., 2016; Cruz et al., 2017; Ngo-Duc et al., 2017)

**Table 1.1 General Circulation Models applied as the initial conditions and boundary conditions of RegCM4.7.1**

General Circulation Models (GCMs)		Development Organization	Atmospheric Grid	
Abbreviation	Full name		Latitude	Longitude
EC-Earth	European Consortium Earth System Model	EC-Earth consortium	1.1215	1.125
HadGEM2-ES	Hadley Centre Global Environment Model version 2 - Earth System Model	Met Office Hadley Centre	1.25	1.875
MPI-ESM-MR	Max Planck Institute Earth System Model, medium resolution	Max Planck Institute for Meteorology, Germany	1.8653	1.875

**Table 1.2 Configuration for RegCM4.7.1**

Parameterization	Configuration
Regional Climate Model	RegCM4 version RegCM4.7.1
Domain	Latitude 14.81oS – 27.26oN Longitude 89.26oE – 146.96oE
Resolution	25 kilometre × 25 kilometre
Domain cartographic projection	Normal Mercator
Cumulus convection Scheme	MIT Emanuel
Ocean Flux scheme	Zeng Ocean model roughness formula 1
Boundary layer scheme	Holslag PBL
Moisture scheme	Explicit moisture

The non-climate drivers were socio-economic statistical data associated with children, for examples number of children by province, number of medical doctors per province, etc. Due to the constraints on the availability of socio-economic projection data, the most current statistical data were applied for non-climate drivers. A projection of non-climate variables was not used in this study.

Four types of climate-related hazards were included in this study, namely heat (high temperature), cold (low temperature), flood and drought. Note that the other hazards, such as sea level rise, wildfire, etc., were not considered under this study due to lack of availability of data on future projection of these events.

The steps taken in preparing hazard index maps, non-climate variables maps, and risk maps associated with the hazard and non-climate indexes are illustrated in Figures 1.3 and 1.4. The detailed steps in preparing the risk maps were as follows:

1. Calculate the gridded extreme precipitation and temperature indices (Tables 1.3 and 1.4) using the downscaling data set of SEACLID/CORDEX SEA with a resolution of 25 km x 25 km cover the area of the whole country.
2. Calculate the provincial average climate indices from the corresponding area average gridded extreme climate indices.
3. Normalize the provincial average climate indices using the Minimum-Maximum Normalization as shown in equation (1) to get the dimensionless indices and to ensure that the value of all indices is in the range of [0, 1]:



$$1 \quad \text{Normalized } X = \frac{(X - X_{\min})}{(X_{\max} - X_{\min})}$$

where:

X is the provincial average climate index of the certain period

$X_{\min}$  and  $X_{\max}$  are the minimum and maximum provincial average climate index over the entire study

4. Convert the direction of the normalized indices so that the higher value reflects higher level of hazard.
5. Calculate the Composite Heat, Cold, Flood and Drought-related Hazard Indices using the additive model with equal weight as shown in equation (2) and normalize the composite indices using equation (1)

$$2 \quad \text{Composite Hazard Index} = \frac{\sum_{i=1}^n \text{Normalized } X_i}{n}$$

where:

Normalized  $X_i$  is the normalized index  $X_i$   
 n is total number of index

**Table 1.3 List of extreme precipitation indices**

Indices	Clarification on Indices	Definition	Unit
<b>Intensity</b>			
Rx1day	Max 1-day precipitation	Maximum 1-day precipitation total	mm
Rx5day	Max 5-day precipitation	Maximum 5-day precipitation total	mm
SDII	Simple daily intensity index	Annual total precipitation divided by the number of wet days (i.e., when precipitation $\geq$ 1.0 mm)	mm/day
R95p	Annual contribution from very wet days	Annual sum of daily precipitation > 95th percentile	mm
R99p	Annual contribution from extremely wet days	Annual sum of daily precipitation > 99th percentile	mm
PRCPTOT	Annual contribution from wet days	Annual total precipitation from days $\geq$ 1 mm	mm

Indices	Clarification on Indices	Definition	Unit
<b>Duration</b>			
CWD	Consecutive wet days	Maximum length of wet spell	days
CDD	Consecutive dry days	Maximum length of dry spell	days
<b>Frequency</b>			
R10mm	Heavy precipitation days	Annual number of days when precipitation $\geq$ 10 mm	days
R20mm	Very heavy precipitation days	Annual number of days when precipitation $\geq$ 20 mm	days

Table 1.4 List of extreme temperature indices

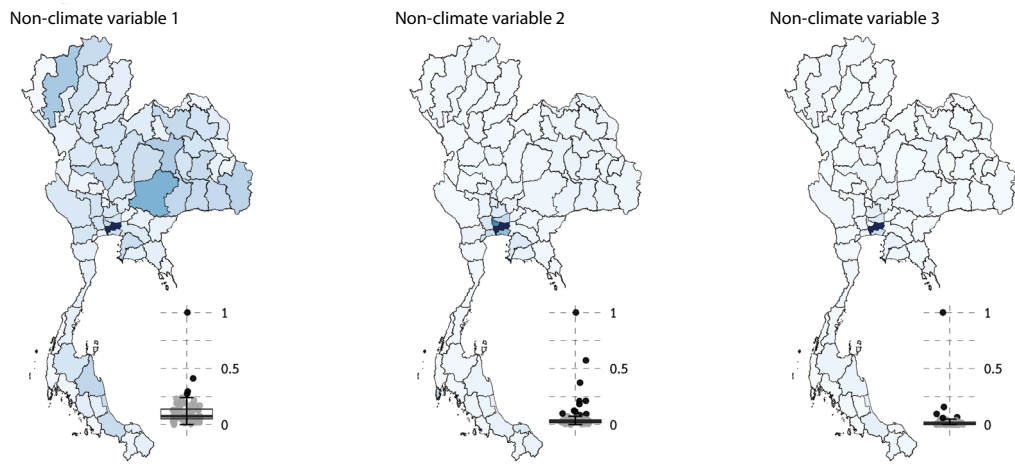
Indices	Clarification on Indices	Definition	Unit
<b>Intensity</b>			
TXn	Min Tmax	Coldest daily maximum temperature	°C
TNn	Min Tmin	Coldest daily minimum temperature	°C
TXx	Max Tmax	Warmest daily maximum temperature	°C
TNx	Max Tmin	Warmest daily minimum temperature	°C
DTR	Diurnal temperature range	Mean difference between daily maximum and daily minimum temperature	°C
<b>Duration</b>			
GSL	Growing season length	Annual number of days between the first occurrence of 6 consecutive days with Tmean $>$ 5°C and first occurrence of consecutive 6 days with Tmean $<$ 5°C. For the Northern Hemisphere, this is calculated from 1 Jan to 31 Dec while for the Southern Hemisphere it is calculate form 1 Jul to 30 Jun	days
CSDI	Cold spell duration indicator	Annual number of days with at least 6 consecutive days when Tmin $<$ 10th percentile	days
WSDI	Warm spell duration indicator	Annual number of days with at least 6 consecutive days when Tmax $>$ 90th percentile	days

Indices	Clarification on Indices	Definition	Unit
<b>Frequency</b>			
TX10p	Cool days	Share of days when Tmax < 10th percentile	% of days
TN10p	Cool nights	Share of days when Tmin < 10th percentile	% of days
TX90p	Warm days	Share of days when Tmax > 90th percentile	% of days
TN90p	Warm nights	Share of days when Tmin > 90th percentile	% of days
SU	Summer days	Annual number of days when Tmax > 25°C	days
TR	Tropical nights	Annual number of days when Tmin > 20°C	days

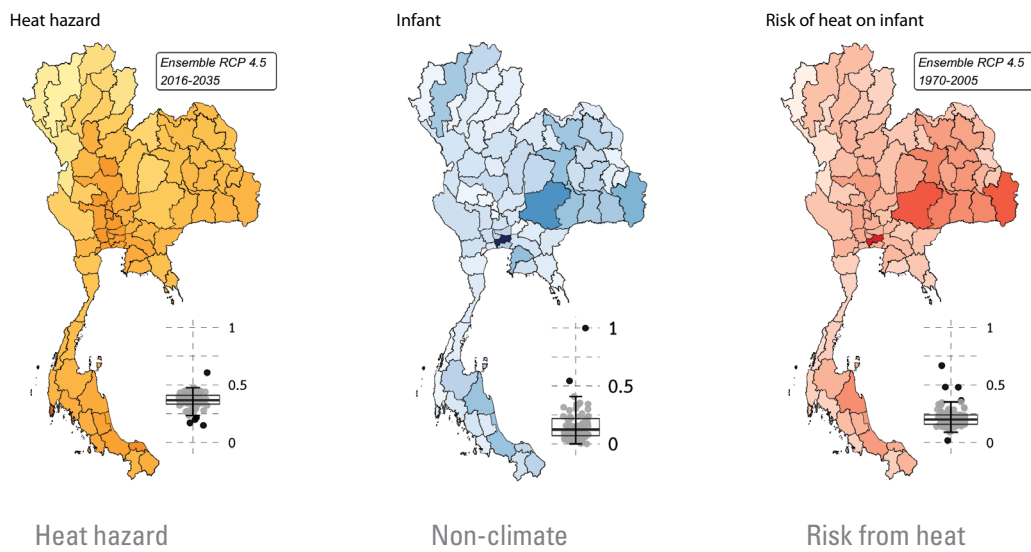
6. Prepare the composite heat-related hazard maps, composite cold-related hazard maps, composite flood-related hazard maps and composite drought-related hazard maps of each RCMs and RCPs scenario over three study periods: near-future period (2016–2035), medium-term future period (2045–2065) and far-future period (2081–2099).
7. Normalize the provincial non-climate variables associated with climate hazard using Minimum-Maximum Normalization to get the dimensionless non-climate variables and the value of each index is in the range of [0, 1].
8. Calculate the risk related to heat, cold, flood and drought hazards by adding the normalized hazard index with the normalized non-climate index and normalize the summation using equation (2).
9. Prepare the hazard maps associated with heat, cold, flood and drought.



**Figure 1.4 Steps to prepare non-climate maps and risk maps**



Calculate the non-climate variables associated with heat, cold, flood and drought hazard



## Part 1.2 Relationship between climate change, children and multidimensional child poverty

This part of the study investigated the relationship between climate change and multidimensional child poverty using the multidimensional poverty index (MPI). The Child MPI was developed basing on data from the Multiple Indicator Cluster Survey (MICS) 2015/16, and is composed of four dimensions, namely education, child welfare, living standards, and health. The Child MPI was developed under a cooperation between the NESDC and UNICEF Thailand Country Office, with technical support from the Oxford Poverty and Human Development Initiative (OPHI) and UNICEF Thailand Country Office. The climate risk index developed in Part 1.1 was used as the proxy for risk of climate change. The following regression model was estimated:

$$CR_i = \beta_0 + \beta_1 Y_i + \beta_2 C_{1i} + \dots + \beta_n C_{ni} + \varepsilon_i,$$

where:

$CR_i$	=	climate risk index or hazard index (note that hazard index or risk index is taken from province-level data; thus, they are the same for all respondents in the same province)
$Y_i$	=	different indicators for child poverty
$C_{1i}, \dots, C_{ni}$	=	control variables that affect climate risk, such as urbanization, adaptive capacity, etc.

Estimating the above regression model enabled investigation of the linkages between selected dimensions of child multi-dimensional poverty and climate risk. The data used to estimate the above regression model came mainly from two sources:

1. The climate risk data is the outcome from part 1.1, which uses data from diverse sources. The climate data set from the Southeast Asia Climate Downscaling/Coordinated Regional Climate Downscaling Experiment Southeast Asia (SEACLID/CORDEX Southeast Asia) Project Phase II: High resolution Analysis of Climate Extremes over Key Areas in Southeast Asia (<http://www.rucore.ru.ac.th/seaclid-cordex-phase2>) was applied in this project. Downscaling data sets from three General Circulation Models (GCMs) under Coupled Model Intercomparison Project Phase 5 (CMIP5), including the European community Earth-System Model (EC-Earth), Hadley Centre Global Environmental Model, version 2 (HadGEM2-ES) and Max Planck Institute for Meteorology Earth System Model (MPI-ESM-MR), were used to analyze future climate projection.
2. Data on multidimensional child poverty indicators came from the Multiple Indicator Cluster Survey (MICS) 2015/2016.

## Part 1.3 Desk research and literature review

In addition to the aforementioned methodology, the research team also reviewed related literature and studies in other countries, which analyzed the impact of climate change and environmental degradation on poverty levels and on children.

For the projected impacts of climate change and linkage with child multidimensional poverty in Thailand, the analysis used data from the future climate projection research conducted by Dr. Jerasorn Santisirisomboon at RU-CORE, Ramkhamhaeng University. Once the climate change impact assessment was completed, the research team verified the findings with experts and stakeholders via an online meeting.

**Task 2:** *Assessment of projected impacts of key national and sectoral climate mitigation, adaptation and environmental policies and programmes on children in Thailand*

For this task, a review was conducted of key climate and environmental policies, plans and programmes, such as Thailand's Nationally Determined Contributions (NDCs), Climate Change Master Plan, and National Adaptation Plan (NAP). As a part of the review process, this research identified whether these plans, policies and programmes sufficiently recognize children's vulnerability to climate change and environmental degradation and identified gaps in the climate mitigation, adaptation, and environmental policies in addressing the risks faced by children in Thailand. Once gaps in plans, policies and programmes were identified and impacts were analyzed, a stakeholder consultation workshop was organized to consult and verify the findings with experts. Due to the COVID-19 situation, the stakeholder consultation workshop took place online.

This research also explored the changing landscape of green skills and green jobs by reviewing related policies and plans, especially those related to climate change, Bio-, Circular and Green (BCG) economy, transition to low-carbon economy and green growth, as well as related literature on green jobs and green skills. By reviewing related studies, this research highlighted the jobs and industries that may be negatively affected by climate change, while also identifying potential employment opportunities which could be created in the transition towards a low-carbon or green economy. This research also identified relevant green skills and green jobs that are more likely to have an impact on youth and children. Finally, this research conducted an analysis of key stakeholders and partners who can address these impacts, including central and local government agencies, private sector and youth networks and influencers, in order to identify ways to seize opportunities for child-sensitive climate actions.

**Task 3:** *Produce recommendations for child-sensitive climate and environmental actions*

Children are one of the most vulnerable groups of population facing the impacts of climate change. Yet, national adaptation plans and policies often do not adequately address the interests and needs of children. This project generated a set of child-sensitive climate and environmental actions grouped around the following four principles taken from a study by UNICEF (2019):<sup>2</sup>

<sup>2</sup> UNICEF (2019), "Are climate change policies child-sensitive? A guide for action," <https://www.unicef.org/media/62956/file/Are%20climate%20change%20policies%20child-sensitive?.pdf> (accessed on 9 September 2021).

### 1. Ambitious and urgent

Policymakers need to set ambitious goals and take urgent actions to mitigate the worsening impact of climate change on children's lives. Adaptation measures need to take the children's best interest into account to prevent foreseeable risks.

### 2. Rights-based

Very often, children's perspectives and needs are not consulted or included in national plans. However, addressing climate change involves long-term teamwork, and children and youth should be considered as right holders who are capable to take part in adaptation and mitigation plans.

### 3. Holistic and multi-sectoral

As children face various well-being challenges from climate change, including, but not limited to health, education, nutrition and social protection, climate adaptation policies must address children's needs and include sectoral interventions.

### 4. Inclusive

Children of all ages, genders, and social backgrounds should be included in the consultation process. This will help empower them with the knowledge and tools to properly address climate change.

In terms of methodology used to carry out Task 3, this study employed two main research tools to generate the child-sensitive climate and environmental actions.

1. **A literature review** of existing research and study relating to child protection and development, as well as climate adaptation, was conducted. Current relevant national policies and plans were reviewed to discover how children can participate more actively and concretely in the decision-making mechanism of national climate and environment actions. A draft of child-sensitive measures to reduce exposure and vulnerability of children, and to accelerate and improve the outcomes of climate mitigation, was also constructed based on findings from the literature review.
2. **Two focus group discussions (FGDs)** with stakeholders were organized. Participants included representatives of children such as the Children and Youth Council of Thailand (CYCT), and representatives from government agencies such as the Department of Children and Youth (DCY), and Ministry of Social Development and Human Security (MSDHS). The main objectives of the FGDs were to test the validity of the draft child-sensitive measures, and to identify and prioritize the recommended actions for all stakeholders.

#### *Task 4: Multi-stakeholder and multi-disciplinary consultation process*

This research involved the consultation and dissemination of key findings with identified stakeholders. This process engaged diverse groups of stakeholders with different expertise and interests related to different facets of climate change, environmental degradation and/or children and youth. Details of the stakeholder mapping and stakeholder group are contained in Chapter 7 of this report. Due to the COVID-19 situation, the stakeholder consultation process and meetings were conducted online.





ส่วนงานตรวจตรา

รักษา

# Chapter



# 2

## Review of impacts of climate change and environmental degradation on children

Climate change is defined as a change in the condition of the climate that may be identified by changes in the mean and/or variability of its properties over time, usually decades or more (IPCC, 2018). Natural internal processes or external forces such as solar cycle modulation, volcanic eruptions, and persistent anthropogenic changes in the composition of the atmosphere or land use may all contribute to climate change. Climate change has many biophysical consequences, such as changing rainfall patterns, increased frequency, intensity, and duration of extreme weather events, sea level rise, and ocean acidification. Floods, typhoons, drought, and extreme temperature are increasing in frequency and severity as a result of climate change. From crop failures to post-traumatic stress to war, climate change creates new problems and exacerbates existing ones (Sheffield, 2011). While much research has been conducted on the impacts of climate change in different contexts, it is becoming increasingly clear that these threats do not have equal impacts on different groups and communities, and specific policies for many vulnerable communities are lacking (Bennett & Friel, 2014). One such often overlooked group is children, hereby defined as people under the age of 18, as stated in the Convention on the Rights of the Child.

Environmental degradation is defined as the deterioration of the environment caused by resource depletion, including air, water, soil, animals, and all other living and non-living elements on earth, as well as contamination and introduction of toxic elements, changes in composition, etc. Because of its impact on living things, this issue has become one of the most pressing concerns of all humans in recent decades. Land, water, and air pollution, water scarcity, and biodiversity loss are examples of environmental degradation. Environmental degradations are caused by or the result of several factors, among which is human activity (Maurya et al., 2020). Human activities such as modern urbanization, industrialization, overpopulation, and deforestation result in increased environmental degradation, which has a number of consequences for humans.

Developing countries face more severe weather threats and have less resilience to cope with the impact (Lawler and Patel, 2012). The following literature review provides an overview of studies on the impacts of climate change on children, environmental degradation on children, and the impacts of natural disasters on children.

## 2.1 Review of climate change impacts on children

### 2.1.1 Direct impacts of climate change on children

Children are vulnerable to multiple types of hazards due to their smaller size, potentially weaker immune system at an early age (UNICEF, 2016), physiological and cognitive immaturity, and dependency on caregivers for safety and protection (Bennett & Friel, 2014). With regards to children's vulnerability to climate change, children potentially face more serious consequences, both from facing higher risks and worse outcomes than adults in general threats (such as heatwaves) and threats unique to their wellbeing and development, such as missing school (Leffers, 2022).

In terms of development, children have critical "windows of vulnerability" during gestation and early childhood, when the immune and central nervous systems are developing and any health disruptions such as malnutrition can have devastating lifelong effects (Walker, 2007). Behaviourally, children are more likely to play outside, being exposed to heat and pollutants, playing on the ground and putting their hands in their mouths, creating pathways for chemical and microorganism exposure (Pongpiachan, 2015). Socially, a child's vulnerabilities to the adverse impacts of climate change are highly dependent on context, most of which are outside the child's control; for example, where the child was born, raised, and educated. Poor children in rural areas of developing countries experience the highest risk, as they are less likely to have access to adequate healthcare, resources for recovery after a natural disaster, and limited social safety nets, among other factors.

### 2.1.2 Indirect impacts of climate change on children

Children are also susceptible to the indirect impacts of climate change. According to Akresh (2016), examples of indirect impacts of climate change on children include food shortages, economic dislocation, and forced migration. Children's education can also be interrupted when schools are destroyed by extreme weather events or families can no longer afford to send their children to school. For examples, flooding and droughts in India, Indonesia, Mongolia, Nicaragua, Pakistan, and Uganda resulted in significant declines in school attendance, some of which lasted a decade (Plan International, 2015). Gibbons (2014) found that the impacts of climate change on children's education is higher among girls than boys since girls' education tends to be less highly valued in many parts of the world. Furthermore, climate-induced forced migration leads to a range of symptoms of trauma and problems with adjustment (Pfefferbaum et al., 2016; Burke, Sanson and Van Hoorn, 2018; Sanson et al., 2018).

### 2.1.3 Impacts of climate change by hazard types

#### 2.1.3.1 Impacts of high temperature and heat on children

Rising temperatures can directly cause mortality, such as through heat stroke and cardiovascular failure, and are especially dangerous to fetuses and children. Basu (2008) found that a 4.7°C increase in mean daily apparent temperature increased mortality in infants under 1 year old and children under 5 years by 4.9 per cent and 4.2 per cent, respectively, while there were no significant changes in adult mortality rates (aged 18–64 years). There is evidence to suggest that children are more susceptible to heat-related illnesses due to their greater surface area to body mass ratio, lower rate of sweating, and slower rate of acclimatization (Bytomski, 2003). According

to a study by UNICEF (2015), exposure to abnormal or prolonged amounts of heat and humidity without relief or adequate fluids can cause various types of heat-related illnesses. The health effects of heatwaves include heat rash, which is prevalent in young children, as well as heat-related cramps, exhaustion and stroke. Children and adolescents with chronic health conditions, such as respiratory conditions and those who take certain medications, may be even more susceptible to heat-related illnesses. During heatwaves, studies have shown that children under 12 months old are particularly vulnerable (Basagaña et al., 2011; Xu et al., 2012). Infants and small children are more likely to die or suffer from heatstroke because they are unable to regulate their body temperature and lack agency to control their surrounding environment.

Furthermore, infants' bodies are naturally evolved to conserve heat, which may make infants more vulnerable to thermal stress. Fleming, Azaz and Wigfield (1992) linked high heat to sudden infant death syndrome (SIDS) and brain trauma. Behaviourally, children are generally more likely to be outside, less able to regulate their own schedules to avoid heat and may not recognize signs of heat illness. Indirectly, hotter days reduce learning and productivity, which impacts education and income levels as an adult.

Some studies have investigated the impacts of climate change, especially temperature, on sedentary behaviour. Existing research has found that higher temperatures at the extremes (i.e., too hot or too cold) are associated with reduced physical activity (Matthews et al., 2001; Quante et al., 2017; Edwards et al., 2015), suggesting that sedentary behaviour increases when temperatures are too high or too low.

### 2.1.3.1 Impacts of floods on children

Floods are highly dangerous and can result in injury or death. In addition, floods may also disrupt the food supply, increase disease spread, and reduce access to medical care. Socially, floods may disrupt education as schools might be damaged and closed, or children may have to relocate to a different school. Meanwhile, families may be forced to evacuate and live in temporary accommodation, and family tensions at home may be exacerbated by flood-related financial worries and the fear of recurring disaster (Walker et al., 2010, Whittle et al., 2012; Mort et al., 2016). Mort et al. (2018) found that children's relationships with space and place are severely challenged following evacuation from home, including loss of agency, friendship networks and familiar space.

The disruption that floods can cause to children's homes, schools and friendship networks can have a significant impact on children's physical and emotional health (Whittle et al., 2012).

They also experience distress, anxiety and disillusionment with societal responses to floods. Flood risk committees and recovery agencies should consider children's ongoing needs following evacuation. Young people are citizens who already contribute to community flood responses and deserve to be more explicitly consulted and included in the development of flood risk management.

### 2.1.3.2 Impacts of drought on children

According to Save the Children (2022), drought can affect children in several ways. Firstly, drought can cause water shortages and increase rates of malnutrition due to insufficient food. Young children are particularly susceptible to undernutrition when households experience food insecurity because nutritional deficiencies affect their growth and development. Secondly, drought may trigger mass migration away from drought-affected areas. Thirdly, drought may disrupt the education of school-aged children.

## 2.2 Review of environmental degradation impacts on children

Environmental degradation has negative effects on many countries around the world. Examples of environmental degradation include waste, land, water, and air pollution, and biodiversity loss. These environmental degradation problems are caused by several factors, including human activities such as modern urbanization, industrialization, overpopulation, and deforestation. This following section provides a review of research on the impact of environmental degradation on children in many countries, divided into direct and indirect impacts of environmental degradation on children.

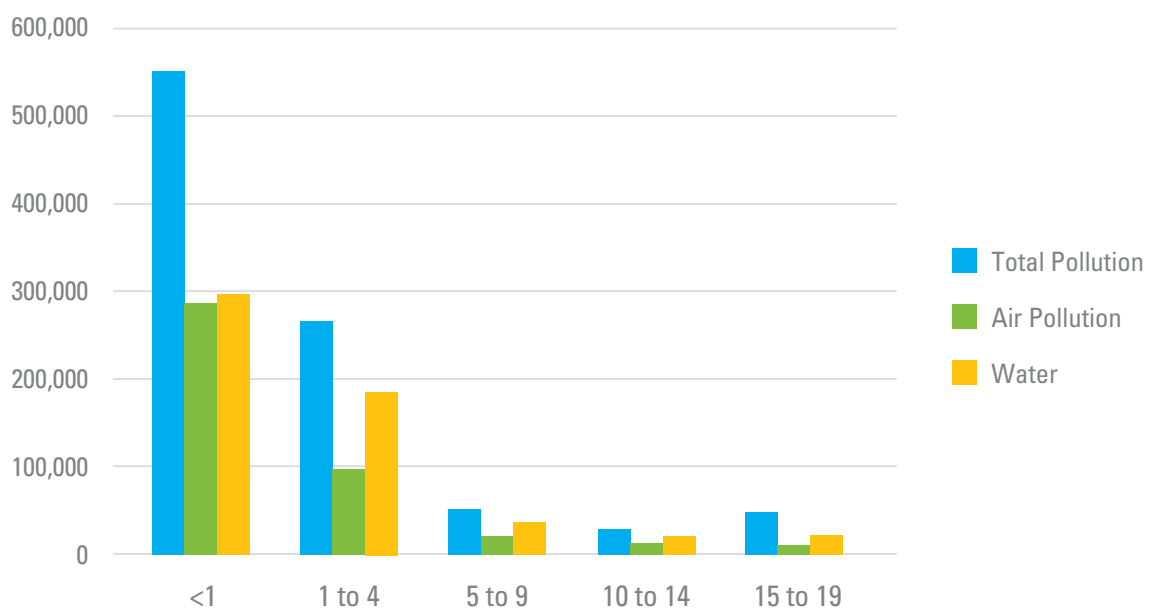
### 2.2.1 Direct impacts of environmental degradation

Pollution is among the types of environmental degradation that has high impacts on children. Pollution can be divided into three categories, namely air pollution, water pollution, and waste. Environmental pollutants can be mixed with house dust and indoor air, contaminating water and food. Early childhood exposure to pollution significantly impacts later-life health and human capital outcomes (Currie et al., 2014).

#### 2.2.1.1 Physical impacts

Children have less developed immune systems and organ systems, which means they are less able to fight infections (Trentacosta et al., 2016). Consequently, air pollution and water pollution can lead to mortality in children. Landrigan et al. (2017) found that, in 2016, most deaths in children under 5 years globally were attributed to respiratory and gastrointestinal diseases, caused by air and water pollution (Figure 2.1).

**Figure 2.1 Global deaths in children attributed to pollution by age in 2016**



Source: Landrigan et al. (2017) cited in Landrigan et al. (2019)

**Regarding air pollution,** a study by UNICEF (2016), which used satellite imagery of outdoor air pollution, found that around 300 million children around the world currently live in areas where outdoor air pollution exceeds international guidelines by at least six times. In total, around 2 billion children live in areas that exceed the World Health Organization (WHO) annual limit of 10 µg/m<sup>3</sup> (the amount of micrograms of ultra-fine particulate matter per cubic meter of air that constitutes a long-term hazard).

Compared to adults, children's developing bodies are more vulnerable to pollutants. Health impacts associated with air pollution include increased mortality risk, adverse respiratory health, cardiovascular diseases, and cancers (Manisalidis et al., 2020). Children's exposure to toxins during this sensitive developmental period produces permanent neurological impairment (Porterfield, 1994). Children's lungs are also more vulnerable to air pollutants, causing respiratory symptoms, lung damage (WHO, 2005) and aggravating asthma (Perera et al., 2019). According to UNICEF (2016), exposure to elevated levels of air pollutants, such as carbon monoxide, is associated with reduced cognitive functioning and ability.

Coneus and Spiess (2012) examined the impact of outdoor pollution and parental smoking on an infant's health. The findings suggest a significant negative impact from particular pollutants. High prenatal exposure to CO causes, on average, a 289g lower birth weight, and ozone levels affect respiratory diseases such as bronchitis. Moreover, Sneeringer (2009) found that the impact of air pollution caused by doubling livestock production is associated with a 7.4 per cent increase in infant mortality driven by respiratory diseases.

Chay and Greenstone (2003a, 2003b) investigated the link between total suspended particulates (TSPs) and infant health in the United States. They analyzed the county's TSP changes from the 1970 Clean Air Act to estimate the impact on infant mortality rates. They found that a 1 per cent reduction in TSPs results in a 0.5 per cent decline in the infant mortality rate, which implied that roughly 1,300 infant lives would have been lost in 1972 without the Clean Air Act. In another study, Chay and Greenstone (2003b) evaluated the TSP variation induced by the 1981–1982 recession's impact on infant mortality. They discovered that a 1 per cent reduction in TSPs results in a 0.35 per cent decrease in infant mortality. The analysis also revealed a nonlinear effect of TSP pollution.

Arceo, Hanna and Oliva (2012) evaluated the effect of pollution on infant mortality in a developing country in which a higher level of air pollution is expected. They found that 1 part per billion increases in CO over the previous week results in 0.0032 deaths per 100,000 births, and 1 g/m<sup>3</sup> increase in PM<sub>10</sub> results in 0.24 infant deaths per 100,000 births. This evidence is in line with Chay and Greenstone (2003b), suggesting a nonlinear relationship between pollution and infant mortality. Children who are more exposed to higher levels of carcinogenic air pollutants from transportation combustion, such as those who live in cities with traffic, have an increased risk of health effects (Ruchirawat et al., 2007). Currie and Walker (2011) studied the effect of the introduction of electronic toll collection (ETC), which reduces traffic congestion and vehicle emissions, on infant health. They looked at mothers' proximity to a toll plaza on infant outcomes and found a reduction in prematurity and low birth weight of 10.8 per cent and 11.8 per cent after ETC's introduction, respectively. This finding replicates the adverse impact of CO and automobile congestion on infant mortality in the literature (e.g., Currie and Neidell, 2005; Currie et al., 2009b; Knittel et al., 2016).

**Regarding water pollution,** freshwater scarcity and contaminated water can also affect children's health. Landrigan et al. (2019) investigated the effect of pollution on children's health. Since children are more vulnerable to the impact of pollution and drink more water each day than adults on a per-kilogram body-weight basis, they are expected to have greater exposure to environmental pollution. Landrigan (2019) indicates that water pollution could lead to diarrhoea, pneumonia, and other infectious diseases in children. According to Owa (2013), over a hundred children die from diarrhoea every day in India, as well as many other countries. Similarly, Pandey (2006) claims that thousands of young people die every day from diarrhoea, cholera, malaria, and other WASH-related diseases as many people around the world continue to lack access to safe drinking water.

**Regarding waste,** Currie, Greenstone and Moretti (2011) studied the impact of hazardous waste on infant health by comparing the birth outcomes before and after a site cleanup. The researcher found a 20–25 per cent increase in congenital anomalies risk for those who live within 2,000 meters of distance. Huo et al. (2007) compared blood lead levels (BLLs) in children aged 1-6 who lived in Guiyu, China’s electronic waste recycling town, with those who lived in Chendian, China’s neighboring town. They discovered a link between child BLLs and the number of e-waste recycling facilities. When compared to children in neighbouring towns, children who live near electronic waste recycling towns have higher BLLs. This increased lead contamination in children’s blood could eventually result in serious health problems. The impact of e-waste on children’s health was also found to be similar by Zeng et al. (2016a) and Wang et al. (2012). According to Zeng et al. (2016), heavy metal exposure has negative effects on children’s health, including lower birth weight and current weight, lung function, hepatitis B surface antibody levels, attention-deficit/hyperactivity disorder (ADHD) prevalence, and DNA and chromosome damage. Wang et al. (2012) also discovered that children who grow up in an e-waste recycling environment have higher BLLs than children who grow up in other environments.

### 2.2.1.2 Cognitive and psychological impacts

Beyond the health effects of early-life pollution exposure, studies have shown neurodevelopmental deficits caused by childhood exposure to environmental toxins. For instance, van Wendel de Joode et al. (2016) assessed the adverse effects of pesticide exposure and found it to be associated with poorer cognitive abilities (e.g., working memory and visual-motor coordination), oppositional disorders, and ADHD. Similarly, Bellinger (2008) claimed that increased childhood lead exposure is associated with neuropsychiatric disorders such as ADHD and antisocial behaviour. Needleman et al. (1979) found that children with high dentine lead levels perform significantly worse on intelligent tests. Wang et al. (2002) also found that blood lead concentrations are associated with poorer learning achievement among primary school children in Taiwan even when socioeconomic status was ruled out. In addition, UNICEF’s 2016 study also highlighted that inhaled ultrafine particles, such as PM2.5, are so small that they can enter the bloodstream, and recent medical research indicates that this can cause the degeneration of blood-brain barriers, leading to oxidative stress, neuroinflammation and damage of neural tissue. As these blood-brain barriers are still developing in children, studies show that their tissue could be less resistant and more vulnerable, potentially affecting their cognitive development.

## 2.2.2 Indirect impact of environmental degradation

### 2.2.2.1 Social and educational impacts

Adverse respiratory health, as indicated by increased hospital admissions, causes school absenteeism, educational underachievement, and increased medical care costs. Gilliland et al. (2001) studied the relationship between ozone, nitrogen dioxide, PM10 (small particles found in dust and smoke) and school absenteeism in 4th-grade children in California. Their results show that a small change in ozone concentration in the short term could lead to an increase in respiratory illness, leading to school absences in children aged 9–10 years. Similarly, Miller and Vela (2013) found that ozone and PM10 are related to a reduction in children’s test scores in Chile, due to respiratory illnesses, fatigue, absenteeism, and attention problems. Currie et al. (2009a) also investigated the relationship between air pollution and school absences. Using schools’ administrative data, they found that higher levels of carbon monoxide, even when below federal air quality standards, significantly increase absences.

Bharadwaj et al. (2017) examined the relationship between fetal exposure to air pollution and fourth-grade test scores. They found a significant negative effect of carbon monoxide and correlated pollutants (e.g., PM10) on math and language performances. Sanders (2012) investigated the impact of prenatal TSP exposure on educational

outcomes (similar to Chay and Greenstone, 2003). The research found that lower TSP levels in a students’ year of birth was associated with an increase in high school test performances.

Since cognitive performance is important in many occupations, high pollution levels may lower productivity and human capital. Isen et al. (2017) explored the difference in outcomes between cohorts born in counties in the USA before and after significant air quality improvements and no improvements counties cohorts from the 1970 Clean Air Act. They found that a higher pollution level in the year of birth is associated with lowered workforce participation and earnings.

Table 2.1 provides a summary of the environmental degradation impacts on children, divided into direct impacts (physical, cognitive and psychological impacts) and indirect impacts (social and educational impacts).

**Table 2.1 Summary of environmental degradation impacts on children**

<b>Direct Impacts</b>	Physical impact – mortality and illness
	Cognitive and psychological impact
<b>Indirect Impact</b>	Social impacts
	Educational impacts
	Economic impacts – pollution increases household’s health expenditure thus cutting expenditure on other dimensions and reduces future labor productivity of children
	Impacts on food security - pollution can cause crop damage and affect food quality and security.



## 2.3 Review of natural disaster impacts on children

Natural disasters have the potential to pose a significant threat to people's property, safety, health, and a country's critical infrastructure and homeland security. Natural disasters include all types of weather and have a variety of occurrences, for example, flood, drought, storm, wildfire, earthquake, and any combination thereof (U.S. Department of Homeland Security, n.d.). Children are at higher risk than other age groups in terms of encountering disasters (IFRC, 2020a). Socially, a child's vulnerabilities to the adverse impacts of natural disaster are highly dependent on contextual factors – for example, where the child was born, raised, and educated – most of which are outside of the child's control (Kousky, 2016). More than half a billion children worldwide live in extremely high flood zones and 160 million young people live in extremely high drought severity areas (UNICEF, 2019a). This section explores the direct impacts and indirect impacts of natural disasters.

### 2.3.1 Direct impacts of natural disaster

#### 2.3.1.1 Physical impacts

Physically, natural disasters can injure and kill children. In addition, saltwater intrusion from a rise in sea level and the decreased availability of fresh water in some areas can lead to water contamination and water scarcity (UNICEF, 2011). Rising temperatures and more frequent floods and droughts also influences the ecology of disease transmission by insects, such as mosquitoes which are an insect vector of malaria, and tend to be more active in warmer temperatures (Shuman, 2010). Meanwhile, heatwaves, rising surface temperatures and a reduction in the ability of vegetation to absorb ozone, can lead to lower air quality and heat-related deaths (IFRC, 2020b).

#### 2.3.1.2 Cognitive and psychological impacts

Children's mental health may be affected in the aftermath of natural disasters known as post-disaster trauma (Kousky, 2016). Symptoms can include hypervigilance; recurring thoughts about the disaster; difficulty in concentrating and sleeping; and depression and anxiety symptoms such as fear, worrying about safety, and losing interest in activities (Lai and La Greca, 2020). Kousky (2016) also found that, mentally, children may be traumatized by their experience of the disaster event and suffer from grief because of being separated from their parents, and stress as a result of migration and breakdown in social networks and local economies. The post-disaster mental stress can be harder on young people because they have less experience coping with difficult situations, feel less able to control events, and understand less about the situation; it can also be harder for children who already have experienced trauma in the past (Centers for Disease Control and Prevention, 2020b). Senarath (2021) studied the post-disaster effect of the 2004 tsunami in Sri Lanka on children's psychological health. All students reported that whenever they hear the tsunami alarm, even a false one, it automatically re-traumatizes them and reminds them of the period when they temporarily stayed at temples or in small huts. Approximately 73 per cent of all samples reported psychological symptoms, for instance loss of appetite, loss of interest in hobbies, insomnia, and headaches as the consequence of the tsunami. Another study showed that children who encountered a tsunami in India were still experiencing emotional suffering a year later (Bhushan and Kumar, 2007).

### 2.3.1.3 Social and educational impacts

Climate-related shocks and natural disasters might interrupt children's education and cause opportunity loss to attend schools. In Ivory Coast, the school enrolment rate of children aged 7–15 years in areas that had experienced rainfall shocks declined approximately 20 percentage points which is more than a third of the original rate (Jensen, 2000). In Mexico, during the six-month period after disasters other than drought, the school enrolment rate dropped by 3.2 percentage points. Students who withdrew from schools often incurred a re-entry cost, especially at secondary level (De Janvry et al., 2004). Moreover, classroom materials might be damaged or lost after the occurrence of a natural disaster. In the aftermath of floods in Cambodia, more than 4,000 textbooks were lost (UNICEF, 2019b). After the cyclone Komen incident in 2015 in Myanmar, 4,116 schools were damaged, while 608 schools were destroyed (Save the Children, 2016). In Sri Lanka, the aftermath of the tsunami in 2004 affected more than 350,000 children in 650 schools. Over 182 schools in Sri Lanka were completely destroyed by tidal waves (Senarath, 2021).

## 2.3.2 Indirect impacts of natural disasters

### 2.3.2.1 Educational and social impact

Natural disasters can harm children indirectly via the impact on the adults and support systems in their lives. This can include parents and adults whose jobs are based in child-centred settings such as teachers, caregivers and nannies (Lai and La Greca, 2020). Findings from India demonstrate that being born to a mother who experienced natural disasters during pregnancy can affect a child's future vocabulary development by age of 5, as well as impact basic mathematical skills and socio-emotional skills such as self-efficacy and self-esteem (Chang, Novella, and Favara, 2020). According to a study in West Pokot, Kenya, which experienced a long period of drought, a third of female pupils in the upper classes of Kapsmatia primary school had to miss school daily to search for water for domestic use with their parents, as illustrated in the photo below (Chai, 2019).

In terms of the impacts on livelihood and income, natural disasters can damage crops, reduce crop yields, and lower the income of agricultural households. If families are struggling financially, children may be forced by parents to miss school to help the household earn extra income (Kousky, 2016). Evidence from Vietnam suggests that this trend is particularly notable among secondary school students. Children and families in low-income areas are particularly vulnerable as social safety nets may be unavailable or inaccessible. Furthermore, if jobs and livelihood opportunities in the area are affected, households might decide to migrate to other areas, as took place in Vietnam during the occurrence of El Nino during 2015 to 2016. Attending classes in a different school can affect academic performance because students might not be familiar with the new environment or curriculum (Battistella and Conaco, 1998; Kandel and Kao, 2001).

Table 2.2 provides a summary of the impacts of natural disasters on children, divided into direct and indirect impacts.

**Table 2.2 Summary of the impacts of natural disasters on children**

<b>Direct Impacts</b>	Physical impacts – impacts on health
	Cognitive and psychological impacts
<b>Indirect Impact</b>	Educational impacts – missing school to earn income
	Social impacts – forced migration and moving neighbourhood and school
	Nutritional impacts and food security – crop damages
	Impacts on food security - pollution can cause crop damage and affect food quality and security.

## 2.4 Review of case studies in Thailand and Southeast Asia on the effects of climate change and environmental degradation on children

### 2.4.1 Impacts of extreme events and climate change on children in Thailand

#### 2.4.1.1 2011 floods

The 2011 floods in Thailand were devastating, affecting roughly 13 million people, and costing \$46.5 billion in damages (Stoklosa et al., 2021). Following the floods, children from both Thai and migrant families were found to be more vulnerable. Risk factors for children included separation from their parents, closed schools, and exposure to unfamiliar situations. Children from migrant families faced even greater challenges due to language barriers, economic status, discrimination, and parental unemployment due to unregulated markets (Stoklosa et al., 2021). Children who were separated from their families, left alone or without a caregiver, and/or unable to attend school, were more vulnerable to human trafficking and potentially at risk of psychologically traumatic experiences (Montgomery, 2011; Myles et al., 2018; Rigby, 2011).

#### 2.4.1.2 Drought

Drought is one of the major sources of risk and uncertainty in agriculture (Pandey et al., 2007). Agricultural activities in Thailand are currently being hampered by drought, particularly in the northeastern areas, which has long been recognized as the country's poorest and most drought-prone region. Drought can contribute to extreme changes in the amount of water in dams, and dried-out natural watercourses (Panyasing et al., 2021). In addition, as agricultural production is a major source of income and employment for parents of Thai children, the impacts of drought on agricultural production and income indirectly affect Thai children. For example, many children will drop out of school and migrate to other places as their family members search for jobs. Interrupting and discontinuing a child's education is a disinvestment in human capital that reduces his or her potential earnings in the future (Pandey et al., 2007; Sricharoen, 2011).

#### 2.4.1.3 High temperatures

Increases in rashes, heat exhaustion, temporary loss of consciousness, and heat stroke may result from the more frequent hot days and heat waves that accompany climate change. In developing countries, the effects are likely to be more severe (Hanna & Oliva, 2016; Orłowsky & Seneviratne, 2012; Graff Zivin & Shrader, 2016). According to Langkulsen and Rwozdi (2016), low-income urban populations in Thailand who live in high-density areas with little open green space are more likely to suffer from heat stress. They also discovered that those who reported more heat stress were more likely to have negative health and well-being outcomes. Even though no studies have been conducted in Thailand to demonstrate that children are more vulnerable to heat than adults, children are particularly vulnerable to climate change because they are physiologically and metabolically less capable than adults of adapting to the heat and other climate-related exposure (Akachi, Goodman and Parker, 2009).

## 2.4.2 Impacts of pollution on children in Southeast Asia

Air pollution has been identified as a contributing factor to childhood health issues such as asthma and allergies. One interesting study in Vietnam found that air pollutant concentrations were higher in the dry season than in the rainy season and that this was related to the risk of acute lower respiratory infections and hospital admissions in young children (Le et al., 2012). In the Philippines, only 54.7 per cent of high school students exposed to air pollution had normal lung function (Palabrica et al., 2015). According to Pawankar et al. (2020), increasing urbanization, air pollution, and climate change increase the epidemic factor of allergic diseases. Meanwhile in Thailand, according to TDRI (2021), the World Bank in 2016 reported that 50,000 Thai citizens died from air-pollution-induced diseases while the effects of air pollution on the national health budget eats 6 per cent of Thailand's annual GDP.

Furthermore, water issues were investigated as a contributing factor to children's health problems. In Indonesia, the behaviours of children exposed to contaminated water were studied. French et al. (2021) conducted a health and environmental assessment in 12 flood-prone informal settlements with groups of children under the age of 5, their caregivers, children aged 5–14, and adults. More than 80 per cent of children under the age of 5 swam or played in local waterways and ate dirt or soil, while more than 80 per cent of children aged 5–14 ate uncooked produce. Microbiological examination of the same study found highly contaminated water and soil, particularly *E. coli* concentrations. When compared to national data, the environmental contamination problems in the studied settlements resulted in a significantly higher rate of diarrhea among young children.



# Chapter



# 3

## Assessment of Climate Change Risk on children in Thailand

### 3.1 Development of child-sensitive climate risk map

#### 3.1.1 Climate change projection

##### 3.1.1.1 Methodology used in climate change projection

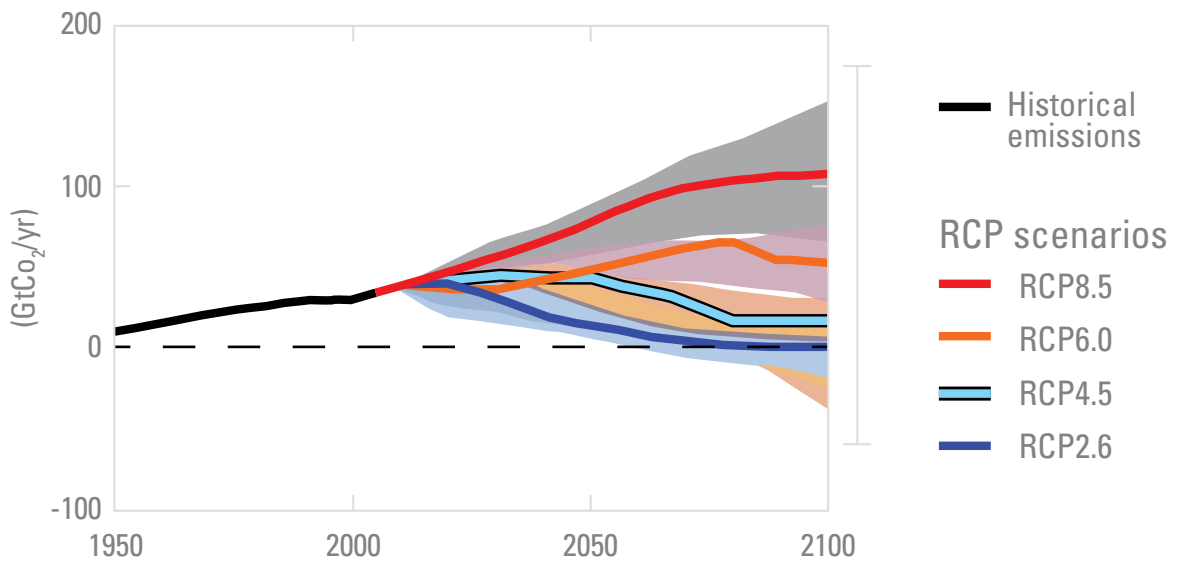
Projections of changes in the climate system are made by using climate models or so-called General Circulation Models (GCMs). These models range from simple to comprehensive climate models. However, the direct use of output from climate models in the analysis of future climate change and other studies including impacts, adaptation and vulnerability in regional or local scale are not practical as GCMs provide climate data and information at a coarse grid resolution. Thus, downscaling techniques have to be applied to achieve a finer grid resolution, which allows researchers to work at a regional level. The two general downscaling approaches are the statistical downscaling technique and the dynamical downscaling technique. The most recent study in Southeast Asia Region, the SEACLID/CORDEX Southeast Asia project, applied the dynamical downscaling technique to downscale GCMs under the framework of the Coupled Model Intercomparison Project Phase 5 (CMIP5) of the World Climate Research Programme. The climate projection data used under this study will be based on the output from the CMIP5 project. Before applying the downscaling data set to any study, it is crucial to evaluate the performance of regional climate models in reproducing the past climate as well as the capability in capturing the extreme climate events. Evaluation of the performance of downscaling the SEACLID/CORDEX Southeast Asia data set is presented in Appendix 1.

The future climate change projection from the CMIP5 climate models, used in the Intergovernmental Panel on Climate Change (IPCC) Fifth Assessment Report (AR5), are based on Representative Concentration Pathway (RCP) scenarios. Four pathways are used in the IPCC AR5, namely RCP2.6, RCP4.5, RCP6.0 and RCP8.5. These RCPs are named after a possible range of radiative forcing values in the year 2100. Radiative forcing is what happens when the amount of energy that enters the Earth's atmosphere is different from the amount of energy that leaves it. Energy travels in the form of radiation: solar radiation entering the atmosphere from the sun, and infrared radiation exiting as heat. If more radiation is entering Earth than leaving, as is happening today, then the

atmosphere will warm up. This is called radiative forcing because the difference in energy can force changes in the Earth's climate (<https://climate.mit.edu/>). The higher radiative forcing values refer to the higher concentration of greenhouse gases in the atmosphere.

The Representative Concentration Pathways (RCPs), used for impact and assessment, describe four different twenty-first century pathways of greenhouse gas (GHG) emissions and atmospheric concentrations, air pollutant emissions and land use. The RCPs include a stringent mitigation scenario (RCP2.6), two intermediate GHG emission scenarios (RCP4.5 and RCP6.0), and one scenario with very high GHG emissions (RCP8.5). In this study, two scenarios are considered in the development of risk maps, namely RCP4.5 and RCP8.5, to capture two extreme scenarios. RCP4.5 is the intermediate scenario, while RCP8.5 represents the scenario without additional efforts to constrain emissions. According to IPCC AR5, relative to 1850-1900, the global surface temperature change for the last two decades of the twenty-first century (2081-2100) is projected to likely exceed 1.5°C for RCP4.5, RCP6.0 and RCP8.5 (high confidence). Warming is likely to exceed 2°C for RCP6.0 and RCP8.5 (high confidence) and more likely than not to exceed 2°C for RCP4.5 (medium confidence). Rising rates and magnitudes of warming and other changes in the climate system, accompanied by ocean acidification, increase the risk of severe, pervasive and in some cases irreversible detrimental impacts.<sup>3</sup> Figure 3.1 shows GHG emissions under different RCPs.

**Figure 3.1 Greenhouse gas emissions under different representative concentration pathways (RCPs)**



Source: IPCC AR5

<sup>3</sup> [https://ar5-syr.ipcc.ch/topic\\_summary.php](https://ar5-syr.ipcc.ch/topic_summary.php)



### 3.1.1.2 Temperature and precipitation projection under climate change

The IPCC AR5 reported that the global surface temperature change at the end of the twenty-first century is likely to exceed 1.5°C relative to the 1850 to 1900 periods for all RCP scenarios except RCP2.6 and it is likely to exceed 2°C for RCP6.0 and RCP8.5, and more likely than not to exceed 2°C for RCP4.5 (IPCC, 2014).

The IPCC AR5 also states that changes in the global water cycle in response to the warming over the twenty-first century will not be uniform. The contrast in precipitation between wet and dry regions and between wet and dry seasons will increase, although there may be regional exceptions. The report also indicates that zonal mean precipitation will increase in high and some of the mid latitudes, and will decrease in the subtropics (IPCC, 2014).

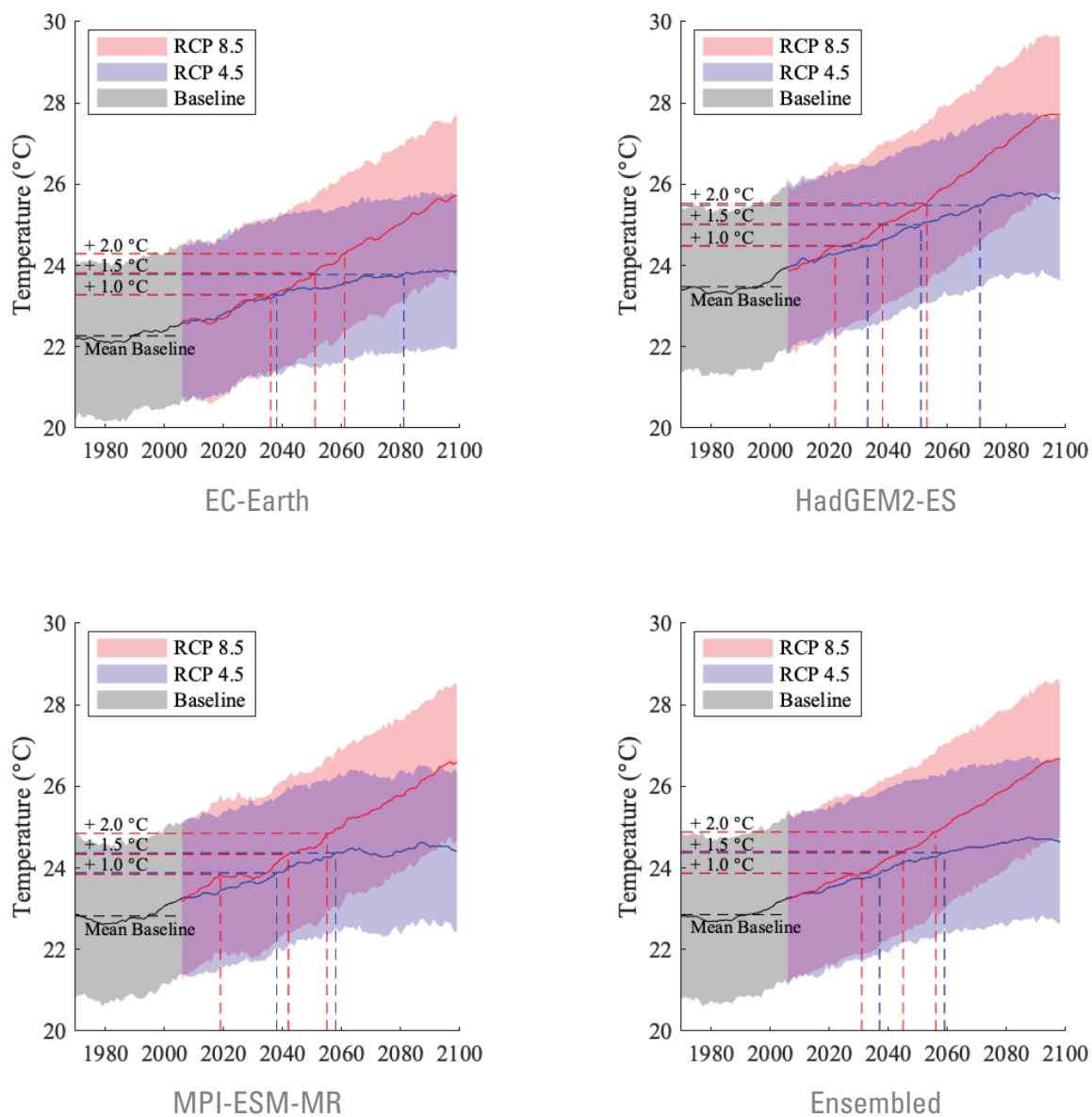
In the case of Thailand, the projections of future temperature and precipitation changes are analyzed based on the change of temperature and precipitation extreme indices. Selected precipitation and temperature extreme indices anomaly including PRCPTOT, CWD, R10mm, TXn and TNn from the previous study (Santisirisomboon et al., 2021a) are illustrated in Figure A1.13 – Figure A1.26 in Appendix 1.

The projection of precipitation extreme indices indicates that the precipitation intensity (maximum 1-day and 5-day precipitation total) as well as frequency (heavy and very heavy precipitation days) are both projected to increase. This suggests that Thailand could experience flash floods triggered by heavy and very heavy precipitation. At the same time, Thailand might face higher risk of drought as the annual contribution from wet days captured by the PRCPTOT index are projected to decrease. The Northeastern and Southern regions of Thailand tend to encounter higher drought impacts than other regions under future climate change scenarios (Santisirisomboon et al., 2021b).

The extreme temperature indices, including the coldest daily maximum temperature (TXn) as well as the coldest daily minimum temperature (TNn), are projected to increase under both RCP4.5 and RCP8.5 scenarios as shown in Figure A1.23 – A1.26 in Appendix 1. The increase in both extreme indices indicate that Thailand is likely to encounter warmer temperatures under changing climate.

The surface temperature change for the end of the twenty-first century over the whole country is projected to exceed 4.0°C relative to the 1970 to 2005 period for both RCP4.5 and RCP8.5 of all 3 RCMs and ensembled as illustrated in Figure 3.2. It is likely to exceed 2°C for both RCPs before the end of 2060.

**Figure 3.2 Temperature projection of whole country under future climate**



Source: Santisirisomboon et al. (2021b)

### 3.1.2 Hazard Index, Risk Index and Risk Maps

The Office of Natural Resources and Environmental Policy and Planning (ONEP) and RU-Core developed risk maps based on the 2007 IPCC definition of vulnerability: “Vulnerability is the degree to which a system is susceptible to, and unable to cope with, adverse effects of climate change, including climate variability and extremes”. Risks are influenced by climate drivers and non-climate drivers. These two factors are calculated and weighed on their direct and indirect risks, and transformed into visual risk maps. The umbrellas under which risks are presented are heat, flooding, drought, and all the three risks combined. ONEP and RU-CORE developed risk maps for six sectors, namely water management, agriculture and food security, tourism, public health, natural resource management, and human settlement.

The risk maps developed under in this project are based on the same methodology and climate projection data set as the risk maps developed by ONEP and RU-CORE. However, there are two key differences as follows:

1. **There are four types of hazards considered in the risk map under this project, namely heat, flood, drought and low temperature**, while the risk maps developed by ONEP and RU-CORE considered only 3 types of hazards, namely heat, flood and drought. Nevertheless, the climate indices used in the development of hazard index under this project and under ONEP and RU-CORE are the same and presented in Table 3.1 below.
2. The risk maps for six sectors developed by ONEP and RU-CORE and the risk maps developed under this project use a different set of non-climate variables. The non-climate variables used by ONEP and RU-CORE are sector-specific variables, i.e., variables related to water management, agriculture and food security, tourism, public health, natural resource management, and human settlement, while **the non-climate variables used in this project are variables related to children**, such as the number of children (0–14 years old), number of medical doctors, number and proportion of underweight newborns (< 2,500 grams) and number and proportion of underweight children (0–5 years old).

#### 3.1.2.1 Hazard Maps

The four types of climate-related hazard considered in this study are heat (high temperature), cold spell (low temperature), flood, and drought. Each hazard index is the composite, or the combination effect, of different climate extreme indices as listed in Table 3.1. Four time horizons are considered, namely baseline (1970-2005), near-term future (2016-2035), medium-term future (2046-2065) and long-term future (2081-2099) under two future climate change scenarios, i.e., RCP4.5 and RCP8.5 (Figures 3.3 – 3.4).

**Table 3.1 List of climate extreme indices used to develop the hazard maps**

	Hazard			
	Heat	Cold	Flood	Drought
Climate indices	TXn	TXx	Rx1day	SDII
	TNn	TNx	Rx5day	PRCPTOT
	CSDI	DTR	R95p	CDD
	TX10p	WSDI	R99p	
	TN10p	TX90p	CWD	
	FD16	TN90p	R10mm	
		SU35	R20mm	
	TR25			

Note: Abbreviations of climate indices presented in Table 3.1 are contained in the list of abbreviations at the start of this report

Considering distribution of impacts from climate hazards, according to Figures 3.3 and 3.4, our results show that **heat and drought seem to have more widespread impacts than low temperature and flood**. The increase in heat hazard and the decrease in low temperature hazard are consistent with the projected changes in intensity, duration, and frequency of extreme temperature indices under both RCP scenarios. The increase in flood hazard in some area of the Northern and Southern parts of Thailand is consistent with the projected changes in precipitation intensity (Rx1day and Rx5day) which indicate heavy and very heavy precipitation with high values corresponding to a high chance of flooding. It is expected to experience higher flood hazard under RCP8.5 than RCP4.5 across all time horizons. The increase in drought hazard is consistent with the projected changes in PRCPTOT and CDD climate extreme indices. The projected increase in CDD reflects longer dry spell; thus, this CDD index can serve as a good measure of drought. The projected decrease in PRCPTOT refers to the decline in the amount of precipitation, which is a signal of drought. According to Figures 3.3 and 3.4, the composite hazard under future climate change scenario RCP8.5 is expected to have higher impacts than RCP4.5 across all time horizons.

### 3.1.2.2 Non-climate variables maps

In this study, four non-climate variables related to children are considered. These non-climate variables include the number of children (0–14 years old), number of medical doctors, number and proportion of underweight newborn (< 2,500 grams) and number and proportion of underweight children (0–5 years old). Maps of these selected non-climate variables are shown in Figure 3.5.

The number of children (0-14 years old), number and proportion of underweight newborns and number and proportion of underweight children (0–5 years old) reflect the exposure and sensitivity to climate change while the number of medical doctors reflect the adaptive capacity to climate change. Therefore, a higher number of children (0-14 years old) or higher number and proportion of underweight newborns and number and proportion of underweight children (0–5 years old) imply an increase in exposure to climate change and higher climate change risk. On the contrary, the increase in the number of medical doctors implies higher adaptive capacity and thus lower climate change risk.

### 3.1.2.3 Risk maps

The maps for composite risk index, i.e., for all non-climate variables, subject to all hazard types under future climate change scenario RCP4.5 and RCP8.5 are shown in Figures 3.6 – 3.7. It is important to highlight that, unlike heat, flood and drought in which risks are likely to increase in the near-term future, medium-term future and long-term futures, the risks of low temperature or cold are likely to decline in the near-term future, medium-term future and long-term future due to the trend of rising temperature according to the future climate projections. The risk maps for individual non-climate variables are shown in Figures A1.27 – A1.34 in Appendix 1.

Children in the Northeastern and Southern regions of the country have high exposure and sensitivity to climate hazards with low adaptive capacity; these regions are expected to experience higher risk from climate hazards than other regions. The ten highest risk provinces under future climate change scenarios RCP4.5 and RCP8.5 are listed in Tables 3.2 and 3.3, respectively. Ubon Ratchathani, Nakhon Ratchasima and Si Sa Ket are three provinces in the Northeastern region of Thailand that are projected to have the highest risk under both RCP4.5 and RCP8.5 scenarios. These provinces have reasonably high exposure to climate change due to their high number of underweight newborns and number of children with low accessibility to medical treatment due to the low number of medical doctors.

According to the overall risk maps shown in Figures 3.6 and 3.7, for children who live in high-risk provinces (such as Ubon Ratchathani, Nakhon Ratchasima, Si Sa Ket, Nakhon Si Thammarat, Narathiwat), having wealth, high income or access to finance will determine their adaptive capacity to cope with the risks of climate change. However, if children in these areas are from low-income families, they are likely to encounter additional vulnerabilities. By considering both the overall risk maps presented in Figures 3.6 and 3.7, along with the poverty map prepared by the National Statistical Office (NSO) in 2017, the provinces that face high risk of climate change and high incidence of poverty are Narathiwat, Buriram, Ubol Ratchathani and Surin. These provinces should be high priority provinces in terms of provision of assistance from the Thai Government. Figure 8 shows Thailand's poverty map developed by the NSO in 2017.

Bangkok has high exposure to climate hazards due to its large number of children; however, children in Bangkok have relatively high accessibility to medical treatment due to the highest number of medical doctors. In addition, Bangkok has a low number of underweight newborns and underweight children. As a result, Bangkok is among the provinces with the lowest risks of climate change under both RCP4.5 and RCP8.5 (Tables 3.4 – 3.5).

Figure 3.3 Hazard maps under climate change scenario RCP4.5

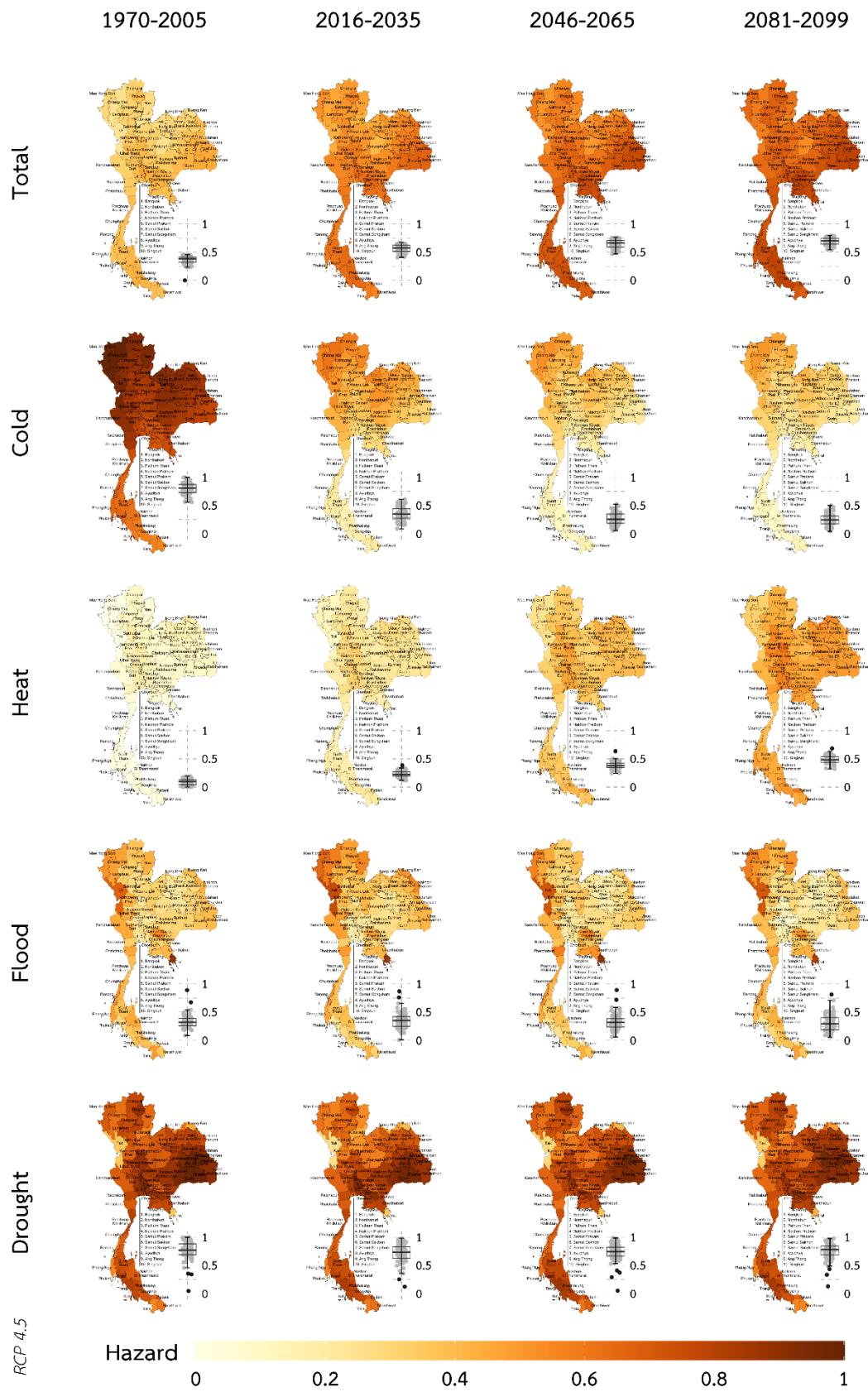
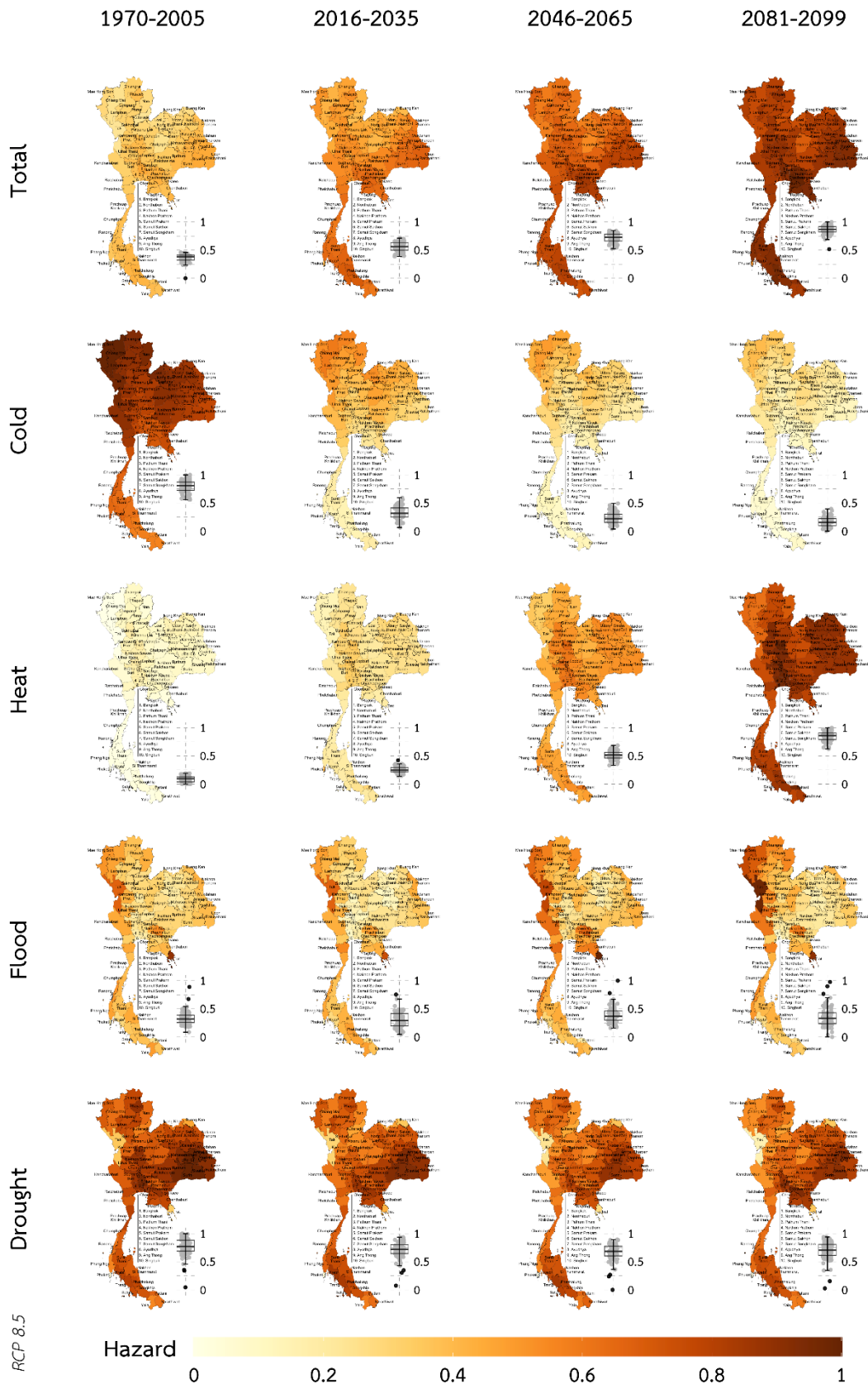


Figure 3.4 Hazard maps under climate change scenario RCP8.5



**Table 3.2 Ten highest risk provinces under future climate change scenario RCP4.5**

Rank	Near-term future 2016 - 2035	Medium-term future 2046 - 2065	Long-term future 2081 – 2099
1	Ubon Ratchathani	Ubon Ratchathani	Ubon Ratchathani
2	Nakhon Ratchasima	Nakhon Ratchasima	Nakhon Ratchasima
3	Si Sa Ket	Si Sa Ket	Si Sa Ket
4	Nakhon Si Thammarat	Narathiwat	Nakhon Si Thammarat
5	Narathiwat	Nakhon Si Thammarat	Narathiwat
6	Surin	Surin	Surin
7	Songkhla	Songkhla	Songkhla
8	Buri Ram	Buri Ram	Khon Kaen
9	Khon Kaen	Khon Kaen	Buri Ram
10	Surat Thani	Surat Thani	Surat Thani

**Table 3.3 Ten highest risk provinces under future climate change scenario RCP8.5**

Rank	Near-term future 2016 - 2035	Medium-term future 2046 - 2065	Long-term future 2081 – 2099
1	Ubon Ratchathani	Ubon Ratchathani	Ubon Ratchathani
2	Nakhon Ratchasima	Nakhon Ratchasima	Nakhon Ratchasima
3	Si Sa Ket	Si Sa Ket	Si Sa Ket
4	Nakhon Si Thammarat	Narathiwat	Nakhon Si Thammarat
5	Narathiwat	Nakhon Si Thammarat	Narathiwat
6	Surin	Surin	Surin
7	Songkhla	Buri Ram	Songkhla
8	Buri Ram	Songkhla	Buri Ram
9	Surat Thani	Khon Kaen	Khon Kaen
10	Khon Kaen	Chon Buri	Surat Thani



**Table 3.4 Ten lowest risk provinces under future climate change scenario RCP4.5**

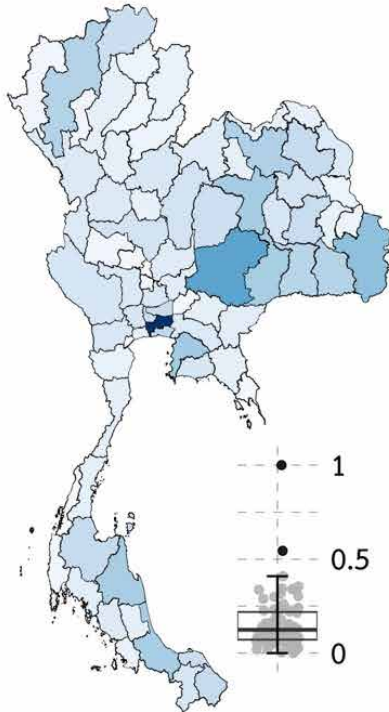
Rank	Near-term future 2016 - 2035	Medium-term future 2046 - 2065	Long-term future 2081 – 2099
10	Nong Khai	Bueng Kan	Nong Khai
9	Nong Bua Lam Phu	Lamphun	Phrae
8	Lamphun	Nong Bua Lam Phu	Samut Sakhon
7	Chai Nat	Phrae	Ang Thong
6	Phrae	Nong Khai	Chai Nat
5	Bangkok	Samut Sakhon	Bangkok
4	Samut Sakhon	Bangkok	Sing Buri
3	Uttaradit	Uttaradit	Uttaradit
2	Samut Songkhram	Samut Songkhram	Samut Songkhram
1	Phuket	Phuket	Phuket

**Table 3.5 Ten lowest risk provinces under future climate change scenario RCP8.5**

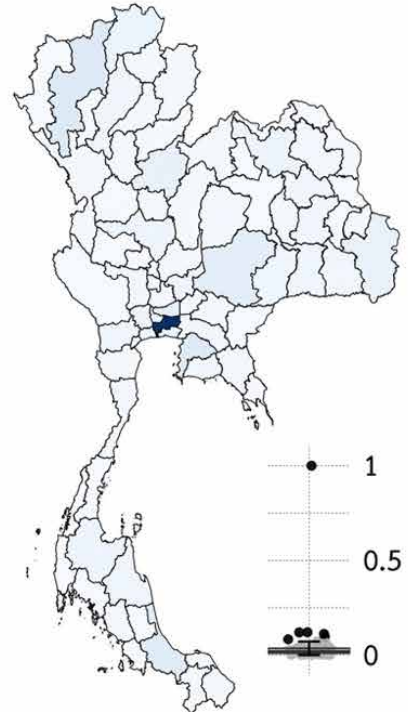
Rank	Near-term future 2016 - 2035	Medium-term future 2046 - 2065	Long-term future 2081 – 2099
10	Bangkok	Bueng Kan	Nong Khai
9	Samut Sakhon	Nong Khai	Ang Thong
8	Bueng Kan Lamphun	Sing Buri	Bueng Kan
7	Chai Nat	Lamphun Phrae	Sing Buri
6	Phrae	Chai Nat	Phrae
5	Nong Khai	Nong Bua Lam Phu	Samut Sakhon
4	Sing Buri	Phrae	Bangkok
3	Phuket	Uttaradit	Uttaradit
2	Uttaradit	Samut Songkhram	Samut Songkhram
1	Samut Songkhram	Phuket	Phuket

Figure 3.5 Maps of non-climate variables

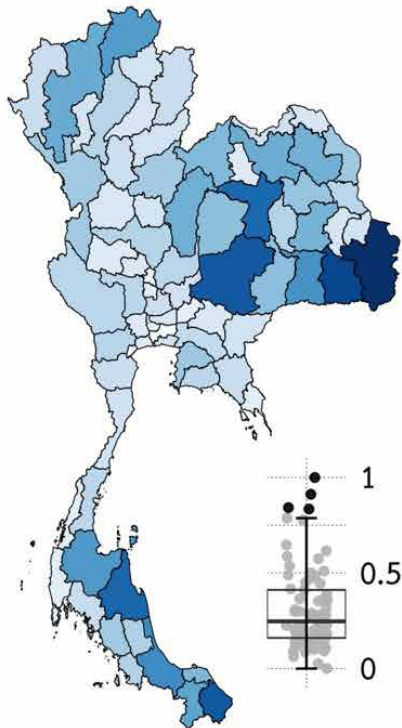
Number of children (0-14 years old)



Number of medical doctors



Number and proportion of underweight new borns (< 2,500 grams)



Number and proportion of underweight children (0-5 years old)

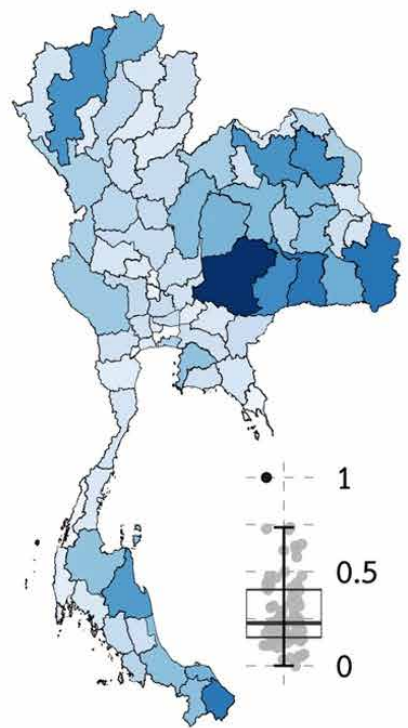


Figure 3.6 Risk maps for selected non-climate variables under RCP4.5

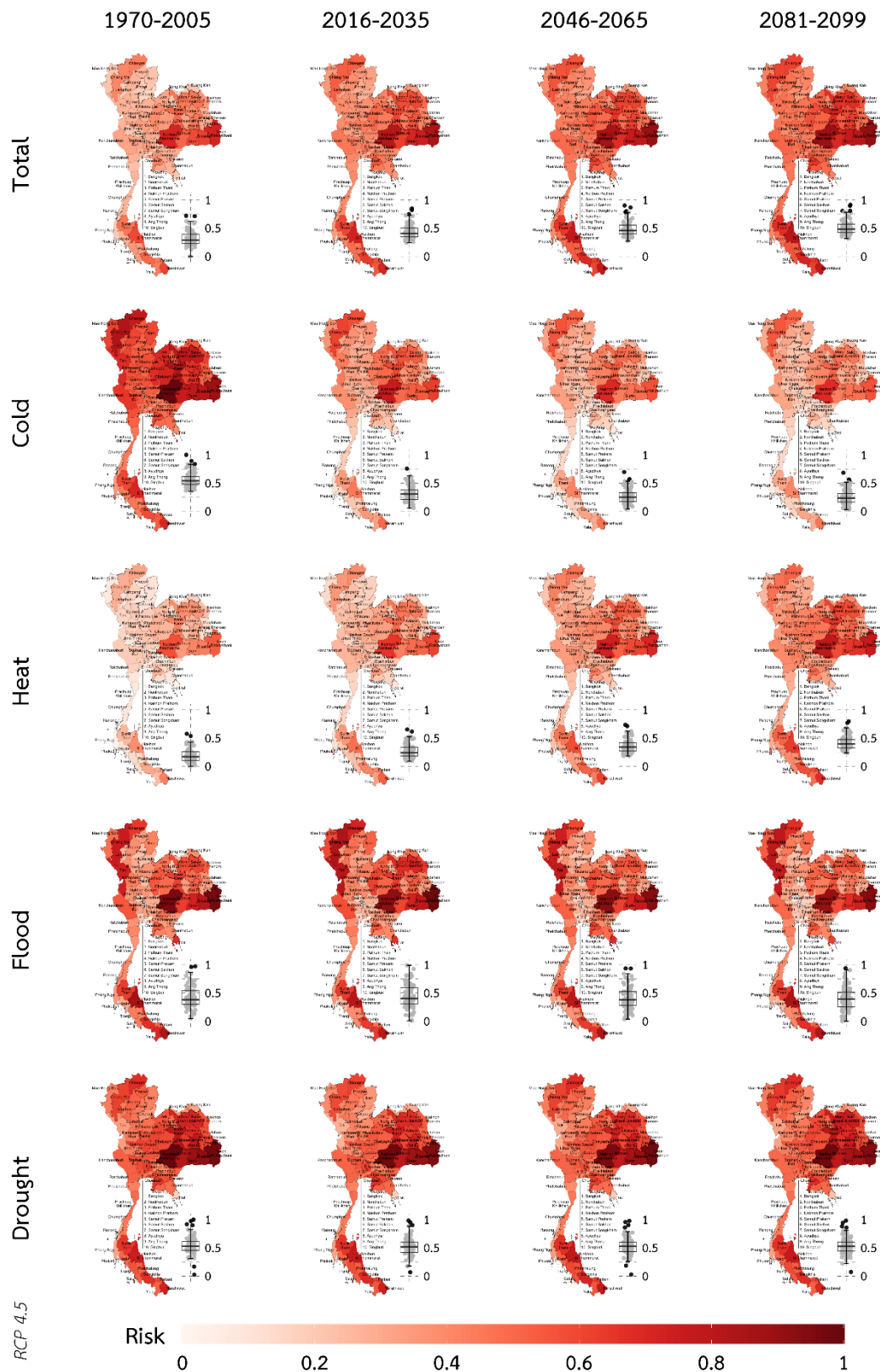
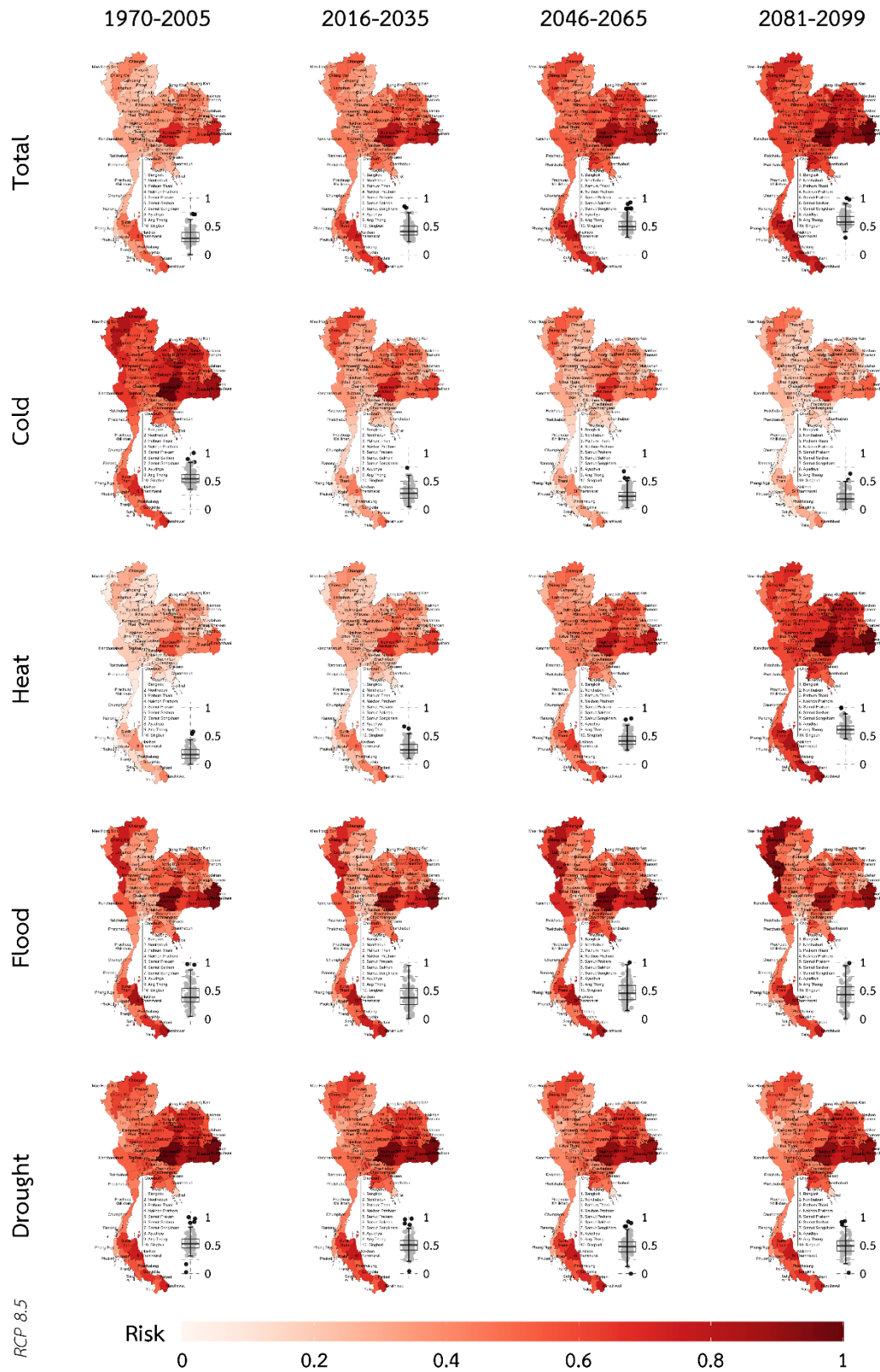
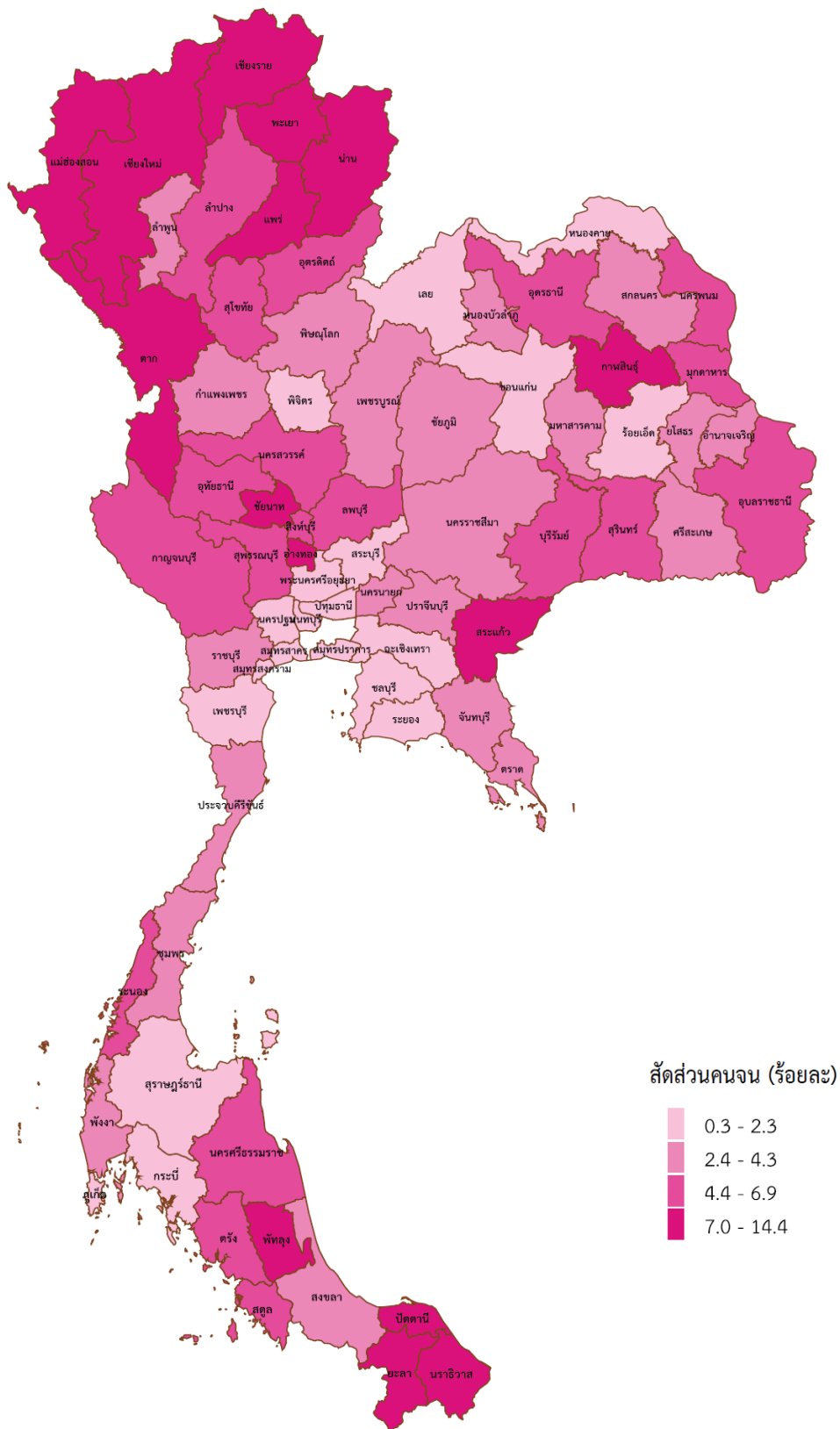


Figure 3.7 Risk maps for selected non-climate variable under RCP8.5



**Figure 3.8 Poverty Map for Thailand – Proportion of population living in poverty (outside municipality areas)**



Source: National Statistical Office 2017

Tables 3.2 and 3.3 show the **top 10 provinces with the highest child-sensitive overall risk of climate change** in the near-term future, medium-term future and long-term future periods under RCP4.5 scenario and RCP8.5, respectively. Provinces with highest overall risk after considering the impacts on children are concentrated in the Northeastern and Southern regions. The provinces in the Northeastern regions which face high overall risk are Ubon Ratchathani, Nakhon Ratchasima, Si Sa Ket, Surin, Buriram, and Khon Kaen. The provinces in the Southern region of Thailand which face high overall risk of climate change are Nakhon Si Thammarat, Narathiwat, Songkhla and Surat Thani. **These provinces should be prioritized by the relevant public and private agencies when implementing or supporting climate change adaptation**, as children in these provinces are likely to face high risks and impacts of climate change.

In addition to the overall risk, the following section summarizes how climate change can affect children in the high priority provinces which face the highest risk of climate change, according to type of climate hazard.

### Heat/High Temperature

- Heat and rising temperature can directly cause mortality among children through heat stroke and cardiovascular failure.
- Children are more susceptible to heat-related illnesses due to their greater surface area to body mass ratio, lower rate of sweating, and slower rate of acclimatization (Bytowski, 2003).
- Infants' bodies are naturally evolved to conserve heat, which may make infants more vulnerable to thermal stress.

**Table 3.6 Top ten provinces exposed to risk of high temperature under future climate change scenario RCP4.5**

Ranking	Provinces	Heat Risk Index
1.	Nakhon Ratchasima	0.652756
2.	Ubon Ratchathani	0.615481
3.	Narathiwat	0.525629
4.	Si Sa Ket	0.51391
5.	Khon Kaen	0.495332
6.	Surin	0.494735
7.	Nakhon Si Thammarat	0.478686
8.	Udonthani	0.461802
9.	Sakon Nakorn	0.438946
10.	Buriram	0.433773

Results from the child-sensitive heat risk map analysis shown in Table 3.6 shows that under the RCP4.5 scenario in the near-term future period, provinces likely to be at highest risk of heat or high temperature are in the Northeastern and Southern regions, especially Nakhon Ratchasima, Ubon Ratchathani and Narathiwat, the top three provinces with highest risk of heat or high temperature in the near-term future.

## Floods

- Floods can injure and kill children.
- Floods may disrupt the food supply, increase disease spread, and reduce access to medical care.
- Floods can cause disruption to children’s homes, education and friendship networks, impacting their physical and emotional health (Whittle et al., 2012).

**Table 3.7 Top ten provinces exposed to risk of flood under future climate change scenario RCP4.5**

Ranking	Provinces	Flood Risk Index
1.	Ubon Ratchathani	0.989069
2.	Nakhon Ratchasima	0.924314
3.	Chiang Mai	0.84061
4.	Nakhon Si Thammarat	0.808795
5.	Tak	0.80836
6.	Narathiwat	0.802792
7.	Si Sa Ket	0.79162
8.	Surin	0.727379
9.	Chiang Rai	0.724807
10.	Sakon Nakorn	0.706265

Table 3.7 shows the top 10 provinces with the highest child-sensitive risk of flood in the near-term future period under RCP4.5 scenario. Ubon Ratchathani and Nakhon Ratchasima are still provinces with highest risk of flood after considering the impacts on children. Three Northern provinces – Chiang Mai, Tak and Chiang Rai – also have high flood risk.

## Drought

- Drought can cause water shortage and increase rates of malnutrition due to insufficient food. Young children are particularly susceptible to undernutrition when households experience food insecurity because nutritional deficiencies affect their growth and development.
- Drought may trigger mass migration away from the drought-affected areas.
- Drought may cause education disruption in school-age children.

**Table 3.8 Top ten provinces exposed to risk of drought under future climate change scenario RCP4.5**

Ranking	Provinces	Drought Risk Index
1.	Nakhon Ratchasima	0.983035
2.	Ubon Ratchathani	0.949702
3.	Si Sa Ket	0.902916
4.	Surin	0.883961
5.	Buriram	0.799908
6.	Nakhon Si Thammarat	0.77608
7.	Narathiwat	0.736724
8.	Khon Kaen	0.733972
9.	Roi Et	0.731421
10.	Songkhla	0.687113

Table 3.8 shows the top 10 provinces with the highest child-sensitive risk of drought in the near-term future period under RCP4.5 scenario. Provinces with highest risk of drought after considering the impacts on children are concentrated in the Northeastern and Southern regions. The Northeastern provinces at high risk of drought are Nakhon Ratchasima, Ubon Ratchathani, Si Sa Ket, Surin, Buriram, Khon Kaen, and Roi Et. The Southern provinces at high risk of drought are Nakhon Si Thammarat, Narathiwat, and Songkhla.



## Low temperature

- Children are more at risk from the cold than adults; as their bodies are smaller, they lose heat more quickly.
- Children exposed to extreme cold for too long without warm, dry, breathable clothing can develop frostbite or even life-threatening hypothermia.

**Table 3.9 Top ten provinces exposed to risk of low temperature under future climate change scenario RCP4.5**

Ranking	Provinces	Low Temperature Risk Index
1.	Nakhon Ratchasima	0.756323
2.	Ubon Ratchathani	0.627426
3.	Chiang Mai	0.613074
4.	Khon Kaen	0.601981
5.	Chiang Rai	0.578204
6.	Udonthani	0.56434
7.	Si Sa Ket	0.540533
8.	Surin	0.538674
9.	Sakon Nakorn	0.532476
10.	Chaiyaphum	0.500064

Table 3.9 shows the top 10 provinces with the highest child-sensitive risk of cold spell or low temperature in the near future period under RCP4.5 scenario. Provinces with highest risk of low temperature after considering the impacts on children are concentrated in the Northeastern and Northern regions. The Northeastern provinces at high risk of low temperature are Nakhon Ratchasima, Ubon Ratchathani, Khon Kaen, Udonthani, Si Sa Ket, Surin, Sakon Nakorn and Chaiyaphum. The Northern provinces at high risk of low temperature are Chiang Mai and Chiang Rai.

## 3.2 Linkages between climate change and child multidimensional poverty

Under this sub-section, the research aims to investigate the linkages between child-sensitive climate risk index developed under this study and child multidimensional poverty as reflected through the multidimensional poverty index (MPI). The Child MPI was developed to capture key aspects of deprivation for children aged 0–17 years. The Child MPI was developed under a cooperation between the NESDC and UNICEF Thailand Country Office, with technical support from OPHI. Understanding multidimensional child poverty will allow policymakers and other relevant stakeholders to make the most effective investments in order to build human capital, reduce inequality, and eliminate poverty in all its dimensions for now and for the future. The Child MPI was developed basing on data from the Multiple Indicator Cluster Survey (MICS) 2015/16, and is composed of four dimensions (education, child welfare, living standards, and health) as shown in Table 3.10. Given the sampling design used by MICS 5 in Thailand, it is possible to analyze the levels of multidimensional poverty and deprivation in 14 provinces (Buriram, Sisaket, Yasothon, Kalasin, Nakhon Phanom, MHS, Tak, Ratchaburi, Kanchanaburi, Songkhla, Satun, Pattani, Yala and Narathiwat). These provinces correspond to 16 per cent of the population living in Thailand. Table 3.11 shows the top 10 provinces with the highest MPI.

**Table 3.10 Dimensions, Indicators, Cutoff, and Weights of Thailand’s Child MPI**

Dimension	Indicator	Deprivation Cutoff A child is deprived if he/she...	Weight (%)
Education	Learning	Is younger than 3 years and does not have at least 1 book, OR is 3-4 years old and does not do 4 or more of the 7 possible activities with the main caregiver, OR is older than 4 and not currently attending school.	25%
Child Welfare	Child protection	Is younger than 1 and does not have birth registration, OR is 2 to 14 years old and lives in a household where a child has suffered severe physical violence, OR is 15 to 17 years old and is married or has been married.	12.5%
	Living conditions	is younger than 5 and was left alone for more than one hour in one day or more during the week prior to the survey, OR was left under the care of another child for more than one hour in one day or more, OR is 5 years or older and lives in a household without both parents.	12.5%
Living Standards	Housing conditions	lives in a dwelling whose main floor material is earth/sand, wood planks or other material, OR the main roof material is thatch/palm leaf, wood planks or other, OR the main walls material is cane/palm/trunks, bamboo with mud, plywood, reused wood, or other.	5%
	Cooking fuel	lives in a household where solid fuels are used for cooking and the cooking is done inside the dwelling.	5%

Dimension	Indicator	Deprivation Cutoff A child is deprived if he/she...	Weight (%)
Living Standards	Asset ownership	lives in a household that owns less than 4 assets (radio, television, refrigerator, air conditioner, bicycle and telephone), OR where no car, boat or big motorcycle is owned.	5%
	Bank account	lives in a household where no member has a bank account.	5%
	Safe drinking water	lives in a household without access to a protected source of water.	5%
Health	Nutrition	is younger than 6 months and has never been breastfed, OR is 6 months or older and younger than 5 years and is wasted or stunted, OR is 5 years or older and the household does not use iodized salt.	12.5%
	Health prevention	is younger than 5 years and does not have the full vaccination scheme according to age, OR is 5 years or older and younger than 15 and lives in a household where there is not a place where to wash the hands, OR is aged 15-17 years and has not received sexuality education.	12.5%

Source: OPHI, NESDC and UNICEF, *Child Multidimensional Poverty in Thailand* (2019)

**Table 3.11 Top 10 provinces with highest MPI**

Provinces	MPI
Pattani	0.141
Kalasin	0.132
Nakhon Phanom	0.120
Tak	0.114
Narathiwat	0.107
Mae Hong Son	0.101
Kanchanaburi	0.080
Yasothon	0.079
Sisaket	0.076
Satun	0.067

Source: OPHI, NESDC and UNICEF, *Child Multidimensional Poverty in Thailand* (2019)

Given the data availability, this study focuses only on the living standards dimension of the child MPI, which consists of housing condition, asset ownership, access to a bank account and access to safe drinking water. These dimensions reflect the adaptive capacity of households for climate change; therefore, we would like to test the hypothesis whether enhancing the households' adaptive capacity can lead to lower climate change risk. To test this hypothesis, the following regression model is estimated.

$$CR_i = \beta_0 + \beta_1 Y_i + \beta_2 C_{1i} + \dots + \beta_n C_{ni} + \epsilon_i$$

where:

- $CR_i$  = climate risk index or hazard index
- $Y_i$  = different indicators for child MPI under living condition component consisting of housing condition, asset ownership, bank account and safe drinking water
- $C_{1i}, \dots, C_{ni}$  = control variables that affect climate risk, such as urbanization, region, total number of household number, number of children in the household, dwelling ownership etc.

Table 3.12 contains a detailed description of each variable used in the regression analysis, while Table 3.13 shows the summary statistics of the socio-economic characteristics of the survey respondents. The total sample size in the MICS 2015/16 survey was 31,000 respondents from different parts of Thailand.

The variables, *d\_sand\_wood*, *d\_roofing*, *d\_four\_asset*, *d\_own\_dwelling*, *d\_bankacc*, and *d\_closed\_water*, are indicators of the child multidimensional poverty index under the living condition component. The three-time horizons considered in this study are 2016-2035 (near-term future), 2046-2065 (medium-term future), and 2081-2099 (long-term future). The risk indices for the near-term future, medium-term future and long-term future are represented by *overall\_risk\_near*, *overall\_risk\_medium* and *overall\_risk\_long*. These three risk indices are the dependent variables in the regression model. Provided that these risk indices are variables that take values within a bounded range, being a continuous variable and does not need to be converted to categories, the regression model to be estimated is the fractional logit regression.

**Table 3.12 Description of variables**

Variables	Variable Description	Code
d_neastn	A dummy variable for region	1 = northeast and north 0 = other
d_rural	A dummy variable for urbanization	1 = rural 0 = urban
total_member	Total number of household members	
n_children	Number of children under age 5 years	
d_sand_wood	Main material of the dwelling floor	1 = earth, sand and wood plank 0 = other
d_roofing	The main material of the roof	1 = natural roofing and rudimentary roofing 0 = other
d_four_asset	The number of assets owned is greater than four	1 = yes 0 = no
d_own_dwelling	Some members in the household owns dwelling	1 = yes 0 = no
d_bank_acc	Some members in the household have a bank account	1 = yes 0 = no
d_closed_water	The main source of drinking water for the household	1 = piped into dwelling and bottled water 0 = piped into compound
overall_risk_near	The overall risk index in the near future time horizon, i.e., 2016-2035	Scaled 0 to 1
overall_risk_medium	The overall risk index in the intermediate future time horizon, i.e., 2046-2065	Scaled 0 to 1
overall_risk_long	The overall risk index in the far future time horizon, i.e., 2081-2099	Scaled 0 to 1

Table 3.13 shows the summary statistics of the respondents in the MICS 2015/16 survey. Most respondents lived in the Northeast region, in rural areas. The average household size was 3.8 persons per household. In the living standard dimension, the main materials of respondents' dwelling floors were not earth, sand, or wood, and their dwelling roofs were not made of natural materials. Furthermore, most respondents owned a house and had more than four assets and a bank account. They also lived in a household with access to a protected source of water.

**Table 3.13 Summary statistics of respondents**

Variables	Obs	Mean	Std. Dev.	Min	Max
d_neastn	31,010	0.4592	0.4983	0.0000	1.0000
d_rural	31,010	0.5161	0.4997	0.0000	1.0000
total_member	28,652	3.7778	1.8852	1.0000	18.0000
n_children	31,010	0.3971	0.6104	0.0000	6.0000
d_sand_wood	28,652	0.1853	0.3886	0.0000	1.0000
d_roofing	28,652	0.0099	0.0991	0.0000	1.0000
d_four_asset	28,442	0.7109	0.4534	0.0000	1.0000
d_own_dwelling	28,652	0.8290	0.3765	0.0000	1.0000
d_bank_acc	28,652	0.8931	0.3090	0.0000	1.0000
d_closed_water	28,652	0.7712	0.4201	0.0000	1.0000

Source: Calculated from MICS 2015/16 survey data and part 1.1 of this project.

Table 3.14 contains the estimation results from the fractional logistic regression. The results shown in Table 3.14 indicate that the variables *d\_rural*, *d\_neastn*, *d\_sand\_wood*, *d\_four\_asset*, *d\_own\_dwelling*, *d\_bank\_acc*, and *d\_closed\_water* have a statistically significant relationship with the overall risk index over the three time horizons. To illustrate, considering the case of the near-term future scenario in Table 3.14, most of the variables are statistically significant and the signs of the estimated coefficients are in the right direction. For instance, those living in rural areas and those in North or Northeastern regions tend to have higher overall risks of climate change. On the other hand, those who have more asset ownership, access to a bank account, access to closed piped water system, and have a dwelling floor made of sand or wood plank, have higher adaptive capacity and therefore face a lower overall risk of climate change.

According to the marginal effect results shown in Table 3.15, living in the Northeastern and Northern regions of Thailand raises the overall risk index by 1.89 per cent. Living in a rural area increases the overall risk by 2.26 per cent, while owning a dwelling increases the overall risk by 2.84 per cent. On the contrary, considering the adaptive capacity, results in Table 3.15 show that having access to a bank account, asset ownership and a closed piped water system lower the risk of climate change. Having a bank account reduces the overall risk by 0.66 per cent. Owning more than four assets reduces the overall risk by 2.13 per cent. Having floors made of earth sand or wood reduces the overall risk by 4.6 per cent, and having access to safe drinking water reduces the overall risk by 6.85 per cent. It is interesting to highlight that the same pattern is observed in both medium-term and long-term future scenarios.

**Table 3.14 Results from the fractional logistic regression**

Variables	Overall risk index		
	Near-term future	Medium-term future	Long-term future
d_rural	0.0904*** (0.0066)	0.0917*** (0.0068)	0.0872*** (0.0066)
d_neastn	0.0758*** (0.0066)	0.0438*** (0.0068)	0.0799*** (0.0066)
d_sand_wood	-0.1844*** (0.0083)	-0.1900*** (0.0085)	-0.1869*** (0.0083)
d_roofing	-0.0492 (0.0385)	-0.0549 (0.0391)	-0.0487 (0.0389)
d_four_asset	-0.0851*** (0.0075)	-0.0944*** (0.0077)	-0.0911*** (0.0075)
d_own_dwelling	0.1138*** (0.0093)	0.1168*** (0.0095)	0.1106*** (0.0092)
d_bank_acc	-0.0263** (0.0111)	-0.0287** (0.0116)	-0.0254** (0.0113)
d_closed_water	-0.2744*** (0.0082)	-0.2933*** (0.0087)	-0.2739*** (0.0085)
Robust Std. Err.	Yes	Yes	Yes
Number of obs.	28,442	28,442	28,442
Wald chi2 (8)	2616.57	2611.09	2542.61
Prob > chi2	0.00000	0.00000	0.00000
Pseudo R2	0.00500	0.00530	0.00500
Log pseudolikelihood	-19612.449	-19504.362	-19345.902

Note: The standard error is in the parenthesis, and \*, \*\*, \*\*\* represent the statistical significance at 90%, 95%, and 99% respectively.

**Table 3.15 Marginal effects (dy/dx) after fractional logit**

Variables	Marginal effects (dy/dx)		
	Near-term future	Medium-term future	Long-term future
d_rural	0.0226*** (0.0017)	0.0227*** (0.0017)	0.0214*** (0.0016)
d_neastn	0.0189*** (0.0016)	0.0109*** (0.0017)	0.0196*** (0.0016)
d_sand_wood	-0.0460*** (0.0021)	-0.0473*** (0.0021)	-0.0461*** (0.0021)
d_roofing	-0.0123 (0.0096)	-0.0136 (0.0097)	-0.0120 (0.0096)
d_four_asset	-0.0213*** (0.0019)	-0.0234*** (0.0019)	-0.0223*** (0.0018)
d_own_dwelling	0.0284*** (0.0023)	0.0291*** (0.0024)	0.0272*** (0.0023)
d_bank_acc	-0.0066** (0.0028)	-0.0071** (0.0029)	-0.0062** (0.0028)
d_closed_water	-0.0685*** (0.0021)	-0.0720*** (0.0021)	-0.0663*** (0.0020)
Robust Std. Err.	Yes	Yes	Yes
Number of obs.	28,442	28,442	28,442
Wald chi2(8)	2616.57	2611.09	2542.61
Prob > chi2	0.00000	0.00000	0.00000
Pseudo R2	0.00500	0.00530	0.00500
Log pseudolikelihood	-19612.449	-19504.362	-19345.902

Note: The standard error is in the parenthesis, and \*, \*\*, \*\*\* represent the statistical significance at 90%, 95%, and 99% respectively.



Table 3.16 shows the estimation results from the fractional logistic regression model (model (1)) and the ordinary least squares (OLS) model (model (2)). The signs of the estimated coefficients under both models are similar, but the size or magnitude of the coefficients are different.

**Table 3.16 Comparison of estimated coefficients under fractional logistic and OLS**

Variables	Near-term future		Medium-term future		Long-term future	
	(1)	(2)	(1)	(2)	(1)	(2)
d_rural	0.0904*** (0.0066)	0.0225*** (0.0017)	0.0917*** (0.0068)	0.0227*** (0.0017)	0.0872*** (0.0066)	0.0213*** (0.0017)
d_neastn	0.0758*** (0.0066)	0.0188*** (0.0016)	0.0438*** (0.0068)	0.0108*** (0.0017)	0.0799*** (0.0066)	0.0195*** (0.0016)
d_sand_wood	-0.1844*** (0.0083)	-0.0457*** (0.0021)	-0.1900*** (0.0085)	-0.0468*** (0.0022)	-0.1869*** (0.0083)	-0.0455*** (0.0021)
d_roofing	-0.0492 (0.0385)	-0.0122 (0.0089)	-0.0549 (0.0391)	-0.0135 (0.0091)	-0.0487 (0.0389)	-0.0119 (0.0088)
d_four_asset	-0.0851*** (0.0075)	-0.0211*** (0.0019)	-0.0944*** (0.0077)	-0.0232*** (0.0019)	-0.0911*** (0.0075)	-0.0221*** (0.0019)
d_own_dwelling	0.1138*** (0.0093)	0.0282*** (0.0022)	0.1168*** (0.0095)	0.0290*** (0.0023)	0.1106*** (0.0092)	0.0273*** (0.0022)
d_bank_acc	-0.0263** (0.0111)	-0.0065** (0.0027)	-0.0287** (0.0116)	-0.0071** (0.0028)	-0.0254** (0.0113)	-0.0062** (0.0027)
d_closed_water	-0.2744*** (0.0082)	-0.0682*** (0.0020)	-0.2933*** (0.0087)	-0.0716*** (0.0020)	-0.2739*** (0.0085)	-0.0658*** (0.0020)
Number of obs.	28,442	28,442	28,442	28,442	28,442	28,442
Wald chi2(8)	2616.57	-	2611.09	-	2542.61	-
Prob > chi2	0	-	0	-	0	-
Pseudo R2	0.00500	-	0.00530	-	0.00500	-
F(8, 28433)	-	347.95	-	344.35	-	339.75
Prob > F	-	0	-	0	-	0
R-squared	-	0.0892	-	0.0883	-	0.0873
Adj R-squared	-	0.0889	-	0.0881	-	0.087
Root MSE	-	0.1333	-	0.13637	-	0.13151

Note: The standard error is in the parenthesis, and \*, \*\*, \*\*\* represent the statistical significance at 90%, 95%, and 99% respectively. (1) represents the fractional logistic regression model, and (2) represents the OLS model

According to the regression analysis, households in rural areas are likely to face higher risks of climate change. However, those with more asset ownership, access to closed piped water system, robust housing structure, and access to a bank account, tend to have higher adaptive capacity and therefore face lower overall risk of climate change. The possession of assets reflects household wealth and ability to adopt climate change adaptation measures to reduce the impacts of climate change. Moreover, during times of crisis, especially after natural disasters or extreme weather events, poor households are often forced to sell their livelihood assets such to access basic services or resources such as food or shelter. Thus, household assets provide a safety net to fall back on during times of crisis and are critical to household resilience and recovery to future climate hazards (UNICEF, 2021). Having access to a closed piped water system will help households to face lower impacts from drought, flood and heat. Having a robust housing structure, especially floors made of earth, sand or wood, will lower the risk of climate change for households. Last but not least, having financial access – which is proxied by owning a bank account – increases the chance of households adapting better to climate change and thus facing lower risk. With these regression analysis results in mind, the **policy recommendations should try to lower the risks of climate change by strengthening the adaptive capacity of households with children**, such as ensuring that they have access to strong and robust housing structure, clean drinking water, and access to a bank account, etc. Details are contained in the policy recommendations in Chapter 5.



# Chapter



# 4

## Review of Policies, Plans and Institutional Arrangements and Gap Analysis

### 4.1 Review of key climate and environmental policies

Climate change and environmental degradation have become two of Thailand's most pressing issues in recent years. The impact of climate change and environmental degradation, such as shifting weather patterns, sea level rise, and an increase in the frequency and intensity of weather-related natural disasters, has affected Thailand, especially in agriculture, tourism, water management, human settlements, and human health. To address these problems, Thailand ratified the Kyoto Protocol in 2002, and has developed several policies and plans to address the problems of climate change and environmental degradation. With these policies and plans, Thailand will be prepared to meet future challenges.

This chapter provides a review of policies, plans, and programmes that focus on climate change and environmental degradation, such as air pollution, water pollution, and waste, as well as plans and policies related to children. A gap analysis is also presented, which aims to assess whether the current climate change and environmental policies and plans explicitly mention children and explicitly contain measures to mitigate the impacts of climate change and environmental degradation on children.

#### 4.1.1 Review of climate change policies

##### 4.1.1.1 National Strategy (2018-2037)

The fifth strategy under the National Strategy mentions the following: 1) improving public health management through the development of preparedness and response systems for infectious diseases caused by climate change; 2) mitigating losses and damages caused by natural disasters and impacts of climate change by improving relevant systems and measures to be more accurate and enhancing the population's ability to adjust to climate change; and 3) investing in climate-friendly infrastructure development.

**Policy gaps:** The strategies under the National Strategy (2018-2037) aim to cover at-risk population groups sensitive to climate change impacts. However, while the strategy covers all vulnerable population groups, it does not explicitly mention children, who are also a group vulnerable to the impacts of climate change. Thus, the National Strategy (2018-2037) does not contain specific policies to mitigate the impact of climate change on children.

#### 4.1.1.2 Master Plan under National Strategy (18): Sustainable Growth

One of the aspects of the Master Plan under National Strategy (18): Sustainable Growth focuses on enhancing preparedness for all economic sectors to minimize loss from climate change impact by reducing greenhouse gas (GHG) emissions in all sectors, upgrading the climate change database, and developing disaster management systems. The Master Plan under National Strategy (18): Sustainable Growth also aims to improve weather forecast and climate change projection systems which are key to an efficient early warning system.

**Policy gaps:** The Master Plan contains policies related to climate change adaptation, which focus on mitigating the impacts of climate change by enhancing preparedness for all economic sectors, developing disaster management system, improving climate change projection data and developing efficient early warning system. However, it does not explicitly mention mitigating the impacts of climate change on children. Furthermore, policies do not particularly reduce the specific climate change impacts faced by children, including impacts from flood, drought, heat and cold.

#### 4.1.1.3 The 12th National Economic and Social Development Plan (NESDP) (2017-2021)

Strategy 4: Strategy for Environmentally Friendly Growth for Sustainable Development under the 12th NESDP mentions climate change and climate change adaptation. With regards to reducing impacts from climate change, emphasis is placed on enhancing the capacity for climate change adaptation to lessen the impacts from climate change and improve the response to natural disasters. The plan aims to establish mechanisms for minimizing impacts from climate change on humans, as well as in high-risk areas or sectors.

**Policy gaps:** The mechanism to reduce impacts from climate change recommended by the 12th NESDP is mainly focused on high-risk areas or sectors and does not consider impacts on children specifically. However, the policies under the 12th NESDP that might help lessen the impacts of climate change on children are as follows. First, the 12th NESDP aims to improve people's awareness and knowledge about climate change by integrating climate change into the school curricula as part of compulsory education from primary level onwards. Second, the 12th NESDP also supports the capacity building of children so that they can deal with the impacts of natural disaster and adapt to climate change.

#### 4.1.1.4 Sustainable Development Goals (SDGs)

SDG-13 (Take urgent action to combat climate change and its impacts) is directly linked to climate change. SDG-13 is composed of three targets, as follows:

- 13.1 Strengthen resilience and adaptive capacity to climate-related hazards and natural disasters in all countries
- 13.2 Integrate climate change measures into national policies, strategies and planning
- 13.3 Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning

**Policy gaps:** The part of SDG-13 that is particularly related to children is Target 13.3: “Improve education, awareness-raising and human and institutional capacity on climate change mitigation, adaptation, impact reduction and early warning”. Even though Thailand has integrated climate change mitigation, adaptation, disaster risk reduction and early warning into primary and secondary curricula, some gaps still remain. For example, there is a lack of application of the concept “progression of understanding of climate change” and children do not yet establish their own connection with climate change. This includes understanding how they are impacted by climate change, how they should adapt to climate change, how to reduce the impacts of climate change and extreme weather events, such as flood, drought, and extreme temperatures, and how they can contribute to reduce carbon dioxide and greenhouse gas emissions to mitigate the risks of climate change.

#### 4.1.1.5 Climate Change Master Plan (2015-2050)

The Climate Change Master Plan 2015-2050 aims to provide a long-term national framework for climate change adaptation and low-carbon growth promotion. It provides a policy framework for the development of mechanisms and tools to achieve effective resolutions for climate change, including the development of detailed action plans and a framework for budget allocation. The Climate Change Master Plan 2015-2050 consists of three key strategies, namely climate change adaptation; mitigation and low carbon development; and enabling environment on climate change management. The climate change adaptation strategies under the Climate Change Master Plan 2015-2050 contain adaptation measures in six sectors, i.e. water resources (including flood and drought management), agriculture and food security, tourism, public health, natural resource management, and human settlement and security.

In response to the impacts of climate change on children, especially impacts from flood, drought, heat and low temperature, the Climate Change Master Plan 2015-2050 contains the following strategies or measures to reduce impacts on children (see Table 4.1 below).

**Table 4.1 Strategies under the Climate Change Master Plan 2015-2050**

Areas	Strategies under the Climate Change Master Plan 2015-2050
Development of risk maps	<ul style="list-style-type: none"> <li>• Development of risk maps, demonstrating flood- and drought-prone areas at national, regional, water basin, provincial, and community levels in order develop an effective risk management and preparedness plan</li> </ul>
Impact assessment	<ul style="list-style-type: none"> <li>• Assess the impact of climate change on food security at national and local level, considering the effects that future domestic and international demand for food will have on the food security, livelihood and nutritional quality of food available to the population, in particular those with high vulnerability to adverse effects due to low income</li> <li>• Assess the potential impact on human settlements in areas at risk of repeated and long-term flooding, torrential floods, drought, and landslides, etc. Risk and vulnerability maps are to be created by assessing the capabilities and resilience of local communities</li> <li>• Assess the impact that climate change will have on the social structure and livelihood of human settlements that are close to or highly dependent on natural resources and geographical features which may be affected by climate change along with the preparedness and adaptive capacities of said communities</li> </ul>

Areas	Strategies under the Climate Change Master Plan 2015-2050
Early warning system	<ul style="list-style-type: none"> <li>• Develop an effective warning system and disease/health impact surveillance networks in high-risk areas</li> <li>• Develop an early warning system that offers accurate and long-range predictions (including meteorological forecasts) along with standard operation procedures and practical guidelines for the public according to the magnitude and severity of the incident</li> </ul>
Awareness raising	<ul style="list-style-type: none"> <li>• Promote disease prevention by raising public awareness regarding health risks and promulgate appropriate prevention guidelines, especially to those at high risk and vulnerability</li> <li>• Raise awareness concerning the potential risk and impact of natural disasters while providing education on options for adaptations</li> </ul>
Surveillance	<ul style="list-style-type: none"> <li>• Build community-based natural disaster surveillance and relief networks; clearly define the responsibilities of all parties and provide support on continual capability building</li> </ul>
Relief mechanisms	<ul style="list-style-type: none"> <li>• Establish remedial and relief mechanisms in readiness for natural disasters by improving existing ones or setting up new ones to support people in emergencies in a timely manner</li> </ul>
Physical and non-physical adaptation measures	<ul style="list-style-type: none"> <li>• Expand the public health insurance system to cover specific population groups who are vulnerable to new and re-emerging diseases, such as children, elderly, livestock farmers and migrant workers</li> <li>• Develop infrastructure with the capacity to withstand natural disasters in all areas at risk</li> </ul>

**Policy gaps:** The strategies and measures in the Climate Change Master Plan 2015-2050 as shown in the table above do not apply particularly to specific population groups, including children, except for the strategy to “expand the public health insurance system to cover specific population groups who are vulnerable to new and re-emerging diseases, such as children, elderly, livestock farmers and migrant workers.” These strategies and measures also do not specifically address the impacts of climate change – heat/high temperature, flood, drought and low temperature – on children, but are applied to the general population. For instance, the early warning system strategy is applied generally to people in affected areas, but as it lacks a child focus, it is not ensured whether the warnings will reach children in high-risk areas. Similarly, there is a possibility that children might not benefit from the awareness raising measures, relief mechanisms and physical infrastructure which are aimed at the general public. Given that the risk maps prescribed by the Climate Change Master Plan 2015-2050 are not developed with child sensitivity in mind, such general risk maps do not provide information to policy makers and other relevant agencies about areas with high risks of children affected by climate change; thus, targeted assistance cannot be provided.

#### 4.1.1.6 National Adaptation Plan (NAP)

The key objectives under the NAP are as follows:

1. To increase the resilience of all sectors in Thailand to climate change impacts by encouraging the inclusion of the climate change adaptation framework into guidelines, plans and policies at all levels.
2. To improve awareness, adaptive capacity, and knowledges of all sectors and prepare all relevant parties to cope with the impacts of climate change adaptation.
3. To develop the databases, research and development and technology to support climate change adaptation.

The adaptation measures in the six sectors under the National Adaptation Plan are shown below in 4.2.

**Table 4.2 Adaptation measures under the National Adaptation Plan**

Sector	Adaptation measures
Water management	<ul style="list-style-type: none"> <li>• Development of flood defense infrastructure and floods warning systems</li> <li>• Development of rainwater storage infrastructure</li> <li>• Development of water footprint database</li> </ul>
Agriculture and food security	<ul style="list-style-type: none"> <li>• Development of early warning systems</li> <li>• Development of climate risk map for the agricultural sector, enhancing farmer's adaptive capacities</li> <li>• Promotion of climate-smart agriculture</li> </ul>
Tourism	<ul style="list-style-type: none"> <li>• Promoting man-made tourist attractions</li> <li>• Encouraging tourists to visit Thailand during low seasons</li> <li>• Supporting the consideration of carrying capacity in tourism activities planning</li> <li>• Encouraging various types of tourism</li> </ul>
Public health	<ul style="list-style-type: none"> <li>• Development of risk maps</li> <li>• Improving the health insurance scheme to cover groups vulnerable to impacts of climate change</li> <li>• Building capacity of public health personnel in dealing with climate-related diseases and illness</li> </ul>
Natural resource management	<ul style="list-style-type: none"> <li>• Reforestation</li> <li>• Conservation of marine and coastal resources as well as mangrove forests</li> <li>• Developing a natural resource database and climate change forecast systems</li> <li>• Developing biological indicators</li> <li>• Enhancing knowledge and awareness on the impact of climate change on biodiversity</li> </ul>
Human settlement	<ul style="list-style-type: none"> <li>• Development and improving efficiency of early warning systems</li> <li>• Promoting climate-resilient architecture</li> <li>• Enhancing capacity of communities in disaster risk management</li> <li>• Promoting access of the vulnerable groups to various forms of assistance</li> <li>• Creating awareness for communities and other relevant parties about climate change risks</li> </ul>



**Policy gaps:** Although the National Adaptation Plan provide guidelines and examples of adaptation measures in six sectors, the plan barely mentions climate change adaptation to address the needs of children, except in the public health and human settlement and security sectors. Adaptation measures in these two sectors have some linkages with children, who are included in the vulnerable groups category. In the public health sector, emphasis is placed on preventing or reducing the health impacts of climate change on vulnerable groups and communities in high-risk areas and extending the coverage of the health insurance system to cover the vulnerable groups. For the human settlement sector, emphasis is placed on promoting the access of vulnerable groups to various forms of assistance and creating awareness for communities and other relevant parties about climate change risks.

In terms of policy gaps, first, the NAP does not contain specific child-sensitive adaptation measures. Children are only mentioned as one of the vulnerable groups. Second, current measures under the NAP do not sufficiently reduce the impacts of flood, drought, heat and low temperature on children. Examples of measures that are missing from the NAP are as follows.

1. Risk maps that identify areas in which children are prone to climate hazards, such as flood, drought, heat and cold spells, which would play a crucial role in risk management and preparedness plans
2. Child-sensitive early warning systems for flood, drought, heat and cold spells
3. Disease or health impact surveillance networks for the areas where children are exposed to high risks of climate change
4. Awareness raising on health risks, appropriate prevention guidelines and climate-risk adaptation aimed at children and parents living in high-risk areas
5. Community-based remedial mechanism and relief networks that support children in emergencies in a timely manner
6. Physical infrastructure to prevent the impacts of flood and drought on children

Without these additions, the adaptation measures under the NAP cannot sufficiently help mitigate the impacts of climate change on children.

#### 4.1.1.7 Thailand's Nationally Determined Contribution Roadmap on Mitigation 2021-2030

Under Thailand's Nationally Determined Contribution (NDC), Thailand is committed to 20-25 per cent GHG emission reductions compared to business as usual (BAU) by 2030. The energy and transport sectors together account for more than 70 per cent of GHG emissions in Thailand; therefore, the energy sector is the primary target sector for GHG mitigation. The proposed mitigation actions under the NDC include feed-in-tariffs, tax incentives and access to investment grants to promote renewable energy. The Thai Cabinet endorsed the NDC Roadmap (2021-2030) in 2017, which outlines the steps to be taken to reach Thailand's NDC targets.

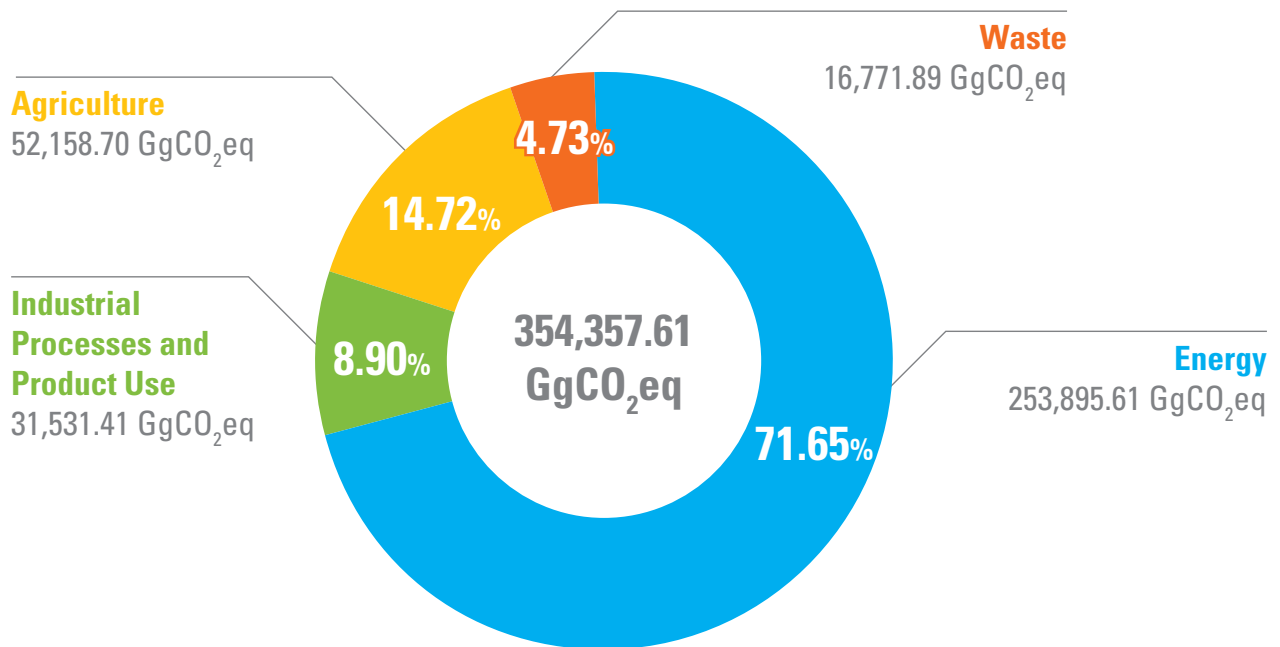
**Policy gaps:** Thailand's NDC Roadmap (2021-2030) does not take into account the impact of climate change on children. It focuses on GHG mitigation in different sectors, namely energy, transport, industry and waste.

### 4.1.1.8 Thailand’s third Biennial Update Report (BUR3)

Thailand’s third Biennial Update Report (BUR3) provides an update on the national GHG inventory, national circumstances, institutional arrangements, and achievement of GHG emissions reduction. The report was prepared using the United Nation Framework Convention on Climate Change (UNFCCC) guidelines and shows that Thailand successfully reduced GHGs emission in 2018 by 57.84 MtCO<sub>2</sub>eq, which is approximately 15.76 per cent lower than its BAU level. Figure 4.1 shows that, as of 2016, the main source of GHG emissions in Thailand was the energy sector, which emitted around 253,895.61 GgCO<sub>2</sub>eq of GHG in 2016. The energy sector released up to 71.65 per cent of total emission sources in Thailand in 2016, followed by agricultural sector, IPPU, and waste sectors, respectively.

**Policy gaps:** Thailand’s BUR3 does not specifically mention children and youth, although it does mention the reduction in number of deaths and missing persons caused by disasters.

**Figure 4.1 Total GHG emissions by sector (excluding LULUCF) in Thailand in 2016**



Source: Ministry of Natural Resources and Environment (2020)

#### 4.1.1.9 Thailand's Environmental Quality Management Plan (2017-2021)

The 4th strategy under the Environmental Quality Management Plan (2017-2021) – “Establishing climate change and natural disaster adaptation capacity and promoting international cooperation” – focuses on climate change. The main goal of this strategy is to ensure that all stakeholders, both private and public, have the capacity to tackle climate change and natural disasters. Furthermore, this plan aims to promote environmental cooperation at both the national and international levels.

**Policy gaps:** Thailand's Environmental Quality Management Plan (2017-2021) does not mention specifically the impacts of climate change on children and ways to mitigate the impacts. The plan aims to raise general knowledge and awareness, and across all levels of education, including formal education, non-formal education, and informal education.

#### 4.1.1.10 Health National Adaptation Plan (HNAP)

The Health National Adaptation Plan (HNAP), Phase 1 (2021–2030) provides guidelines enabling multisectoral partnerships to strengthen and build health resilience against climate change. The HNAP is composed of four strategies as follows:

1. Strengthening community skills in adaptation and health literacy to cope with health risks from climate change.
2. Integrating the resources of all sectors to proficiently drive public health implementation climate change.
3. Strengthening public health preparedness for climate change to support economic and social development and security.
4. Developing the national public health system in response to climate change to an international standard.

The HNAP aims to strengthen the knowledge and skills of high-risk populations, such as children, elderly, bedridden patients, and disabled people to ensure that they are able to cope with health risks from climate change.

**Policy gaps:** Though the HNAP has raised concerns about the impacts of climate change on children as one of the vulnerable or high-risk groups and contains strategies which emphasize building capacity and strengthening knowledge of these groups, some policies are not covered by the HNAP, such as the development of child-focused risk maps, child-sensitive early warning systems, and child-sensitive relief mechanisms. Thus, not all the impacts of climate change on children are prevented or mitigated.

## 4.1.2 Review of environmental degradation policies

Air pollution, water pollution, solid waste and hazardous waste are some of the key environmental degradation issues which impact Thai children and youth. This section considers three environmental degradation problems: air pollution, water pollution and waste. The plans and policies related to these three types of pollution are reviewed and summarized below.

### Air pollution

Air pollution is mentioned in several plans and policies, including the National Strategy (2018-2037), the Master Plan under the National Strategy (18): Sustainable Growth, the National Reform Plan, the 12th NESDP (2017-2021), as well as sectoral plans and policies, etc. The section that follows will review each plan and policy in detail.

#### 4.1.2.1 National Strategy (2018-2037)

Under the 5th strategy of the National Strategy (2018-2037), the aim is to develop and put in place systems and mechanisms for surveillance, monitoring, inspection, and control of pollution in the manufacturing sector, especially the implementation of point source pollution emission control and standardized pollution management. In addition, emphasis is also placed on promoting law enforcement to prevent and control pollution.

**Policy gaps:** The 5th strategy of the National Strategy does not specifically include policies and measures to prevent the impacts of air pollution on children and youth in Thailand.

#### 4.1.2.2 Master plan under the National Strategy (18): Sustainable Growth

The master plan under National Strategy (18): Sustainable Growth aims to reduce air pollution related to industrial processes and product use. Emphasis is placed on at-source pollution management and investment in pollution-control infrastructure. Examples of measures include air pollution control, traffic control in congested areas, and air pollution warning systems, etc.

**Policy gaps:** This master plan does not mention or contain child-focus measures to reduce the impacts of air pollution on children.

#### 4.1.2.3 National Reform Plan

The National Reform Plan refers to bottom-up air pollution management systems, environmentally friendly production and consumption, and air pollution reduction through cooperation between the public, private, and citizen. The National Reform Plan focuses on reducing air pollution in areas with severe air pollution problems, including northern provinces, southern provinces, industrial estate areas, and major cities. Examples of measures to control air pollution include encouraging the use of low-emission vehicles, stringent controls on motor vehicle emissions, and the use of economic instruments and legal measures. The following policies related to air pollution fall under the National Reform Plan:

1. Incentivizing factories to reduce pollution at source by encouraging consumers to consume environmentally friendly products.
2. Improving the pollution monitoring system in buildings, developing transparent pollution emissions data and putting in place mechanisms for public participation in emission surveillance, control, and monitoring.

3. Developing a database for greenhouse gas emissions as well as a public information system and identifying the best economic mechanisms to incentivize the private sector to reduce greenhouse gas emissions.

**Policy gaps:** The National Reform Plan targets general populations, the public sector, and the private sector, and does not specifically focus on the impacts of air pollution on children.

#### 4.1.2.4 The 12th National Economic and Social Development Plan (2017-2021)

Under the 4th strategy, “Environmentally Friendly Growth for Long-Term Development”; emphasis is placed on addressing the problems of haze, burning of agricultural residues and forest fires in the Northern and Southern parts of Thailand through multilateral or bilateral collaboration with neighbouring countries and through law enforcement. Under the 7th strategy, “Infrastructure and Logistics Advancement”, emphasis is placed on improving public transport infrastructure, particularly in urban areas, to encourage people to reduce the use of private vehicles. Under the 9th strategy, “Regional, Urban, and Economic Zone Development Strategy”, focus is placed on developing efficient transportation systems in cities to alleviate the problem of traffic congestion.

**Policy gaps:** Even though the 12th National Economic and Social Development Plan refers to children and youth several times throughout the plan, when it comes to impacts of air pollution, this plan does not present specific policies to mitigate the impacts of air pollution on children and youth.

#### 4.1.2.5 Environmental Quality Management Plan (2017-2021)

The Environmental Quality Management Plan (2017-2021) focuses on air pollution from industries and the transport sector, as well as haze pollution, particularly in the Northern part of Thailand. The main measures to prevent air pollution under the Environmental Quality Management Plan (2017-2021) include the development of a comprehensive database, the use of economic instruments to create incentives for pollution reduction at source, the use of monitoring and control systems, as well as enforcement of laws and regulations. The plan also aims to provide assistance to those affected by air pollution, particularly those living in the affected areas, and rehabilitate the areas affected by air pollution.

**Policy gaps:** Even though this plan aims to assist vulnerable groups affected by air pollution through the use of financial and legal mechanisms, children, who are one of the groups most affected by air pollution, are not specifically mentioned.

#### 4.1.2.6 20-Year Pollution Management Strategy (2017-2036) and Pollution Management Plan (2017-2021)

The 20-Year Pollution Management Strategy (2017–2036) is a long-term pollution management strategy that is aligned with the National 20-year Strategy. The main strategies to address the air pollution are to: encourage the efficient use of natural resources and the use of environmentally friendly technology across the board in all economic sectors; increase the efficiency of waste disposal and waste treatment; and develop a pollution management system.

**Policy gaps:** Children are mentioned in this plan as one of the target groups for pollution control and prevention. This plan aims to use the formal and informal educational systems to raise children’s awareness of environmental issues, pollution issues, and long-term environmental issues. However, this plan does not contain measures to mitigate the impacts of air pollution on children.

#### 4.1.2.7 Action Plan to tackle particulate matter pollution (2019-2024)

The following issues are emphasized under the Action Plan to tackle particulate matter pollution, namely: (i) management and control of pollution from sources; (ii) taking immediate actions to address air pollution issues during crises; (iii) prevention and reduction of pollution at source; and (iv) improving pollution management efficiency through the development of management tools and mechanisms, as well as research and development.

**Policy gaps:** The Action Plan does not contain specific measures to mitigate the impacts of air pollution, particularly particulate matters, on children and youth in Thailand.

### Water pollution

#### 4.1.2.8 National Strategy (2018-2037)

Water pollution and wastewater are mentioned in Strategic Agenda 5 “The National Strategy on Eco-Friendly Development and Growth” under the National Strategy (2018-2037). The focus is on developing policies and laws to support water pollution management and encouraging water pollution control technology and innovation. To reduce the impact of water pollution and wastewater, this plan includes goals and guidelines for increasing drainage capacity and increasing wastewater treatment capacity, as well as improving institutions and laws related to control of water pollution.

**Policy gaps:** The National Strategy (2018-2037) does not take into account the impacts of water pollution and wastewater on children and youth and does not include any measure to mitigate the impacts of water pollution and wastewater on children.

#### 4.1.2.9 Master plan under the National Strategy (19): Water Management

The Master Plan under the National Strategy (19): Water Management aims to improve the country’s water security by focusing on water resource management. The part of this plan that is related to water pollution is the water usage control and management subplan. This subplan aims to set aside water sources for drainage, water storage, and water quality management purposes. It also focuses on utilizing economic instruments and mechanisms to encourage people to reduce the release of chemicals or toxic substances into water sources.

**Policy gaps:** Even though this plan covers a variety of actions to protect water resources, including the development of a wastewater treatment system, the control of wastewater release into public water sources, and the formulation of water quality standard laws, it does not contain policies or measures to mitigate the impact of water pollution or wastewater on children.

#### 4.1.2.10 National Reform Plan

One of the goals of the National Reform Plan is to resolve wastewater issues and to allocate wastewater management resources to ensure good water quality. Proposed measures to address water pollution include the use of technologies for water recycling, provision of knowledge to all stakeholders, seasonal water management strategy, and establishment of water resource information centres, etc.

**Policy gaps:** The National Reform Plan does not consider the impact of water pollution on children and does not contain any policy or measure to mitigate the impact of water pollution on children.

#### 4.1.2.11 The 12th National Economic and Social Development Plan (2017-2021)

Strategy 4 under the 12th National Economic and Social Development Plan (2017–2021) – “Environmentally Friendly Growth Strategy for Sustainable Development” – addresses issues relating to water pollution. Strategy 4.3 aims to reduce pollution and improve environmental quality. Several measures under the 12th National Economic and Social Development Plan (2017–2021) to tackle water pollution problem include water quality improvement, promotion of wastewater treatment from the source through law enforcement, as well as research, innovation and technology development. These measures help reduce contamination in water resources, particularly critical watershed areas and wetlands.

**Policy gaps:** The 12th National Economic and Social Development Plan (2017–2021) does not consider the impacts of water pollution and wastewater on children and does not contain policies and measures to prevent and reduce impacts of water pollution on children.

#### 4.1.2.12 The National Environmental Quality Promotion and Conservation Policy and Plan 2017-2036

The parts of the National Environmental Quality Promotion and Conservation Policy and Plan (2017–2036) that are related to water pollution include improving water quality, promoting reuse and recycling of wastewater, supporting the development of an efficient wastewater treatment system that meets international standards, monitoring and regulating water quality, and establishing a monitoring system and transparent assessments of water quality.

**Policy gaps:** Though some of the measures under this plan place an emphasis on environmental education and lifelong learning about the environment, this plan does not explicitly address the impacts of water pollution and wastewater on children and does not contain any specific measure to mitigate the impacts of water pollution and wastewater on children.

#### 4.1.2.13 20-Year Pollution Management Strategy (2017-2036) and Pollution Management Plan (2017-2021)

The key measures under these plans to address the issue of water pollution include encouraging all sectors to cut down on water consumption and increase awareness about the value of water. The plan also encourages the establishment of water treatment businesses to reduce water pollution and wastewater, which should be regulated, supervised, and monitored by government agencies.

**Policy gaps:** Even though this plan aims to prevent or minimize the impact of water pollution on the population, the plan does not specifically mention the impacts of water pollution on children or youth and does not contain specific measures to mitigate the impacts of water pollution on children or youth.

#### 4.1.2.14 The 20-Year Water Resources Management Master Plan (2018–2037)

The areas under the 20-Year Water Resources Management Master Plan (2018–2037) that are linked to water pollution and wastewater include water quality management and water resource conservation, and operation management. The focus is to develop and improve the water treatment system in the local community, recycle wastewater, prevent wastewater generation at the source, and conserve and improve natural water sources such as rivers, lakes, and other bodies of water across the country. Another area of focus is on establishing water resource management institutions, updating water pollution legislation, and supporting international collaboration on water pollution and wastewater issues.

**Policy gaps:** This plan does not explicitly mention the impact of water pollution and wastewater on children and youth, nor is there any specific action for children or youth to deal with water pollution and wastewater.

## Waste

### 4.1.2.15 National Strategy (2018-2037)

Two parts of Strategy 5 of the National Strategy (2018-2037), “National Strategy on Eco-Friendly Development and Growth”, are related to solid waste, namely promoting sustainable consumption and production, and eliminating pollution and damaging agricultural chemicals in line with international standards. Examples of measures include economic measures and social measures to persuade people to change their consumption habits. In addition, emphasis is also placed on utilizing the 3Rs principle in waste management (reduce, reuse, recycle), as well as developing a system to track waste and pollution management nationwide in a systematic manner.

**Policy gaps:** The National Strategy does not explicitly consider the impact of waste on children and youth and does not contain measures to prevent or reduce impacts of waste on children or youth.

### 4.1.2.16 Master plan under the National Strategy (18): Sustainable Growth

Two sub-plans under Master Plan (18): Sustainable Growth are related to solid waste, namely “Encouraging green growth and long-term development” and “Reducing pollution that has an impact on the environment”. Several tools are mentioned in this master plan, including the use of economic instruments, social mechanism, law enforcement, eliminating pollution at its source, enhancing waste disposal facilities, encouraging all stakeholders to work together on solid waste management, and encouraging private sector investment in waste management systems.

**Policy gaps:** The Master Plan (18): Sustainable Growth does not consider the impact of waste on children or ways to mitigate the impacts of waste on children.

### 4.1.2.17 National Reform Plan

Examples of measures under the National Reform Plan related to waste include implementation of waste management policies, strict waste management law enforcement, using economic instruments in the local area to raise local people’s awareness, encouraging social sector collaboration, and improving pollution management systems at the source

**Policy gaps:** The National Reform Plan aims to enhance the knowledge of children and youth on waste management through educational systems and the media. However, there are no child-specific measures to mitigate impacts of waste on children and youth.

### 4.1.2.18 The 12th National Economic and Social Development Plan (2017-2021)

The Strategy for Environmentally Friendly Growth for Sustainable Development under the 12th National Economic and Social Development Plan (2017-2021) refers to solid waste management. By boosting awareness among all individuals, especially students and teenagers, this approach intends to eliminate waste at the source.

**Policy gaps:** Although the 12th National Economic and Social Development Plan (2017-2021) contains awareness raising measures, there are no child-specific measures to mitigate impacts of waste on children and youth.



#### 4.1.2.19 The National Environmental Quality Promotion and Conservation Policy and Plan 2017-2036

The National Environmental Quality Promotion and Conservation Policy and Plan 2017-2036 has three main policies that refer to solid waste: 1) encouraging green growth for long-term wealth and sustainability; 2) improving natural resources and environment management standard; and 3) creating partnerships in natural resource and environmental management.

**Policy gaps:** Though the National Environmental Quality Promotion and Conservation Policy and Plan 2017-2036 advocates for a framework for environmental education, sustainable development, and global citizenship in the primary education system from early childhood to high school, there are no child-specific measures to reduce or mitigate impacts of waste on children and youth.

#### 4.1.2.20 Environmental Quality Management Plan (2017-2021)

The Environmental Quality Management Plan (2017-2021) has two main strategies that refer to solid waste, namely good environmental quality management and optimizing the use of natural resources and the environment in a cost-effective and sustainable way. This plan includes several measures to address the waste problem, such as increasing waste management knowledge and awareness in schools, local communities, and waste management centres; encouraging waste separation at the source; assisting in the reduction of food waste; and encouraging the use of containers or bio-plastic bags that are biodegradable in nature.

**Policy gaps:** Though this plan focuses on providing knowledge and awareness to the students in school, as well as the local community, to prepare the youth in Thailand to be more environmentally friendly and embrace the 3Rs principle on a day-to-day basis, it does not contain measures to mitigate the impacts of waste pollution on children and youth.

#### 4.1.2.21 The 20-Year Pollution Management Strategy and Pollution Management Plan 2017-2021

The 20-Year Pollution Management Strategy and Pollution Management Plan 2017-2021 contains three main strategies related to solid waste management, including pollution prevention and reduction at source; improving the waste disposal and treated process, and control pollution from source; and developing pollution management systems. This plan also aims to increase the knowledge of all stakeholders through various actions such as integrating pollution knowledge into basic education, establishing waste learning centres, and supporting research and development on waste management.

**Policy gaps:** Though this plan aims to increase the knowledge of all stakeholders including children and students through various actions such as integrating pollution knowledge into basic education and establishing waste learning centres, this plan does not contain any child-specific measures to reduce the impacts of waste on children.

#### 4.1.2.22 National Solid Waste and Hazardous Waste Management Roadmap and National Solid Waste and Hazardous Waste Management Master Plan (2016-2021)

The National Solid Waste and Hazardous Waste Management Roadmap is an integration of all provinces' solid waste management plans, as well as plans from the private sector and the public sector. Several measures related to waste management are mentioned in the roadmap, such as supporting private sector investment in waste management, enforcing waste management plans and policies, enhancing citizens' knowledge regarding waste management, and so on. The parts of the roadmap and plan that are linked to children and youth are raising awareness on solid waste management among students and youth through activities and actual implementation in schools.

**Policy gaps:** Though this plan aims to increase the knowledge of all stakeholders including children and students on waste management, this plan does not contain child-specific measures to reduce impacts of waste on children.

#### 4.1.2.23 Plastic waste management roadmap (2018-2030)

The plastic waste management roadmap (2018–2030) aims to tackle Thailand’s plastic waste problems and move towards sustainable plastic management through a circular economy model. The focus of this roadmap is to replace plastics with environmentally friendly renewable materials and to promote plastic waste recycling. The plastic waste management roadmap (2018–2030) and action plan (2018–2030) place emphasis on raising awareness and enhancing understanding of all stakeholders on plastic waste through a series of public relation campaigns and online media.

**Policy gaps:** Though this plan aims to raise awareness and understanding of all stakeholders including children and students on plastic waste, this plan does not contain child-specific measures to reduce the impacts of plastic waste on children.

### 4.1.3 Review of natural disaster related policies and plans

#### 4.1.3.1 National Strategy (2018-2037)

The strategies under the National Strategy (2018-2037) related to natural disaster and disaster management are the national strategy on security, national strategy on competitiveness enhancement, and national strategy on eco-friendly development and growth. Under the national strategy on security, emphasis is placed on developing an efficient national threat preparedness and management system to prepare the country to effectively deal with threats and disasters of every dimension. For the national strategy on competitiveness enhancement, emphasis is placed on promoting the development of an industry related to disaster management, for instance, a system warning, a responsive disaster preparation, and an assistance before and after disasters. For the national strategy on eco-friendly development and growth, emphasis is placed on improving disaster management systems and strengthening people’s capacity to cope with disasters.

**Policy gaps:** The strategies under the National Strategy (2018-2037) aim to cover all groups vulnerable to natural disaster, but does not explicitly mention children, who are also considered to be one of the groups most vulnerable to the impacts of natural disaster. Thus, the National Strategy (2018-2037) does not contain specific policies to mitigate the impact of natural disaster on children.

#### 4.1.3.2 Master plan under the National Strategy (18): Sustainable Growth

One of the aspects of the master plan under National Strategy (18): Sustainable Growth focuses on enhancing preparedness for all economic sectors to minimize loss from natural disaster. Examples of policies and measures include database development, development of accurate and timely natural disaster early warning systems, and integration of natural disaster preparedness into project planning and investment in infrastructure projects.

**Policy gaps:** Though the master plan under National Strategy (18): Sustainable Growth contains policies related to the development of a disaster management system, improving the natural disaster data and developing efficient early warning systems. However, it does not explicitly mention mitigating the impacts of natural disaster on children.

#### 4.1.3.3 The 12th National Economic and Social Development Plan (2017-2021)

Strategy 4 under the 12th National Economic and Social Development Plan – Strategy for Environmentally Friendly Growth for Sustainable Development – mentions natural disaster preparedness and management. With regards to reducing the impacts from natural disaster, emphasis is placed on improving natural disaster response and establishing mechanisms for minimizing impacts in high-risk areas or sectors, as well as on humans.

**Policy gaps:** The mechanisms to reduce impacts from natural disaster recommended by the 12th National Economic and Social Development Plan mainly focus on high-risk areas or sectors, not children. Nevertheless, the plan supports the capacity building of children so that they can prevent themselves from impacts of natural disaster.

#### 4.1.3.4 National Disaster Risk Management Plan (2015)

This National Disaster Risk Management Plan (2015) aimed to create and enhance awareness for disaster risk reduction before, during and after disaster, and provide strategic direction for implementation to align with the Disaster Prevention and Mitigation Act B.E. 2550 (2007) and the Sendai Framework for Disaster Risk Reduction 2015–2030. Strategies under the National Disaster Risk Management Plan (2015) focus on disaster risk reduction; an application of an integrated emergency management system; strengthening and enhancing efficiency of sustainable disaster recovery (i.e. building back better and safer); and promoting international cooperation on disaster risk reduction.

**Policy gaps:** The strategies under the National Disaster Risk Management Plan (2015) aim to cover all groups vulnerable to natural disaster, but does not explicitly mention children, who are also considered to be one of the groups most vulnerable to the impacts of natural disaster.

### 4.1.4 Review of children related policies and plans

#### 4.1.4.1 Ministry of Social Development and Human Security's 20-Year Strategy (2018-2037)

The MSDHS 20-Year Strategy (2018-2037) has four sub-strategies as follows:

1. Enhance the potential of populations and communities, as well as growth support systems, for a better quality of life.
2. Build appropriate and effective social security systems for specific target groups.
3. Systematically encourage social collaboration among all stakeholders.
4. Enhance the organization's performance and grow as a social leader.

This plan intends to promote early childhood development, as well as equipping all youth populations in Thailand with vital and up-to-date skills. This first sub-strategy focuses on strengthening family support networks such as child development centres, child-friendly environments, and so on, to ensure the best possible development for Thai children.

**Policy gaps:** The MSDHS 20-Year Strategy (2018-2037) does not refer to the impacts of climate change or environmental degradation issues on children in its action plans.

#### 4.1.4.2 The first Department of Children and Youth strategy (2017-2021)

The first DCY strategy (2017-2021) provides key guidelines for the DCY to achieve the goal of supporting children to have a better society, better quality of life, and more security in their lives. The main objective is to ensure that children and youth in Thailand have adequate access to their own rights and welfare benefits. The first DCY strategy (2017-2021) contains six main strategies to achieve its goals as follows.

1. Improve children- and youth-related policies and plans in a proactive way.
2. Enhance children and youth's ability and potential in all aspects, including health, knowledge, morals, and personality, to support children's future development.
3. Improve the social protection system to cover all children and youth in Thailand, such as child lost applications, alarm systems, etc.
4. Create and support suitable social welfare systems for children and youth in Thailand. This plan aims to help improve the quality of life for children suffering from abuse by using efficient and effective social welfare systems.
5. Promote social collaboration to solve agenda-based problems such as teenage pregnancy, child violence, etc.
6. Develop the abilities of DCY staff.

**Policy gaps:** Even though the first DCY strategy (2017-2021) has a focus on children and youth in many aspects, this plan does not mention the impacts of climate change and environmental degradation on children and youth and does not contain any measures to mitigate the impacts of climate change and environmental degradation on children and youth.

#### 4.1.4.3 The Second National Children and Youth Development Plan (2017-2021)

The Second National Children and Youth Development Plan (2017-2021) aims to improve the physical, mental, emotional, social, and intellectual well-being of children and youth. Developing learning skills and becoming creative citizens who are aligned with the twenty-first century can help children and youth adapt to globalization. Building public responsibility and consciousness is also an important component of the plan, which aims to make children active participants in the social development process. The Second National Child and Youth Development Plan includes five major strategies, namely developing the potential of children and youth; improving the surrounding environment to support effective children and youth development; encouraging participation of children and youth; promoting roles and mobilizing collaboration across all sectors in children and youth development; and developing innovations in child and youth development.

**Policy gaps:** Even though the Second National Children and Youth Development Plan focuses primarily on children and youth development, and mentions the current situation related to climate change and natural disasters, this plan does not discuss the effects of climate change and environmental degradation on children and youth.

#### 4.1.4.4 National Child Protection Strategy (2017-2021)

The National Child Protection Strategy focuses on proactive prevention and protection through a holistic approach, with the vision of “every child lives well, happily, and safely in a family community and in a protective and caring environment.” The strategy covers six strategies as follows.

1. Empowering people surrounding children to provide protection to children
2. Building capacity of professionals and multidisciplinary teams for child protection
3. Mobilizing and supporting participation of volunteers for child protection
4. Upgrading standards and capabilities in providing services consistent with the situations and needs of children, systematically and comprehensively
5. Developing system and mechanisms for supporting implementations, monitoring and evaluation, and transferring and managing knowledge
6. Promoting international collaboration and coordinating mechanisms for child protection

**Policy gaps:** The National Child Protection Strategy does not mention of the effects of climate change and environmental degradation on children and youth.

#### 4.1.4.5 The Basic Education Core Curriculum (2008)

According to the Office of the Basic Education Commission (OBEC) and the Office of the Permanent Secretary, Ministry of Education, there is currently some integration of climate change, sustainable development and global citizenship into Thailand’s basic education core curricula, teacher training and student evaluation. Thailand has integrated climate change mitigation, adaptation, impact reduction and early warning into primary and secondary curricula. For primary and secondary education, climate change is integrated into the teaching of science, social, religion and culture, and health and physical education.

**Policy gaps:** Though the integration of climate change mitigation, adaptation, disaster risk reduction and early warning into Thailand’s basic core curricula will help raise awareness and build capacity of children about climate change, climate change mitigation and climate change adaptation, this on its own is not sufficient to eliminate the risks or impacts of climate change on children.

#### 4.1.4.6 Notifications of the Ministry of Education Re: Establishment of a coordinating centre to monitor the situation of dust (PM2.5)

According to the Notification of the Ministry of Education Re: Establishment of a coordinating centre to monitor the situation of dust (PM2.5), educational institutions must enhance students’ knowledge on environmental health, environmental education, environmental management, and climate change to raise awareness and participation, prevent, correct, and reduce environmental risk for long-term good quality of life.

**Policy gaps:** Though this notification aims to raise awareness and understanding of students on climate change and dust, this notification does not contain child-specific measure to reduce impacts of climate change and pollution on children.

## 4.2 Summary of policy gaps

After considering the current plans and policies related to climate change adaptation in Thailand, it is clear that only some of these plans and policies, such as the National Adaptation Plan and the HNAP, treat children as a high-risk or vulnerable group. Relevant adaptation strategies include disease or health impact surveillance in areas where children are exposed to high risks of climate change as well as awareness raising on health risks, appropriate prevention guidelines and adaptation options to children and parents living in high-risk areas. However, these strategies alone cannot eliminate the risks and impacts of climate change on children.

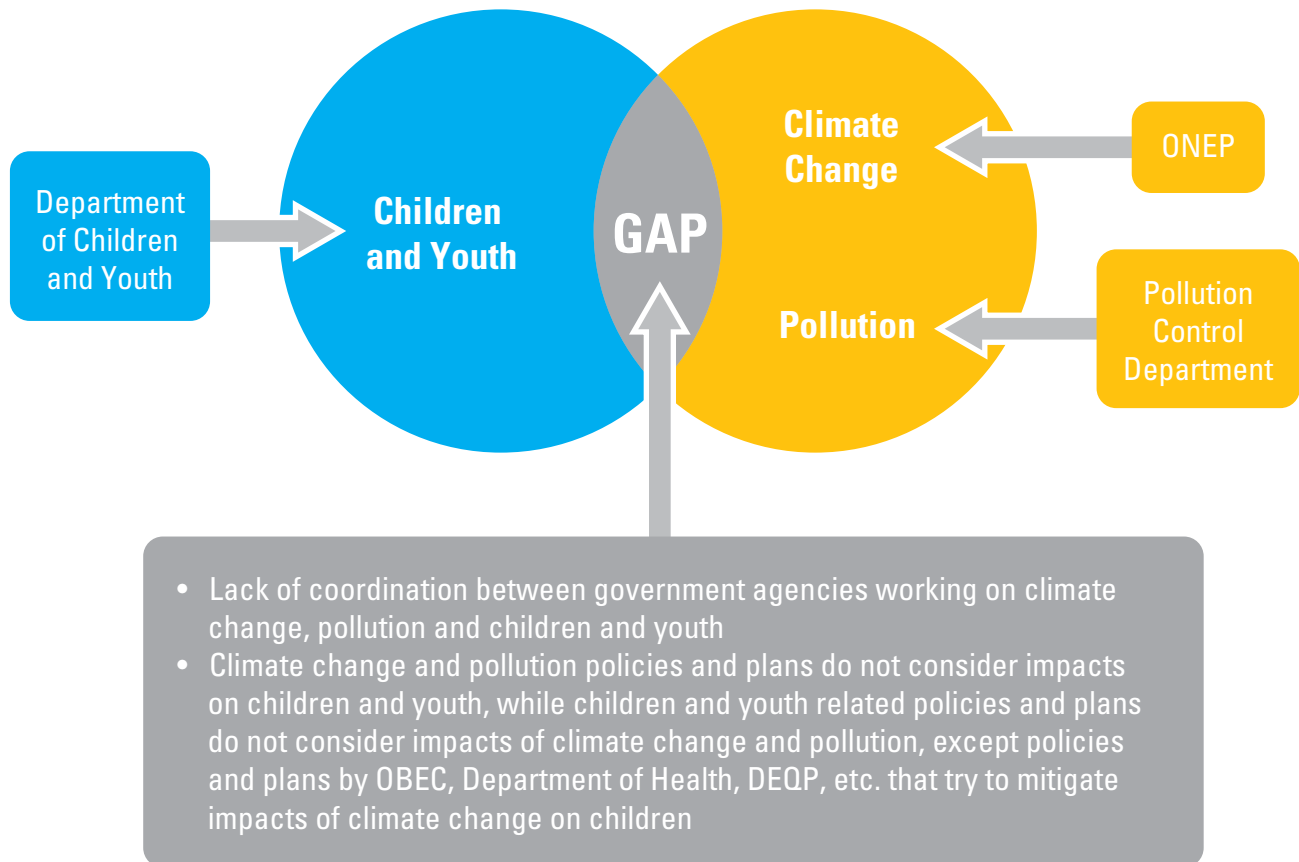
This report identified four main gaps which require attention:

1. A lack of specific measures in place to protect children from the effects of climate change and environmental degradation.
2. No adaptation plan to mitigate the risks of climate change at the sub-nationals and provincial levels.
3. A lack of coordination among relevant government agencies.
4. A lack of involvement of children and youth in policy formulation.

The **first gap**, as shown throughout Chapter 4, is that there are **no specific measures in these policies to protect children from the effects of climate change and environmental degradation**. The **second gap** is that, at present, there is **no adaptation plan to mitigate the risks of climate change at the sub-nationals and provincial levels**. This means that the high-risk provinces highlighted in this study do not yet have plans to reduce the impacts of climate change on children and residents, and lack adaptation measures.

A **third gap**, highlighted by stakeholders via online consultation meetings, is the **lack of coordination among relevant government agencies**, specifically the DCY, OBEC, the DOH, the PCD, and ONEP. Currently, the government agencies responsible for climate change or environmental degradation planning and policy formulation – ONEP and the PCD – do not pay particular attention on mitigating the impacts of climate change and pollution on children. Instead, the focus is on reducing the risks and impacts faced by vulnerable groups. On the other hand, the DCY's main focuses are on child protection, capacity building for children and youth, and welfare improvement for children and their families. Reducing impacts from climate change is not in the main interest of the DCY.

However, some government agencies have begun to integrate climate change impact reduction into their policies and planning. For example, OBEC, Ministry of Education, has integrated climate change mitigation, adaptation, disaster risk reduction and early warning into the Basic Education Core Curriculum B.E. 2551. This will help raise awareness and build the capacity of children about climate change, climate change mitigation and climate change adaptation. For the DOH, MOPH, reducing climate change impacts on children is part of the Health National Adaptation Plan (HNAP), although the HNAP contains strategies and emphasizes on building capacity and strengthening knowledge of vulnerable groups, not only children. In addition, several government agencies, such as the Department of Environmental Quality Promotion, Department of Disaster Prevention and Mitigation, etc. have conducted capacity building activities on climate change adaptation and disaster management to different target groups, including children, students, etc. Though a few government agencies now have projects or activities related to reducing climate change impacts on children, there is still a lack of coordination among these agencies. Figure 4.2 contains an overview of the focuses of different government agencies and the gaps that still exist.

**Figure 4.2 Gaps of policies and institutional arrangements**

The **fourth gap** was highlighted by stakeholders who participated in the focus group discussions. They emphasized that currently **children and youth are not sufficiently encouraged to take part in the process of policy formulation** and their voices are not heard in response to urgent issues caused by climate change and environmental degradation.

## 4.3 Review of international cooperation framework or agreements related to children, climate change and sustainability

### 4.3.1 Children's Rights to a Safe, Clean, Healthy and Sustainable Environment in the ASEAN Region

The Principles and Policy Guidance on Children's Rights to a Safe, Clean, Healthy and Sustainable Environment in the ASEAN Region (United Nations Environment Programme (UNEP), 2021) sets out fundamental principles for realizing children's rights to a safe, clean, healthy and sustainable environment and for putting the interests of children at the centre of initiatives by all segments of society. This document was developed based on collaboration between UNEP, UNICEF and UN Human Rights through a consultative process with experts in the fields of child rights and environmental issues, including children and youth from across the region. As children, especially from the most vulnerable and marginalized backgrounds, are more exposed to and disproportionately impacted by climate change and other environmental hazards than other groups, despite being the least responsible for these issues, it is vital for children to realize their rights to a safe, clean, healthy and sustainable environment.

The principles under this document specify key points to be considered when making decisions and taking actions that affect children and the environment as follows.

1. **A healthy environment:** all children have the right to live and grow up in a healthy environment.
2. **Child participation:** all children have the right to share their views and to participate in making decisions that affect children and their right to a healthy environment.
3. **Child-friendly information:** all children have the right to get information for living in a healthy environment in the language that they understand and in ways that are interesting to them.
4. **Environmental education:** all children have the right to learn about the environment and how to protect it.
5. **Protection from climate change and damage to the natural environment:** all children have the right to be protected from all kinds of harm caused by climate change, pollution and the loss of plants, animals and other natural resources.
6. **Ending harmful business activities:** all children have the rights to be protected from all kinds of harm caused by business activities.
7. **Making help available:** all children have the right to ask for and receive support and to get child-friendly justice when they experience harm caused by violations of their rights to a healthy environment.
8. **Protection from violence:** all children have the right to be protected from all kinds of threats or problems, from anyone, when they demand respect for their rights to a healthy environment and when they seek justice if their rights have not been respected.



In addition, the policy guidance also outlines how different actors can help to ensure that there is a healthy environment for children. Governments can contribute by making laws and rules that respect the above principles, including making sure children are able to participate in decision-making; making sure schools provide accessible, age-appropriate education on the environment; and providing sufficient funding to make all these actions possible. Businesses can contribute by monitoring their activities to ensure that they do not impact children and the environment; avoiding activities that can cause harm on children; making sure everyone in the company understands and respects children's rights to a healthy environment; and listening to the voices of children before making a business decision. Communities can also contribute by protecting children's rights to a healthy environment in a safe way; working with children to introduce good practices for the environment where they live; and supporting the government, schools, businesses and communities to respect the principles. Last but not least, the media can contribute by reporting on what governments and businesses are doing well and are not doing well in respecting children's rights to a healthy environment; producing information for children about the environment; and reporting on activities organized by children to protect the environment and fight climate change.

### 4.3.2 United Nations Sustainable Development Cooperation Framework

Among the guiding principles of the UN's Sustainable Development Cooperation Framework, there is one principle that refers to "leaving no one behind," which is a rights-based framework that represents the unequivocal commitment of all UN Member States to reduce inequalities and vulnerabilities, including vulnerabilities caused by the impacts of climate change and environmental degradation. This implies that it is crucial to move beyond assessing overall average and aggregate processes for the general population towards ensuring progress for all population subgroups, including children and youth. To comply with the principle of leaving no one behind, disaggregated data and qualitative analysis are required to identify who is being excluded or discriminated against, how and why, and who is experiencing multiple intersecting forms of inequality. This entails identifying unjust, avoidable or extreme inequalities in outcomes and opportunities, and patterns of discrimination in law, policies and practices. To address such problems, the Cooperation Framework calls for supporting legal, policy, institutional and other measures, and for ensuring the free, active and meaningful participation of all stakeholders, particularly the most marginalized.



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# Chapter



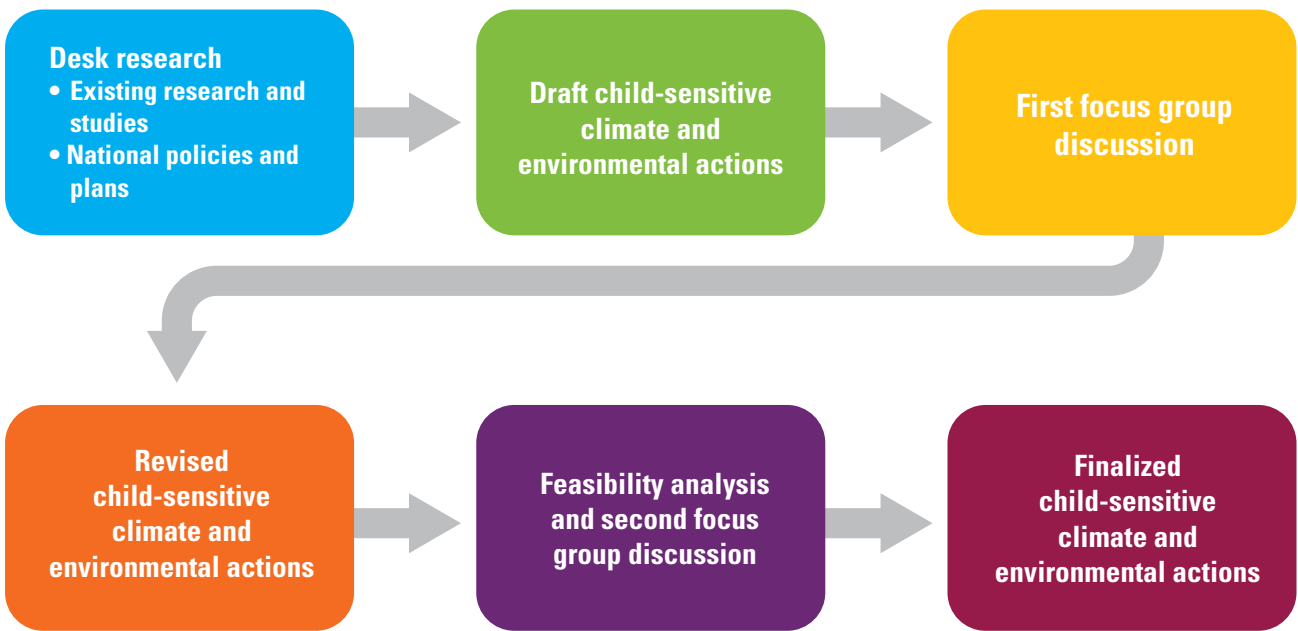
# 5

## Child-sensitive Recommendations

### 5.1 Methodology, tools and data for identification, prioritization and selection of child-sensitive climate and environmental recommended actions

Multiple processes were used to develop these recommendations for child-sensitive climate and environmental actions. First, desk research was conducted to review existing research and studies, as well as related national policies and plans, to establish a draft recommendation on child-sensitive climate and environmental measures. Second, a focus group discussion (FGD) was held on 11 March 2022 to validate the proposed draft recommendations. Subsequently, the draft child-sensitive actions were revised accordingly to the comments and suggestions from the FGD. Finally, a feasibility analysis was conducted on 4 April 2022 during the second FGD, after which the recommendations were finalized. Figure 5.1 presents a detailed description of the methodology and tools used to develop the child-sensitive climate and environmental recommended actions.

**Figure 5.1 Process for developing child-sensitive climate and environment recommended actions**



### 5.1.1 Desk research

Key literature on how children can participate more in climate and environmental decision-making was reviewed, with a focus on research conducted in Thailand and in countries with similar socioeconomic backgrounds, namely Indonesia, Malaysia, Philippines, and Vietnam. Reviewing research conducted in the context of these five countries provided useful for developing a framework for child-sensitive recommendations. However, it should be noted that the research papers under review by the research team only came from five online databases: Scopus, Web of Science, ScienceDirect, Thai-Journal Citation Index (TCI), and Thai Journal Online (ThaiJO).

### 5.1.2 Child-Sensitive Framework

It is critical that our proposed child-sensitive climate and environmental actions directly address children’s issues. Thus, a guiding principle developed by UNICEF (2019) was adopted as a framework to ensure that children’s rights and needs are included in the national climate and environmental recommended actions and that the impacts of climate change and environmental degradation on children are considered. Figure 5.2 shows a brief description of each principle under this framework.

**Figure 5.2 Four guiding principles for developing child-sensitive actions**

Source: UNICEF (2019).

#### 5.1.2.1 Principle 1: Ambitious and Urgent

A climate policy that takes children’s rights and best interests into account must include sufficiently ambitious mitigation and adaptation measures to protect children’s rights and best interests from present harm and foreseeable risk caused by climate change. Given that climate-related impacts are already occurring, there is an urgent need for a significant increase in child-sensitive adaptation measures and resources.

A review of Thailand’s climate change and environmental degradation policies and plans, as well as a review of 31 papers, found that the current climate change and environmental degradation policies and plans in Thailand do not sufficiently address the needs of children. Children are frequently grouped into vulnerable populations, rather than mentioned as a separate group with distinct needs and vulnerabilities that require urgent attention. There is a critical need for climate change and environmental degradation preventive measures, resources, and an increased emphasis on children.

#### 5.1.2.2 Principle 2: Rights-based

A child-sensitive climate change and environmental policy must explicitly and meaningfully mention children and youth. Children and youth must be regarded as rights holders and key players. Even though climate change and environmental degradation affect children and adults asymmetrically, children are frequently referred to as a “vulnerable group” rather than important stakeholders. Children and youth should be prioritized based on their specific needs, vulnerabilities, and rights. Currently, Thailand has some policies and plans related to climate change and environmental degradation that prioritize children and youth in Thailand. However, these do not explicitly mention the specific needs, vulnerabilities, and rights of children and youth.

### 5.1.2.3 Principle 3: Holistic and multi-sectoral

As children's well-being face various challenges from climate change, including, but not limited to health, education, nutrition and social protection, climate adaptation policies must address children's needs and include sectoral interventions in climate policies. Interventions in areas that are most relevant to children's needs and rights in the national context must also be included in national policies. Because children face distinctive and heightened risks of climate change, policies must include measures to address all relevant risks through a holistic and multi-sectoral approach.

A review of key climate and environmental policies and plans in Thailand found that there is no policy and plan that specifically addresses the needs of children. The National Adaptation Plan, for example, only discusses the health impacts of climate change on vulnerable groups, which also include children. The Climate Change Master Plan 2015-2050 includes a long-term goal of lowering the proportion of children under the age of 5 who are malnourished. Plans and policies for children must consider all aspects of children's well-being, such as education, physical and mental health, and housing.

### 5.1.2.4 Principle 4: Inclusive

A child-sensitive climate policy must be informed by the systematic consultation and meaningful participation of children at different stages of climate policy-making process, including children from different age groups, gender, and social backgrounds. Equipping children with relevant knowledge and tools necessary in tackling climate change is one of the most simple but effective approaches in reducing the impacts of climate change on children.

According to existing reviews of research and studies, children, particularly children from developing countries, are among the most vulnerable to the effects of climate change and pollution. Despite being the primary stakeholders affected by climate change, pollution and natural disasters, children are frequently excluded from the process of development of climate change, pollution and natural disaster plans, policies, or measures.

## 5.1.3 Focus group discussion

The main goal of conducting FGDs was to test the validity of the draft child-sensitive climate and environment recommended actions, as well as to identify and prioritize recommended actions for all stakeholders. The FGDs held online via Zoom. The first FGD took place on 11 March 2022 and the second FGD took place on 4 April 2022. Twenty-three participants participated in the FGDs, including representatives from relevant government agencies, non-governmental organizations (NGOs) and children. The outcomes of the two FGDs are contained in Appendix 2.

## 5.1.4 Feasibility analysis

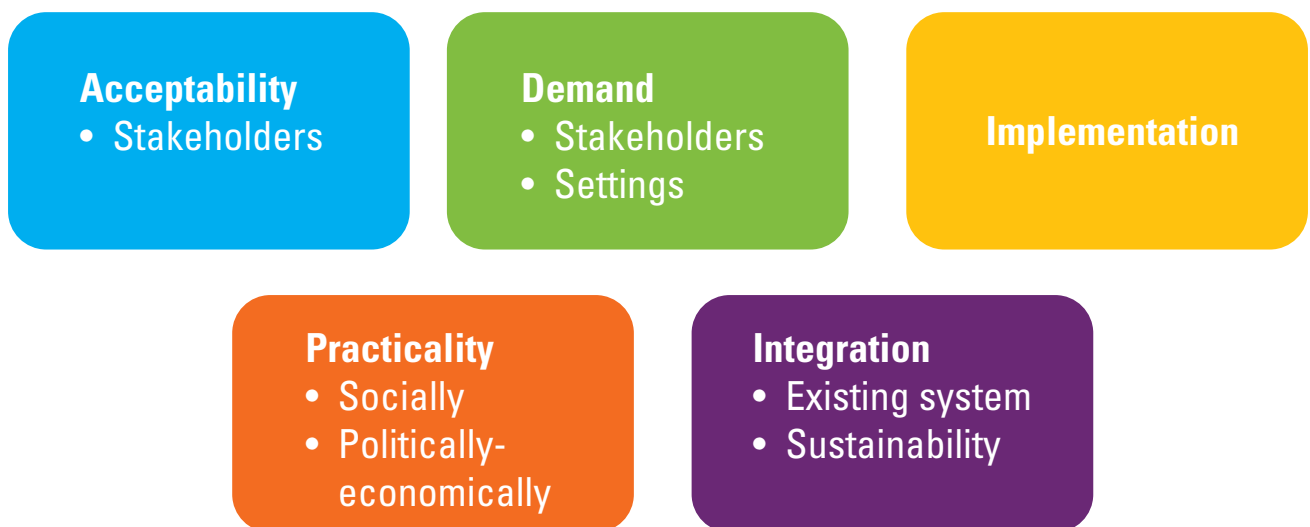
A feasibility analysis was conducted to determine whether the draft child-sensitive climate change and environmental recommended actions are practical and can be implemented. The framework of feasibility analysis was adapted from several studies in the fields of business, politics, and public health (Bowen et al., 2009; Hamlin, 2017; Yoon, 2018). The following sub-sections provide details on the feasibility analysis framework and method.

### 5.1.4.1 Feasibility analysis framework

The feasibility analysis framework used in this study includes five key areas, namely acceptability, demand, implementation, practicality, and integration (as shown in Figure 5.3). The framework was adapted from Bowen et al (2009). Each key area is described below.

1. Acceptability: how the targeted stakeholders, who are involved in policy implementation, react to the proposed draft actions
2. Demand: determining whether the recommended actions are demanded by stakeholders and society
3. Implementation: the degree to which an action is likely to be carried out as planned and proposed
4. Practicality: how an intervention can be delivered, considering the necessary resources, time, and commitment
5. Integration: whether a new initiative can be integrated into an existing policy or programme, organizational setting, or social environment.

**Figure 5.3 Key focuses of the feasibility analysis**



Source: Adapted from Bowen et al. (2009)

### 5.1.4.2 Survey on the feasibility of child-sensitive actions

The questionnaire used to assess the feasibility of the study's child-sensitive climate change and environmental degradation actions was developed based on the five key areas shown in Figure 5.3. The goal of conducting the feasibility survey was to assess the feasibility and viability of the revised child-sensitive climate and environmental recommended actions. A FGD was held online via Zoom Cloud Meeting on 4 April 2022 to present the revised child-sensitive recommendation and distribute the feasibility survey to the 31 participants (including representatives of children and youth, government agencies, and experts). The outcome of the FGDs and feasibility evaluation can be found in Appendix 2. The questionnaire is presented in Appendix 3.

## 5.2 Policy recommendations for child-sensitive climate and environmental actions

The results from the risk map analysis highlight the provinces and regions in Thailand that are exposed to high risk of climate change, including heat, flood, drought, cold spell or low temperature. Though the different provinces are vulnerable to different types of hazards, the Northeastern and the Southern regions are the two regions which face the highest levels of risk from climate change after incorporating child-related factors. **The top 10 provinces facing the highest child-sensitive climate change risks are Ubon Ratchathani, Nakhon Ratchasima, Si Sa Ket, Nakhon Si Thammarat, Narathiwat, Surin, Songkhla, Buriram, Khon Kaen and Surat Thani.** However, currently, Thailand has no detailed risk assessment or adaptation planning prioritizing these areas. National policies and climate change policies do not currently contain measures to support climate change adaptation in these areas and do not contain measures to help reduce impacts of climate change on children specifically. The climate change and environmental degradation related government agencies, such as ONEP and the PCD, aggregate children and youth into vulnerable populations and do not consider children and youth as a separate target group. Meanwhile, the DCY, whose policies focus on promoting welfare of children and youth as well as on child protection, do not incorporate measures to mitigate the risks of climate change and environmental degradation on children. This suggests a lack of coordination between government agencies working on climate change, environmental degradation and children and youth. Therefore, the impacts of climate change and environmental degradation, especially pollution, on children and youth are not successfully mitigated. At present, children and youth in the high-risk areas highlighted above are still exposed to high risks of climate change.

Given the key gaps and challenges highlighted above, it is important to propose policy recommendations to close these gaps. In this study, **three sets of recommendations are proposed:**

- 1. Recommendations to reduce the risks and impacts of climate change on children:**
  - a. Promote awareness-raising among children on climate change**
  - b. Climate-proof school, housing, and health facility infrastructure**
  - c. Develop child-friendly early warning systems**
  - d. Install essential infrastructure**
  - e. Improve access to finance to support adaptation**
  - f. Strengthen health systems and social protection**
- 2. Recommendations on the process and steps towards the formulation of child-sensitive climate policy**
- 3. Recommendations to reduce the impacts of environmental degradation on children.**



## 5.2.1 Policy recommendations to reduce risks and impacts of climate change on children

To reduce the risks of climate change on children, a good starting point might be to prioritize the high-risk areas highlighted in the child-sensitive risk maps presented earlier. The top ten provinces exposed to high risk of climate change after incorporating child-related factors are Ubon Ratchathani, Nakhon Ratchasima, Si Sa Ket, Nakhon Si Thammarat, Narathiwat, Surin, Songkhla, Buriram, Khon Kaen and Surat Thani. The following are policy recommendations to reduce risks and impacts of climate change in these high-risk areas.

### 1. Promote awareness-raising among children on climate change

The first adaptation measure is to raise awareness among children about climate change. According to UNESCO (2022), education is crucial to promote climate action. It helps people understand and address the impacts of the climate crisis, empowering them with the knowledge, skills, values and attitudes needed to act as agents of change. Children should be informed about how they might be affected by climate change so that they can prepare themselves to cope with the impacts and find ways to reduce those impacts. Double-tracked approaches should be used in educating and raising awareness among children, namely **integrating climate change into the school curricula at all levels**, covering primary, secondary and tertiary education, and **raising children's awareness through activities** about climate change, climate change adaptation and climate change mitigation.

For the first track, which emphasizes the integration of climate change into the curriculum, as suggested by the School of Sustainability at Stanford University, it is important that curricula lead children through a progression of understanding of climate change as follows.

1. Encourage children to think about climate and weather and consider their own connection to climate change.
2. Children should then understand how excess carbon dioxide is rapidly changing the climate. Carbon dioxide and its ability to absorb and re-radiate heat is key in understanding climate change. Children should then look at sources of carbon dioxide, allowing them to understand that climate change is caused mostly by humans.
3. Children should then learn how changes in the climate are already causing significant harm to both physical and biological systems, impacting children and young people, the economy, society, and environment.
4. Climate change requires global action and local solutions. Lessons on climate change mitigation provide children with an opportunity to examine and choose mitigation strategies to reduce carbon dioxide emissions.
5. Children should then learn about how to adapt to climate change, including how to reduce the impacts of climate change and extreme weather events, such as flood, drought, and extreme temperatures.

At present, OBEC, under the Ministry of Education, has integrated climate change mitigation, adaptation, disaster risk reduction and early warning into the Basic Education Core Curriculum B.E. 2551 in three subjects: science; health and physical education; and social studies, religion, and culture. **Despite the integration of climate change into the Basic Education Core Curriculum, some gaps remain. There is still a lack of application of the concept “progression of understanding of climate change” and children do not yet establish their own connection with climate change – for example, how they are impacted by climate change and how they can contribute to reduce carbon dioxide and greenhouse gas emissions to mitigate the risks of climate change. In addition, the current Basic Education Core Curriculum has been in use since 2008, so materials and topics in the curriculum might not be up to date and reflect the current situation. Therefore,**

**during revision of the Basic Education Core Curriculum, OBEC might consider revising subjects related to climate change to ensure that there is a progression of understanding of climate change and adding additional information on how climate change impacts children and youth, including how can they prepare for and adapt to climate change as well as their roles and potential contribution in reducing greenhouse gas emissions.**

In addition to the integration of climate change into school curricula, the Department of Environmental Quality Promotion (DEQP) has also integrated climate change into environmental study manuals for primary and secondary school teachers. The key objectives of the study manuals are to ensure that students are taught about things they “should know” and “must know” about climate change, activities to enhance student awareness and understanding, and suggestions for student evaluation. Moreover, OBEC, in collaboration with the Department of Disaster Prevention and Mitigation under the Ministry of Interior, and Japan International Cooperation Agency (JICA), developed natural disaster management-related learning activities and conducted training for teachers in three pilot schools in three provinces, namely Namhu School in Maehongsorn province (landslides), Hadhong School in Chumporn province (flooding) and Tachatchai School in Phuket province (tsunami). Given that these initiatives are still limited to a few schools, there are still gaps that remain. **In the future, these initiatives should be scaled up to other schools in other provinces and extend the coverage to cover other types of natural disaster and extreme weather events.**

For tertiary education, which is overseen by the Office of Higher Education Commission, currently there is a certain degree of integration of climate change, environmental management, sustainable development and global citizenship in the General Education subject in the science faculty. However, given that each university has independence in opening new programmes and courses, the Office of Higher Education Commission currently does not have detailed data on the different university programmes and courses that integrate climate change into their teaching. In the future, **the Office of Higher Education Commission should coordinate with different universities – both public and private – to collect data and develop the central database. This database will play a vital role in providing information to students who are searching for faculties, programmes and courses that offer teachings on climate change.**

The second track focuses on increasing children’s understanding of climate change, climate change adaptation and climate change mitigation through awareness-raising activities. Examples of activities that have been implemented by the Department of Environmental Quality Promotion include e-Learning courses, online learning programmes designed for staff within the Ministry of Natural Resources and Environment, local administrative organization staff, private organization staff, students and the general public. Interested users need to sign in and select the e-learning courses they are interested in. After completing each e-learning course, users need to complete an assessment before being able to print out the certification and proceed to other e-learning modules. At present, the e-learning courses cover over 40 topics, including disaster management, climate change, global warming, climate change adaptation and sustainable consumption and production. **Despite the availability of these e-learning courses, it is important to highlight that as these courses are not specifically designed for children, and the subjects covered do not yet address how children are affected by climate change, how children can protect themselves from climate risk and its impacts, and how children can contribute to greenhouse gas mitigation. UNICEF can step in to help fill these gaps. In particular, UNICEF can share evidence-based research both within Thailand and lessons learned from other countries on climate change impacts on children and concrete steps which can be taken to safeguard children’s livelihoods and health. In addition, UNICEF might consider working with government agencies that provide e-learning courses, such as the DEQP, to design child-focused and child-sensitive climate change modules to be used as supplementary learning resources for both children in the formal education system and the general public, to raise their awareness on climate change.**

Other extra-curricular activities conducted by the DEQP include the Mahingsa Saisueb project. The objective of

the Mahingsa Saisueb project is to encourage children to explore and conserve natural resources and environment in their local communities through a four-step process, namely discover, explore, conserve and share. Though these are very useful activities that raise awareness, children's engagement and participation, these activities focus on the conservation of natural resources and environment in local schools and communities, rather than the impact of climate change on children, and children's roles in climate change mitigation and adaptation. **To fill these gaps, the DEQP might consider extending the scope of these projects to encourage the participation of children in reducing greenhouse gas emissions in their schools or local communities, such as energy conservation, recycling waste, etc.**

As described above, climate change awareness raising efforts have been concentrated on children and youth in the formal education system. However, in Thailand, there are quite a large number of out-of-school children. According to the Equitable Education Fund (EEF), around 1.7 million children between the ages of 12-21 years are currently out of education. A high number of out-of-school children are children with disabilities or from migrant communities, ethnic minorities and indigenous groups. Reasons for not attending school include poverty (children dropping out of school to help parents earn money), issues with identity documentation (in case of migrant or stateless children), health issues, frequent relocation, and labour issues. The impact of climate change creates additional risks for already vulnerable out-of-school children.

Raising awareness for these out-of-school children on climate change impacts and how to adapt to lower the risks of climate change is essential. However, the challenges of educating out-of-school children are complex. This is where UNICEF can make contributions. In 2005, UNICEF Thailand in partnership with Mae Hong Son Primary Education Service Area Office 1 developed the 'District School' or 'Highland School' model (UNICEF, 2021). The District School model aims to provide children living in remote areas with the opportunity to access education closer to home, while not creating a large burden for the government. It is a flexible model, well-suited to the local context, and has the potential to enhance educational access and reduce educational inequality, as shown in Mae Hong Son Province. The integration of local languages into the teaching and learning creates a familiar atmosphere for ethnic minority students, helping them to connect to Thai-language learning. Since its inception in 2005, thousands of ethnic children have benefited from the District School model in Mae Hong Son Province, contributing towards reducing the number of out-of-school children in Education Service Area Office

**1. UNICEF can promote the integration of disaster risk management and climate change into the teachings conducted in District Schools or Highland Schools to raise the awareness of both out-of-school children, as well as children in the formal education system, on how to cope and deal with the risks associated with disaster and climate change. To be specific, UNICEF can provide support to District Schools by preparing teaching materials on climate change and disaster risk reduction written in local languages and aligning with the local context. In addition, UNICEF can share evidence-based research and materials to other institutions actively involved in education for out-of-school children.** Table 5.1 shows examples of institutions actively engaged in providing education or raising awareness for out-of-school children in Thailand.

**Table 5.1 Examples of institutions actively engaged in providing education or raising awareness for out-of-school children in Thailand**

Names of Institution	Out-of-school children involved
UNESCO (in partnership with Microsoft, True Corporation and the Ministry of Education under the “Learn Big” project)	Stateless and ethnic minority children
Equitable Education Fund	Underfinanced or disadvantaged children and youth
Save the Children Thailand	Conflict-affected children, comprising migrants, refugee and ethnic minority children in Thailand as well as disadvantaged children in Narathiwat, Yala and Pattani

Overall, the main government agencies involved in implementing this policy recommendation “raising awareness among children on climate change” include OBEC, Ministry of Education, the DEQP, and the Office of Higher Education Commission. In addition to these core agencies, other agencies have also been raising awareness of children on climate change. These include the Department of Disaster Prevention and Mitigation, which focuses on raising awareness and building capacity on disaster management, such as building children’s awareness on earthquakes, flooding, landslides, and tsunami; the Department of Mineral Resources, which is responsible for organizing training on surveillance and evacuation during earthquakes and landslides; and the Department of National Parks, Wildlife and Plant Conservation, which provides a training module on climate change adaptation for children and communities living near national parks. **However, the main gap that exists is that children have not been sufficiently engaged in the design of these training modules. In the future, children in local communities should be engaged in the design of training modules so that training can respond to their needs. UNICEF can support the Department of Mineral Resources and the Department of National Parks, Wildlife and Plant Conservation to facilitate child participation, so that the voices of local children can be heard. UNICEF can suggest to these agencies the types of child participation that might be appropriate in each context.** Table 5.2 contains a summary of awareness raising on climate change for children implemented by each government agency and recommendations on UNICEF’s potential contribution to address gaps.

**Table 5.2 Summary of awareness raising on climate change implemented by each government agency, recommendations for government agencies and UNICEF**

Names of Institutions	Current actions and activities on awareness raising for children on climate change	Recommendations to relevant institution to fill the gaps	UNICEF's potential contributions
Office of the Basic Education Commission (OBEC)	Integration of climate change into the Basic Education Core Curriculum in the subjects of science, health and physical education, and social studies, religion, and culture	OBEC to revise Basic Education Core Curriculum to ensure a progression of understanding of climate change, adding topics on how climate change impacts children and youth, how can they prepare for and adapt to climate change as well as their roles and potential contribution in reducing greenhouse gas emissions.	Share findings and lessons learned from previous research conducted by UNICEF, such as UNICEF (2015) "Unless we act now: The impact of climate change on children" and UNICEF (2021) "The climate crisis is child rights crisis: introducing children's climate risk index".
Department of Environmental Quality Promotion	E-Learning courses designed for staff within the Ministry of Natural Resources and Environment, local administrative organization staffs, private organization staffs, students and general public covering topics of disaster management, climate change, global warming, climate change adaptation and sustainable consumption and production, etc. and extra-curricular activities to enhance awareness, such as Eco-school and Mahingsa Saisueb projects	DEQP to consider designing child-specific e-learning modules on climate change and extending the scope of Eco-school and Mahingsa Saisueb projects to encourage participation of children in reducing greenhouse gas emission in their schools or local communities, such as energy conservation, recycling waste, etc.	Share evidence-based research both within Thailand and lessons learned from other countries on climate change impacts on children and concrete steps to be taken now to safeguard children's livelihoods and health.  Consider working with the Department of Environmental Quality Promotion, to design child-focused climate change modules to be used as supplementary learning resources for both children in the formal education system and the general public.

Names of Institutions	Current actions and activities on awareness raising for children on climate change	Recommendations to relevant institution to fill the gaps	UNICEF's potential contributions
Office of Higher Education Commission	The Office of Higher Education Commission is responsible for formulating policies and plans to enhance the capacity of universities in Thailand and monitor and evaluate the programmes run by different universities in Thailand.	The Office of Higher Education Commission should coordinate with different universities – both public and private – to collect the information about universities, faculties and programmes that offer education about climate change and develop the central database. This database will play a vital role in providing information to students who are searching for faculties, programmes and courses that offer teachings on climate change.	UNICEF might partner with universities, especially those located in high-risk areas or provinces share evidence-based research on climate change and its impacts on children and youth to increase the climate change related courses or programmes offered to students in the local areas.
Department of Disaster Prevention and Mitigation (DDPM)	DDPM in collaboration with OBEC and JICA raise awareness and build capacity on disaster management through learning activities and conducted training for teachers in three pilot schools in three provinces, namely Namhu School in Maehongsorn province (landslides), Hadhong School in Chumporn province (flooding) and Tachatchai School in Phuket province (tsunami).	In the future, these initiatives should be scaled up to other schools in other provinces and extend the coverage to cover other types of natural disaster and extreme weather events.	To align with UNICEF's Strategic Plan, 2022-2025, Goal Area 4 (enhance the availability of data and evidence on climate change and disaster impacts on children), UNICEF can identify provinces that have high climate risk and share this information with DDPM, OBEC and JICA so that these agencies can focus on these areas when scaling up pilot initiatives.
The Department of Mineral Resources	The Department of Mineral Resources is responsible for organizing training on surveillance and evacuation during earthquake and landslides.	Children in local communities should be engaged in the design of training modules so that training can respond to their needs.	Support the Department of Mineral Resources and the Department of National Parks, Wildlife and Plant Conservation to offer child participation (e.g. child-led consultative participation and collaborative participation).
Department of National Parks, Wildlife and Plant Conservation	The Department of National Parks, Wildlife and Plant Conservation has the training module on climate change adaptation for children and communities living near the national parks	Children in local communities should be engaged in the design of training modules so that training can respond to their needs.	

Names of Institutions	Current actions and activities on awareness raising for children on climate change	Recommendations to relevant institution to fill the gaps	UNICEF's potential contributions
EEF, UNESCO and Save the Children	<p>EEF, UNESCO and Save the Children have been involved in provision of education for out-of-school children, such as stateless and ethnic minority children, underfinanced or disadvantaged children, as well as conflict-affected children. In addition, in Thailand, non-Formal Education plays important roles for the out of school youth and adults. The Office of the Non-Formal Education Commission (ONFEC) provides Non-Formal Education and Informal Education to provide opportunities for youth and adults to access basic education and/or continue their studies at higher levels. Furthermore, skills training for out-of-school youth and adults is provided by various providers, such as the Department of Skill Development, Ministry of Labour.</p>	<p>Awareness raising activities and teachings should cover topics including the impacts of climate change on children, how children can protect or adapt themselves to climate change, and how children can contribute in terms of reducing greenhouse gas emissions.</p>	<p>Promote the integration of disaster risk management and climate change into the teachings conducted in the District Schools or Highland Schools to raise awareness of out-of-school children and ethnic minority students.</p> <p>Provide supports to District Schools by preparing the teaching materials on climate change and disaster risk reduction in local languages and aligning with local context.</p> <p>Share evidence-based research and materials to other institutions which actively involved in education for out-of-school children.</p>

## 2. Climate-proof school, housing, and health facility infrastructure

One necessary measure to reduce risks and impacts of climate change on children in high-risk prioritized areas is to promote climate-proof or climate-resilient schools. As shown in Chapter 2, climate change can cause disruption to education, affecting children and youth. The key hazards and climate risks considered under this project include heat, flooding, drought and cold temperatures. To help UNICEF and responsible government agencies identify the schools at high risk of being impacted by these climate hazards in the future, UNICEF can overlay maps showing the geocoordinates of schools in Thailand under Project Connect (which aims to create a live map of every school in the world and the status of their internet connection) and develop risk maps to identify at-risk schools. Such information can then be used by relevant government agencies including UNICEF in planning and developing measures to make schools in those high-risk areas climate resilient or climate proof.

To address flood risk, **the first strategy to prevent flood damage is to avoid building school facilities in flood hazard areas;** this is the most effective way to minimize risks to students, teachers, school personnel and school property. However, **if this is not possible, and a school needs to be built in a flood hazard area, site layout and facility design measures can minimize damage and risks.** According to the Federal Emergency Management Agency (FEMA, 2004),<sup>4</sup> school planners and designers should check with the appropriate regulatory authority to determine the minimum flood elevation to be used in site planning and design. With respect to design and construction of school facilities to resist flood damage, it is essential that there should be minimum requirements in model school building codes and regulations. In Thailand, the relevant government agencies overseeing and regulating the building codes and construction are the Department of Public Works and Town and Country Planning, and local administrative organizations. In addition, the Design and Construction Division under OBEC is responsible for overseeing standards of construction of school buildings. However, the current building standards for OBEC schools only cover a few types of hazard, namely earthquake and sea level rise, and therefore not all types of climate hazard are covered. There are also no specific requirements on how to make school buildings flood resilient. **FEMA (2004) recommends the following: first, building sites for schools should be reasonably safe from flooding, and adequate site drainage should be provided to reduce exposure to flooding. Second, school buildings should be elevated to or above the base flood level or by specially designed and certified floodproofing measures. Third, school buildings should be constructed with electrical, heating, ventilation, plumbing and air conditioning equipment and other service facilities that are designed or located to prevent water from entering within the components.**

For **measures to deal with drought**, schools might consider replacing older plumbing fixtures with newer, more water-efficient fixtures, implementing a proactive leak-detection programme, and using recycled water for toilets and landscaping needs to conserve water. Examples of heat adaptation strategies for schools include having flexible scheduling for school activities, alternative school uniform, as well as heat-supportive environments in schools, such as shade provision and hydration strategies. Finally, examples of adaptation strategies for cold in schools include constantly monitoring of temperature in classrooms and school facilities, installation and maintenance of water heating system, bringing in temporary heating sources, rearranging the timetable if required, or temporary school closure.<sup>5</sup> **Given that, in Thailand, there exists no data on schools that are vulnerable to climate hazards – flooding, drought, heat and cold – UNICEF can contribute by providing data on vulnerable schools, both through overlaying maps containing school geocoordinates with climate risk maps, as well as conducting survey of schools in high-risk areas to obtain information about the needs of these schools in responding to climate hazards.**

<sup>4</sup> FEMA (2004), "Risk Management Series Design Guide for Improving School Safety in Earthquakes, Floods, and High Winds."

<sup>5</sup> Source: <https://neu.org.uk/advice/cold-weather-and-classroom-temperature-england>



In addition to school facilities, the results from the regression analysis also show that having robust housing structure can also help reduce the risks associated with climate change; therefore, assistance should be provided to households so that they can construct their homes with robust building structure and materials.

The strengthening of the infrastructure of health care facilities is also vital to reduce the vulnerability of children to risk of climate change. **Climate-resilient health infrastructure and services are crucial for the functioning of a health system.** This includes ensuring that the location of health care facilities and the building codes take into consideration current and projected future climate risks. It also includes ensuring the climate-resilience of essential services to health facilities, such as water and sanitation services which may be compromised by flood or drought, and electricity supply that may be cut off during extreme weather events.<sup>6</sup> Examples of strategies to enhance the climate resilience of health care facilities include the use of solar-powered photovoltaics, water pumps and vaccine chains, which can enhance resilience by ensuring independent water and energy supplies to remote rural facilities, and continued use during times of disaster or extreme weather events. The World Health Organization (WHO) launched guidance for climate-resilient and environmentally sustainable health care facilities, covering water, sanitation and health care waste, energy, and infrastructure. For water, sanitation and health care waste, examples of adaptation strategies include regularly checking water pipe connections for signs of deterioration, regularly monitoring water supply during emergencies to ensure adequate access throughout the duration of the event, monitoring of sewer overflows to fix pumps in advance of flood seasons, identifying available alternative safe water sources, and ensuring that water storage in the health care facility is sufficient to meet the needs of the facility in case of an extreme weather event. For energy, examples of adaptation strategies include having critical back-up of power supplies available for building infrastructure, an adequately backed up energy source if the main source fails during an extreme weather event, and ensuring that adequate lighting, communications, refrigeration, and sterilization equipment are available during climate-related disasters or emergencies. Examples of adaptation strategies for health care infrastructure include regularly inspecting buildings both internally and externally for signs of deterioration, ensuring that ventilation and air conditioning systems are safely secured with backup arrangement, and ensuring that the roof is leak-proof and insulated.

The Department of Disaster Prevention and Mitigation, the Ministry of Interior, and local administration organizations under the Ministry of Interior are the government agencies responsible for the post-disaster rehabilitation and reconstruction. To be eligible for assistance for the development of new permanent housing or reconstruction of destroyed or damaged schools, the provincial governor must issue a disaster declaration for areas affected by disasters so that provision of relief and emergency assistance to disaster affected communities can be allowed in accordance with the law. Housing recovery efforts which aim at addressing post-disaster housing issues can help mitigate the vulnerabilities of household and schools to future impacts of climate change. Strengthening the infrastructure of the health facilities falls under the Department of Health Service Support, Ministry of Public Health. The Department of Health Service Support is responsible for issuing the permit to establish health facilities – both hospitals and clinics – while the Department of Public Works and Town and Country Planning, municipalities, local administrative organizations and district offices oversee the building structure and construction. **There are several adaptation strategies available to make school facilities and health care facilities climate proof or climate resilient. However, the relevant government agencies responsible for post-disaster assistance might not have access to this information, including the costing of each option. Therefore, technical assistance on costing different adaptation options would be helpful for these agencies.**

<sup>6</sup> Source: <https://www.who.int/teams/environment-climate-change-and-health/climate-change-and-health/country-support/building-climate-resilient-health-systems/climate-resilient-and-sustainable-technologies-and-infrastructure>

### 3. Develop child-friendly early warning systems

An early warning system is a climate change adaptation measure which helps communities prepare for hazardous climate-related events. A successful early warning system can help save lives and jobs, land and infrastructure. Dissemination and communication are critical to ensure an effective and proactive response. Early warning information must be provided in the appropriate language, use effective communication channels, and be understandable and accessible to children so that they can take appropriate actions to reduce possibility of injury and loss of life. Accordingly, an early warning system should be developed based on a people-centred approach that empowers children. Alongside the development of an early warning system, every community in high-risk areas should formulate a plan to rescue children from an area at risk, which starts from identifying vulnerable children, finding a shelter, drawing escape routes to safe areas, and leading them to a safe place. The government agencies responsible for issuing early warning at the national level are the Thai Meteorological Department, National Disaster Warning Center, the Royal Irrigation Department, the Department of Mineral Resources and the Department of Disaster Prevention and Mitigation (DDPM). The DDPM then conveys the early warning to the provincial and local levels through the local administration organizations. It is important that these related government agencies collaborate and work together. **To ensure that early warning messages are child sensitive, the warning messages need to be simple to understand and clearly give instruction and guidance to children** about actions that need to be taken during disasters or extreme weather events. According to Pattapong (2019), children in different age groups have different needs and interests; therefore, it is important that the warning messages cater for age differences. However, the government agencies responsible for issuing early warning are not familiar with children's special needs, so it is important to engage other government agencies, such as the Department of Children and Youth, to support them in developing child-friendly messaging. **UNICEF can explore partnering with the Department of Disaster Prevention and Mitigation in developing child-friendly guides or manuals for disaster preparedness, prevention and response, and disseminate these materials to children living in the high-risk areas identified under this project.**

### 4. Install essential infrastructure

There are at least three types of infrastructure necessary for children to adapt to climate change. First, infrastructure to give safe access to clean and drinkable water for children must be installed at community level, linked to every household in the area. This is to ensure that children have access to clean and safe water, especially in the event of flooding, drought, and extreme heat. Results from the regression analysis reveal that having access to a closed piped water system, which is clean and safe, will lower the risks of climate change. According to Thailand's Voluntary National Review on the Implementation of the 2030 Agenda for Sustainable Development, in general, Thai people have reasonably good access to drinking water, with the proportion of households being able to access clean drinking water rising from 97 per cent in 2012 to 98 per cent in 2016 and 99.5 per cent in 2019. This is attributed to the government's efforts to provide clean water for villages without an existing plumbing system. The number of villages in Thailand without an existing plumbing system declined from 7,321 villages to 169 villages. Nevertheless, some gaps still remain as, according to data from the Report on Drinking Water Quality from 2009-2019 by the MOPH, only 40.8 per cent of water available to households was appropriate for consumption and 43.7 per cent of water in households needed further treatment before consumption. Most of these water resources came from sources provided by local government bodies. Thus, **in the future, the responsible government agencies particularly the Provincial Waterworks Authority, should aim to extend coverage and access to a closed pipe water system to ensure that water available for household consumption has reached acceptable standards. Another challenge is to ensure that households have access to water filters or other treatment options to ensure that water is appropriate for consumption. One possible role for UNICEF is to provide supplementary data to the government by surveying households with children that lack access to safe drinking water, their access to water treatment technology, and identify any barriers that prevent families from having access to clean and safe drinking water.**

Second, to ensure that the best interests of the child will be safeguarded in the event of interrupted public services during natural disasters and extreme weather events, **telecommunication and internet infrastructure need to be strengthened.** This is to ensure that all children can access to online services such as online learning and tele-medicine, even when they are not able to go outside their homes. The key agency related to telecommunications and internet is the Office of the National Broadcasting and Telecommunications Commission (NBTC). The NBTC needs to collaborate with the Provincial Disaster Prevention and Mitigation offices to provide necessary telecommunication equipment and mobile WIFI signal distributor vehicles to ensure that the internet and communication signals in disaster affected areas are uninterrupted. In addition, the NBTC also needs to seek cooperation from telecommunication and internet service providers to send staff to the disaster affected areas to ensure that internet and telecommunication signals are uninterrupted. **A key challenge is the lack of data on which communities lack access to telecommunication or internet services as well as communities that face difficulties with telecommunication and internet infrastructure and require support. A survey should be conducted to gather data and, ideally, if UNICEF can help collect information on the geocoordinates of such communities and overlay this information with climate risk maps, this can then help NBTC to prioritize the communities or areas that need immediate support.**

Third, adequate infrastructure can also make the difference between life and death in a disaster situation. Robust building structures can save children's lives during disasters and extreme weather events. This is consistent with the outcomes from the regression analysis which shows that robust housing structure is associated with lower climate risk. In the event that a house is damaged or destroyed, the Ministry of Interior usually mobilizes financial support for households to build new permanent housing or to reconstruct damaged houses. However, to be eligible, households have to be in an area declared disaster-affected by the provincial governor, and need to have proof that their houses have been destroyed or damaged by disaster. **One challenge that exists is that households which are damaged or destroyed but not located in a disaster-declared area are not eligible for financial support. Furthermore, according to the current guidance issued by the Ministry of Finance in 2019, the maximum amount of financial support is capped at 49,500 Thai Baht per household, which might not be a sufficient amount to purchase the good quality construction materials necessary to ensure that the rebuilt home is robust and climate proof. UNICEF might be able to provide technical support on the costing of different options for robust and climate-resilient homes.**

## 5. Improve access to finance to support adaptation

When facing a crisis, poor people are often forced to sell their livelihood assets such as land, livestock, and farming tools to access basic services or resources such as food or shelter. These assets provide families with a safety net to fall back on during times of crisis and are critical to their resilience and recovery to future climate hazards. Possessing few or no assets severely reduces an individual's ability to recover quickly from environmental shocks and stresses. This is consistent with the results from our regression analysis, which show that households that possess more at least four assets face lower risks of climate change. Poorer people will also find it harder to replace these assets in the long term due to low income and socioeconomic resilience. Therefore, access to short-term liquidity and finance is crucial for poor households with children so that they can cope with the impacts of extreme weather events and invest in long-term adaptation measures to make their households resilient to the climate change risk in the long-term. Our regression analysis also shows that households that have access to finance (proxied by having a bank account) tend to face lower risk of climate change. **A key recommendation, therefore, is to enhance financial inclusion among households with children, especially those living in high-risk areas, as financial inclusion can help reduce vulnerability to climate change.** According to the financial access survey conducted by the Bank of Thailand in 2020, over 99 per cent of Thai households had access to basic financial services. No-access households were those with insufficient income and those who were unfamiliar with financial products. Among these no-access households, households with no income and households aged 15-22 years had the highest no-access rates. **Given that the Bank of Thailand has information**

**on the households with access and no access to financial services by province, UNICEF can contribute by overlaying such a map with the climate risk map to identify the provinces that should be prioritized in terms of enhancing access to financial services.**

## 6. Strengthen health systems and social protection

A child who is poor and lacks access to social protection is more vulnerable to climate and environmental shocks and stresses (UNICEF, 2021). **Strengthening health systems will be crucial to managing and improving resilience to extreme weather events, especially storm and flood.** The key responsible agency in terms of strengthening health systems is the DOH. Currently, the DOH has developed and put in place a mechanism for heat warning as well as a heat warning system at the community level in Thailand. One gap that remains is data or mapping showing which areas in Thailand at high risk of climate change lack access to health care facilities. This is where UNICEF can contribute by overlaying a map of hospital or health care facilities in Thailand with the climate risk maps developed under this project. The result would indicate priority areas that require improved access to health care facilities.

In addition, **strong social protection systems will also be necessary to prevent abuse, neglect, and other related harms that children face because of droughts, floods and the associated impacts such as migration and displacement.** Examples of social protection include cash transfers and child grants, school meals, assistance connecting families to health care services, provision of nutritious food, and education for children and youth. According to UNICEF (2021), in emergencies, social protection is crucial to ensure that children and their families have access to the necessary resources to meet their needs and cope with environmental stresses without resorting to negative coping strategies which can have devastating medium- and long-term impacts. This requires social protection systems to be ready to respond to crises, including through mechanisms which can identify potential shocks, operational systems that can react quickly, and contingency funding approaches that can allow for rapid scale up.

Some recommendations on strengthening social protection in this context are as follows. First, it is important to ensure that the social protection system increases the coverage of children being protected, especially during the time of climate crisis. **Social protection systems must provide essential coverage for all children and their families regardless of their gender, sex, age, ability (or disability), race or other characteristics.** Second, it is essential to ensure that the social protection system is shock responsive. **Key programmes must be designed to reach more people, often with larger transfers at crucial times, while contingency financing mechanisms are required so that changes can happen quickly.** Examples of relevant social protection measures include social transfers, social insurance (health insurance and unemployment insurance), and programmes and services that support employment and livelihoods and enable families to have sufficient income while ensuring provision and time for quality childcare. The relevant government agencies to act on these recommendations are the DCY and the MSDHS, as well as UNICEF.

### 5.2.2 Recommendations on the process and steps towards the formulation of child-sensitive climate policy

The three gaps highlighted in the previous sub-section are: Gap #1: A lack of specific policy measures to protect children from the effects of climate change and environmental degradation; Gap #2: A lack of climate change adaptation plans and measures at sub-national level, especially in high-risk provinces; and Gap #3: A lack of coordination among relevant government agencies. The study proposes the following process or steps towards closing these gaps by aligning and coordinating work on climate change at the national and sub-national levels using the hybrid approach, i.e., a combined “top-down” and “bottom-up” approach. **A top-down approach will**

**help to bridge the gap in climate and environmental policies, which at present rarely mention children and youth and therefore do not address child-specific threats and impacts of climate change, and enable government agencies responsible for climate change and environmental policies to update or revise policies and plans to become more child-sensitive.** In addition, ONEP should utilize the information from the child-sensitive risk maps produced in this report in the development of measures to mitigate the risks of climate change on children and youth and in climate change planning. For instance, the Northeastern and Southern regions and provinces identified as high-risk areas – especially Ubon Ratchathani, Nakhon Ratchasima, Si Sa Ket, Nahon Si Thammarat and Narathiwat – should receive special attention and priority. Possible channels for integrating child-sensitive recommended actions include the process through which ONEP revises national climate change plans (e.g. the Climate Change Master Plan 2015-2050 and the National Adaptation Plan). ONEP should then communicate these child-sensitive revisions with the relevant government agencies.

Second, since different areas in Thailand might experience different effects of climate change and have different capacity in mitigating and adapting to climate change, **it is vital that child-sensitive climate and environmental actions are developed from the bottom-up.** In doing so, Local Government Organizations (LGOs) – including Provincial Administration Offices (PAOs), Municipalities (MPs), and Subdistrict Administration Offices (SAOs) – shall play a key role in providing a platform for stakeholders to meet and formulate mitigation and adaptation plans suitable for each area, as well as to manage and implement such plans. The role of ONEP could be to provide technical supports to the LGOs in analyzing the climate risk data and deciding upon interventions necessary to tackle climate change risks. The PSDHS office in each province – the main government agency working with vulnerable groups – can act as coordinator between provincial government agencies, identifying regional representatives of children and youth of diverse backgrounds to participate in the policy decision-making platforms and ensure that the rights and best interests of children and youth are considered and protected.

### 5.2.3 Recommendations to reduce the impacts of environmental degradation on children

Chapter 2 highlighted the many ways in which children are vulnerable to adverse impacts from air pollution, including physical impacts, cognitive and psychological impacts and social impacts. Therefore, child-sensitive recommendations also include **measures to mitigate the impacts of environmental degradation on children**, such as promoting the use of clean cooking fuels, promoting energy efficiency, transitioning to renewable and clean energy, and developing sustainable agricultural practices and clean transportation. Switching to cleaner cooking fuels or an electric stove can reduce household air pollution and greenhouse gas emissions, which will benefit children. Transitioning from fossil fuels to renewable energy not only reduces greenhouse gas emissions but can also lead to a reduction in air pollution levels, including PM2.5, carbon monoxide, etc. In the agricultural sector, switching from the use of chemical fertilizer, pesticides and insecticides to compost and organic fertilizers can reduce health impacts on children in households and in the wider community. Switching from internal combustion engine vehicles to electric vehicles or electric train can also lessen the problem of air pollution and thus reduce impacts on children. **A number of government agencies can be involved in implementing these measures.** For example, the Ministry of Energy is responsible for promoting the use of clean cooking fuels, energy efficiency and renewable energy. The Ministry of Transport, the Ministry of Energy, Electric Vehicle Association of Thailand and ONEP can promote the switch to electric vehicles and clean public transport. Lastly, the Ministry of Agriculture and Cooperatives can promote the switch to sustainable agriculture, such as GAP or organic agriculture.

## 5.3 Suggestions for future research

The results from this project show that **adapting to climate change requires access to finance as climate change adaptation requires new technology, changes in practices, resilient and robust physical infrastructure, etc.** Climate finance – whether domestic or international – supports an enabling environment (i.e., policies and institutions), directly finances climate projects, and mobilizes other sources of financing. Government budgets are the largest source of financing for development more broadly in Thailand, including for climate change. The Climate Public Expenditure and Institutional Review (CPEIR) conducted by UNDP and ODI (2012) is one of the few known studies in Thailand which aimed to review public spending on climate change activities and assess the extent to which expenditures were supported by existing policies and institutional responsibilities. The CPEIR found that, between 2009 and 2011, approximately 2.7 per cent of the government budget was spent on climate change related projects (UNDP and ODI, 2012), which is equivalent to about 52 billion Thai baht or \$US1.7 million per year. There were 137 agencies under 14 ministries involved in the delivery of climate change activities; however, more than 75 per cent of the allocated budget was concentrated in only 10 agencies. The agencies receiving the highest share of the allocated climate change budget were the Royal Irrigation Department, the National Parks, Wildlife and Plant Conservation Department and the Department of Water Resources. In addition, according to UNDP and ODI (2012), the majority of climate change funds were allocated to projects which only had climate resilience and climate mitigation as secondary objectives, such as water distribution and storage projects (Tambunlertchai et al., 2015).

To the best of our knowledge, given that the CPEIR conducted by UNDP and ODI in 2012 is the only available study related to climate change finance, and given that the study does not specifically focus on analyzing the financing need for child-sensitive climate change adaptation projects, there is a gap in the literature on quantifying or estimating the amount of finance required to support child-sensitive climate change adaptation. **Therefore, more research on climate change financing, including the prioritization of climate change risks that impact children, should be a priority. This will ensure that effective investment and appropriate budget allocation can be conducted in the future.**

This study has found that children living in different provinces in Thailand face multiple types of risk of climate change, i.e., heat, flood, drought or low temperature, with limited resources available to support climate change adaptation. However, the methodology used in this study to develop a risk map was only able to identify which provinces require priority attention as they face high risks of climate change. The main reason why this study was not able to prioritize climate change risk or climate hazards is that the methodology does not have a “sensitivity layer” built into the analytical framework. **Therefore, it is recommended that future studies should incorporate a sensitivity layer to the model to provide deeper layers of information.**



# Chapter



# 6

## Green Jobs and Green Skills

### 6.1 Identification of green skills and potential jobs based on current policy scenarios and sectors that may be negatively affected by climate change

One of the impacts of climate change is a changing employment landscape and skills required for future careers. It is important for policymakers and stakeholders to be prepared to address this change. The development of green skills is one of the mechanisms through which to prepare children and youth for future green jobs stemming from climate change mitigation and adaptation. These green skills will make today's children and youth relevant in the future green economy, and ensure that children and youth gain, strengthen, and retain knowledge to live in the new and changing environment. It is essential that education and training opportunities include climate change knowledge and truly empower youth actions on climate change (Amponsem et al, 2019). Climate-change-related education and skill training – whether formal, non-formal or informal education – are therefore crucial aspects for policy formation and implementation and should be mainstreamed.

#### 6.1.1 Definition of green jobs and green skills

According to the ILO, green jobs are defined as “decent jobs that contribute to preserve or restore the environment, whether in traditional sectors such as manufacturing and construction, or in new, emerging green sectors such as renewable energy and energy efficiency” (ILO, 2016). Green skills, meanwhile, are skills that “enable people to work and live in a more environmentally efficient or sustainable way, regardless of sector or industry” (Plan International and the Research Base, 2014, p. 14). In many circumstances, the terms green jobs and green skills are used in an unclear manner. It is important to clarify the terms as the definitions might impact on policies related to green jobs and/or green skills. It seems that, when the term ‘green jobs’ is used, the focus tends to be on jobs and business activities, whereas the term ‘green skills’ is used with a focus on the life of people who have those skills.



While a transition towards a low-carbon or green economy could create employment opportunities due to the creation of new jobs in environmentally friendly sectors, such as renewable energy or electric vehicle production, jobs in the sectors that cause high greenhouse gas emissions, such as fossil fuels, will be at risk. Furthermore, future green jobs will require different sets of skills, for example, car mechanics will need to be equipped with skills in repairing electric vehicles (EVs) and maintenance of EV batteries. Data from Statista<sup>7</sup> shows that the top five sectors that will offer new job opportunities as a result of the green stimulus or post-COVID green recovery plan in Thailand are: 1) building efficiency; 2) wind and solar energy; 3) power networks; 4) electric vehicles; and 5) industrial energy efficiency. This data is aligned with Rattanakhomfu (2021), which proposes that there will be a high demand in jobs relating to biofuel, renewable energy, green marketing, and sustainability.

## 6.1.2 Green jobs and green skills in the context of Thailand's climate change-related plans

The Climate Change Master Plan 2015-2050 refers to raising awareness and knowledge on climate change, and green jobs and green skills are broadly mentioned in the context of some sectors. For example, under Strategy 2, it is mentioned that, in the transport sector, there is a need to “develop the skills of the workforce and other supporting structures to attract foreign investment into energy efficient automotive industry and develop mechanics with maintenance skills”. Under Strategy 3 – Enabling environment for climate change management – the emphasis is on raising awareness on climate change and increasing adaptive capacity. The plan also highlights the importance of integrating climate change, green development, and sustainable development concepts into school curricula at all levels; supporting activities that focus on raising environmental awareness and environmental responsibility across all levels; and promoting the development of courses and degrees which focus on environmental issues. However, while the Climate Change Master Plan 2015-2050 mentions green jobs and green skills, it does not provide any details on the specific green skills and skillsets needed for green jobs.

The National Adaptation Plan also emphasizes that climate change issues should be integrated into curricula at all levels and in both non-formal and informal education. The goal is to ensure that children and young people have adequate understanding of the root causes and impacts of climate change and know how to mitigate the risks of climate change and adapt to climate change. Nevertheless, the National Adaptation Plan does not specify the required skillsets for children and youth to deal with the impacts of climate change.

## 6.1.3 Thai labour market, green jobs, and green skills

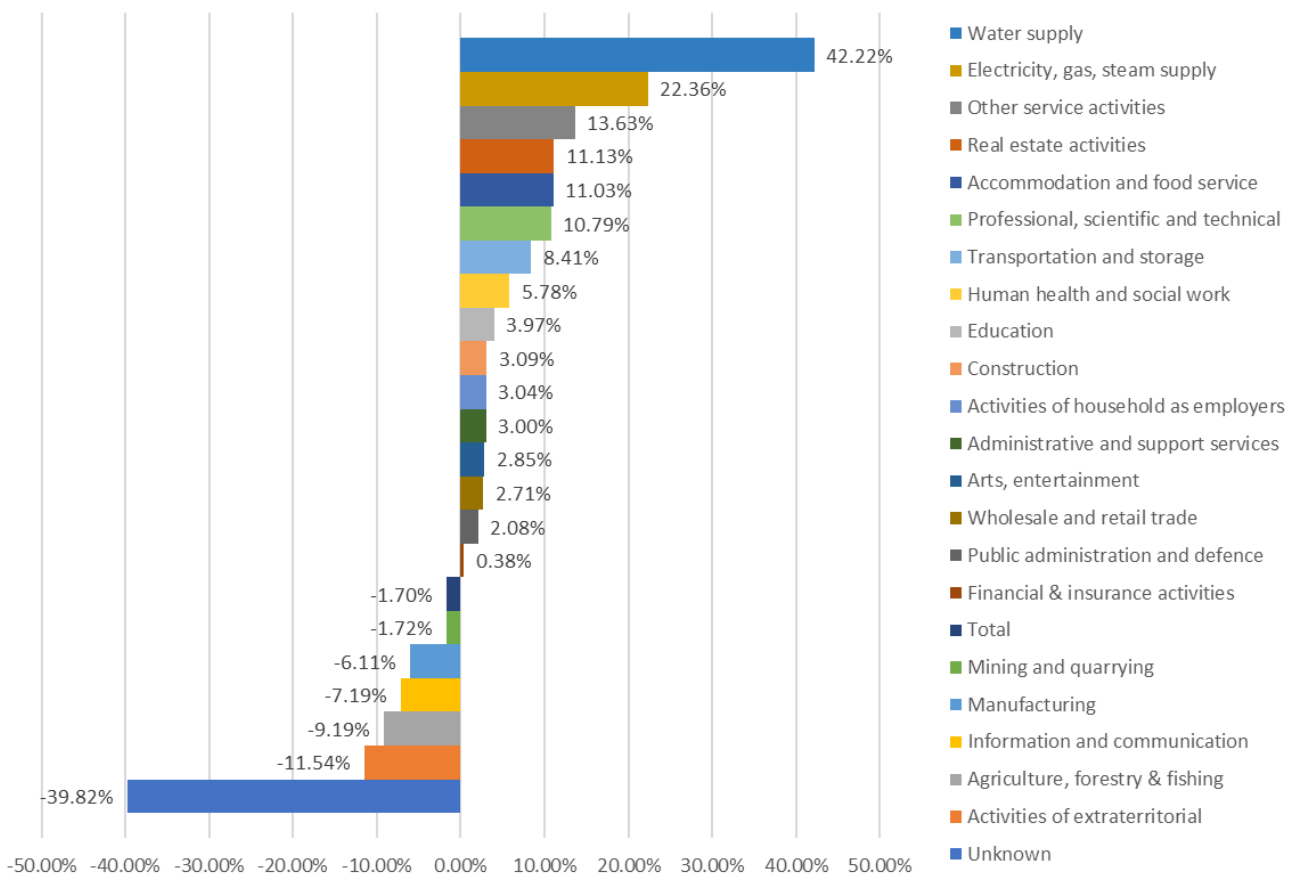
A recent ILO report (ILO, 2021) highlights that, as a consequence of the COVID-19 pandemic, youth employment declined by 7 per cent in the first quarter of 2021. The youth unemployment rate grew by 3 percentage points for both men and women, reaching 6 per cent and 8 per cent, respectively. This negative impact on youth employment may potentially be exacerbated by climate change.

The presence of climate change-related policies and plans may cause labour market inequalities, particularly for workers who face direct negative impacts from climate change or lack green skills required for future green jobs. These workers might experience lower wages and fewer opportunities than other workers who are better-equipped with skills (Sutummakid and Kulkolkarn, 2018). In addition, climate change and climate actions might create new jobs, cause some jobs to be replaced, drive some jobs off the market, or lead to job adjustments (Sutummakid and Kulkolkarn, 2018). Thus, it is important to make the distinction between new green occupations, existing occupations that require new green skills, and roles that require retraining so that appropriate policies can be formulated to deal with these changes (CEDEFOP, 2010).

<sup>7</sup> <https://www.statista.com/statistics/1126330/number-of-green-jobs-under-a-sustainable-recovery-plan-worldwide/>

Figure 6.1 compares employment change between 2015 and 2020 by industry. The figure shows that total employment decreased by -1.70 per cent in 2020 compared to 2015. Most employment changes occurred in the energy, service, industry, and transportation sectors. Among the top three sectors with increasing employment, the water supply sector shows the largest employment change, with a 42.22 per cent increase in employment. Examples of jobs in the water supply sector includes jobs in sewerage, waste management, and remediation activities. The electricity, gas, and steam supply sector has the second highest increase in employment, while third largest increase in employment is in the other service sector. Examples of jobs in the other service sector include jobs in the environmental and ecological organizations (i.e., environmental protection jobs such as information dissemination, political participation, and fund raising). The transport and storage sector experienced an 8.41 per cent increase in employment. On the other hand, employment in the agriculture, forestry, and fishing sectors declined by 9.19 per cent, while employment in the manufacturing sector fell by 7.19 per cent, and employment in the mining and quarrying sector declined by 1.72 per cent.

**Figure 6.1 Employment change in Thai labour market by industry, from 2015 to 2020**



Disaggregated employment data on green industries and brown industries are needed to observe trends and estimate future labour demand. It is noticeable that Thai employment data based on the use of TSIC 2009 could hinder the way that the changes in green jobs can be observed. From 2015 to 2020, Thailand has retained 22 industries, but the high percentage of unknown industry at the bottom of the graph in Figure 6.1 suggests that a key challenge for Thailand will be to distinguish between green and brown economic activities.

### 6.1.4 Education and training for green jobs and green skills

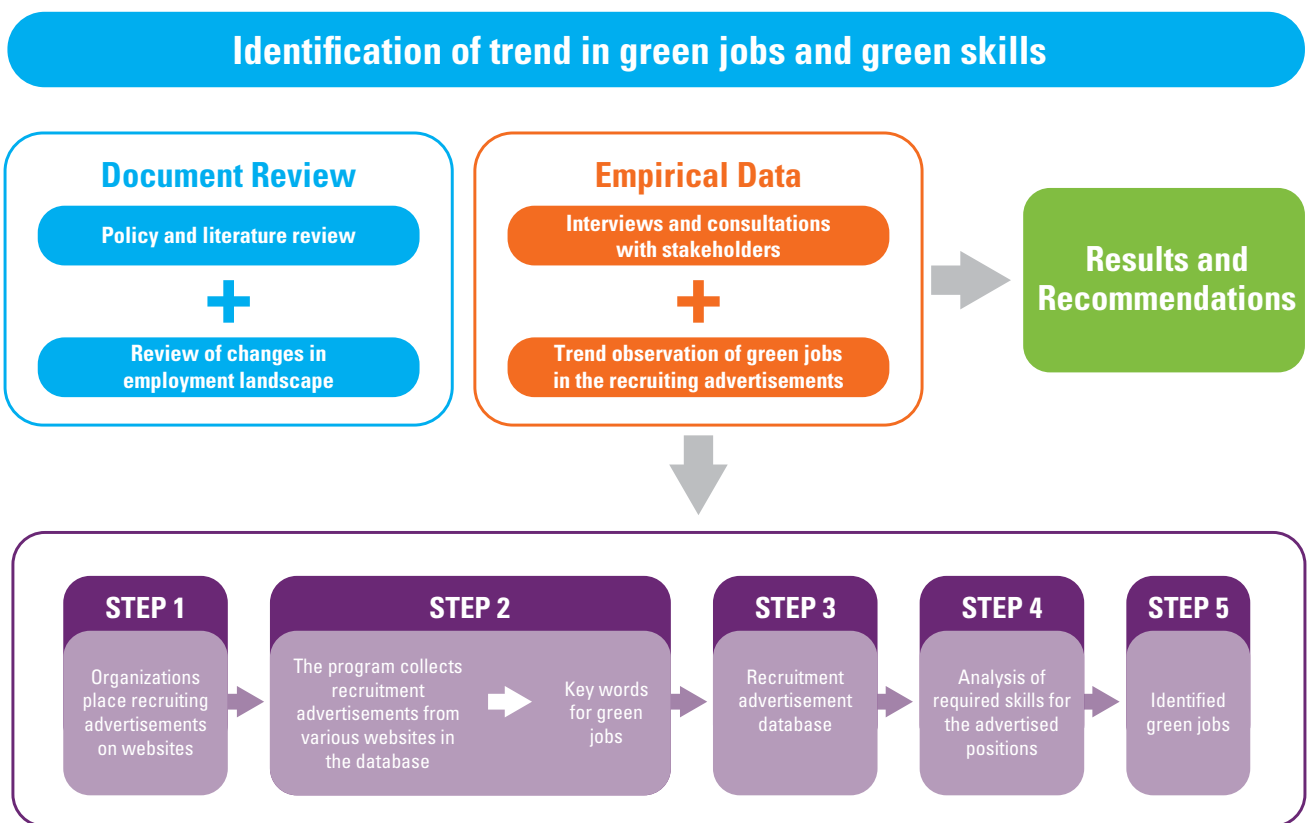
In the green economy, individuals need to have basic general competencies as well as specific technical competencies. Murga-Menoyo (2014) categorizes the four types of key competencies needed as generic competencies, generic competencies for sustainable or green economy, specialized/technical green skills for the green economy, and top-up skills in sustainability.

Although this categorization helps to facilitate the conceptualization of the education and training needed for green skill development, there is still uncertainty on how to define these competencies. Further steps to support education and training for green skill development include conducting evaluative research to identify the skills gap; promoting innovations in the education and training process; and providing sufficient support for teacher training. Another challenge in developing competencies is defining what green skills and green jobs are. As mentioned earlier, 'green skills' can be defined as the skills that "enable people to work and live in a more environmentally efficient or sustainable way, regardless of sector or industry". Thus, green skills are necessary in a range of roles and sectors, not just green jobs. Generic green skills or competencies could provide alternative livelihoods for people, especially those living in areas affected by climate change.

## 6.2 Evidence on green job trends from recruitment websites

This section provides empirical evidence on trends in green jobs and green skills, using data from different recruitment websites. Figure 6.3 shows the process used in this study to identify green jobs and green skills trends.

**Figure 6.2 Process to identify trends in green jobs and green skills**



A job advertisement database was developed which collected data on a quarterly basis starting from Q3/2018 to Q4/2021 (14 quarters in total). Job advertisement data was taken from the following 12 websites or job portals:

1. Jobant.com
2. Jobbkk.com
3. Jobpub.com
4. Jobsdb.com
5. Jobsugoi.com
6. Jobth.com
7. Jobthai.com
8. Jobthaiweb.com
9. Jobtopgun.com
10. Nazionejob.com
11. Thaibestjobs.com
12. Workventure.com

A five-step data gathering process was then conducted as follows:

- Step 1:** The program sent daily requests to the above-mentioned job advertisement websites or job portals to collect data on advertised positions, and stored this data as HTML files.
- Step 2:** The HTML files were processed into a database format entitled “mongodb”. The data points in the database consisted of, for example, title of the advertised position, employer name, date of job posting or advertisement, required qualifications for the position, required skills for the position, and other data points.
- Step 3:** The enquiries related to green jobs were set, including a list of the key words signifying that the advertised positions could be classified as green jobs.
- Step 4:** The program used a processing model to analyze the advertised positions.
- Step 5:** The program identified green jobs based on the information included in the advertised jobs.

Keywords were divided into general keywords for green jobs and sector-specific ones. Sector-specific keywords included the following grouping: ‘Energy’, ‘Industrial’, ‘Transportation/Logistics’, ‘Services/Corporate’. The research team obtained the keywords by visiting the main recruitment websites and searching for green or sustainability-related jobs in various sectors, then listing the keywords included in both job titles and/or job description and requirements. Those keywords were sent to the data team to gather the number of advertised positions that met the criteria from the database.

**Table 6.1** Keywords used to collect job advertisement data

Grouping	Sub-Grouping	Key words – English	Key words – Thai
General	N/A	Climate change CSR Environment ESG Green Renewable Sustainability Sustainable development	การพัฒนาที่ยั่งยืน ความยั่งยืน
Energy	Renewable energy engineer	Biogas Biomass Carbon neutral Clean energy Energy management RDF process Renewable Renewable energy Renewable power	พลังงานทดแทน
	Solar energy engineer	PV system Smart PV Solar Solar PV Solar power plant Solar rooftop Solar system	โรงไฟฟ้าพลังงานแสงอาทิตย์
	Wind energy engineer and other types of engineers	Sustainable hydropower Wind engineer Wind farm	
	Building management	Building sustainability Green building Facility management	
Industrial	Environmental engineer	Environmental health officer Environmental management ISO 14001 Quality assurance Sustainable development Safety management	ผู้จัดการด้านสิ่งแวดล้อม ระบบคุณภาพสิ่งแวดล้อม

Grouping	Sub-Grouping	Key words – English	Key words – Thai
Industrial	Waste management	Waste management Recycle Waste sourcing Water treatment Soft-water treatment Industrial waste	คุณภาพน้ำทิ้ง
	Industrial process	EHS Environmental management system Energy performance Factory sustainability manager QHSE Quality manager Safety, Health and Environment Officer Supply chain management Sustainable manufacturing Process efficiency	วิศวกรความปลอดภัย รายงานความยั่งยืน
Transportation/ Logistic	EV	EV charging network EV EV Bus EV charger Electric vehicles Energy storage Charger EV bike	ช่างประกอบรถสามล้อไฟฟ้า รถโดยสารพลังงานไฟฟ้า อะไหล่ไฟฟ้า ซ่อมบำรุงด้านไฟฟ้า รถตู้ไฟฟ้า มอเตอร์ไซค์ไฟฟ้า สกู๊ตเตอร์ไฟฟ้า
	Logistics	Sustainability and intermodal capacities	ผู้เชี่ยวชาญด้าน โลจิสติกส์ที่เป็นมิตร ต่อสิ่งแวดล้อม
Services/ Corporate	Marketing/Public relation	CSR Corporate communication Sustainable development	เจ้าหน้าที่ประสาน นักลงทุน การตลาดเพื่อความยั่งยืน
	Sustainability consultant	Climate change service Disaster risk management EIA ESG Decarbonization Sustainability global standard Supply chain management Sustainability plan Sustainability service	รายงานความยั่งยืน นักวิชาการสิ่งแวดล้อม

Grouping	Sub-Grouping	Key words – English	Key words – Thai
Services/ Corporate	Sustainability executive	CSR Environmental reporting GRI SD Stakeholder Sustainability Sustainability and risk management Sustainability development Sustainability reporting Sustainability specialist Sustainability strategy Sustainable development	รายงานความยั่งยืน เจ้าหน้าที่สิ่งแวดล้อม พัฒนาเพื่อความยั่งยืน
	Green finance	Green finance Sustainable finance	การลงทุนเพื่อความยั่งยืน
	Data analytics/Education	Sustainability data analytics Environment education	เจ้าหน้าที่วิชาการสิ่งแวดล้อม
	Procurement	Green procurement	

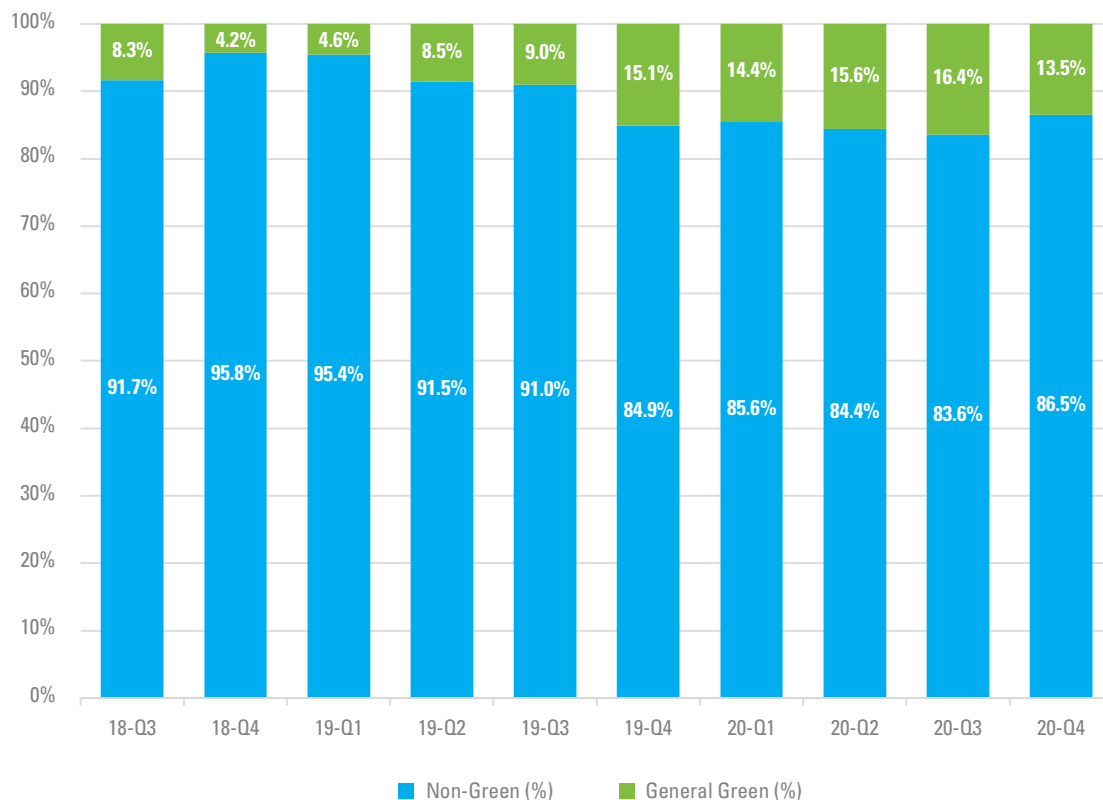
Source: Thailand Development Research Institute



## 6.2.1 Findings

Figure 6.3 shows the percentage of green jobs in the 'General' category compared to non-green jobs. There appears to be an increasing trend of green jobs compared to total jobs from Q4 of 2018 to Q4 of 2020. The upward trend peaked in Q3 of 2020 when 16.4 per cent of green jobs were available in the observed job advertisement websites. This number illustrates a significant increase compared to 4.2 per cent in Q4 of 2018. Even though the COVID-19 pandemic caused the total number of jobs posting or job advertisement to decline, the percentage of 'General' green jobs posted on the job advertisement websites still shows an upward trend.

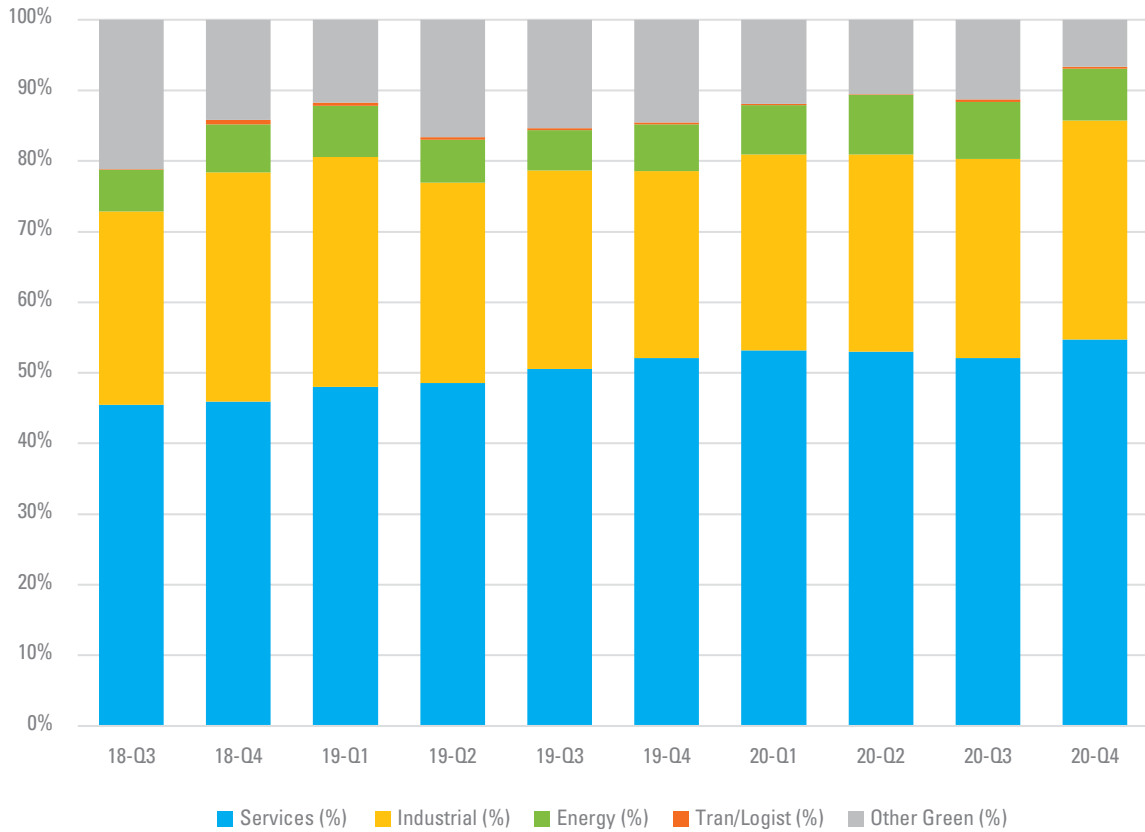
**Figure 6.3 Percentage of General green jobs and non-green jobs**



Source: Authors' own analysis

Figure 6.4 illustrates the number of green jobs in different sectors as a percentage of 'General' green jobs (i.e., total green jobs from the job advertisement websites considered in our database). The percentage of green jobs in the 'Services and Corporate' sector dominates other sectors, showing an upward trend since Q3 of 2018. The second and the third dominant sectors are the 'Industrial' and 'Energy' sectors, respectively. However, it is interesting to note that the percentage of green job postings in the 'Transportation and Logistic' sector shows a very small share compared to other sectors.

**Figure 6.4 Percentage of green jobs by sector**



Source: Authors' own analysis

## 6.2.2 Discussion of Results

The increase in the percentage of green jobs during Q3 of 2018 to Q4 of 2020 might be driven by the fact that corporations have shown more interest in sustainability, green economy, and ESG investment in response to the climate change crisis. The continuous promotion of sustainability or ESG issues by the Stock Exchange of Thailand (SET) may also have contributed. In 2018, SET launched the Thailand Sustainability Investment Index (SETTHSI Index), following the establishment of the Thailand Sustainability Investment (THSI) List in 2015. These factors may have inspired businesses to undergo green transformation, possibly contributing to the increasing trend of green jobs being advertised.

It is interesting to note that the percentage of green job advertisements in the 'Services and Corporate' sector dominates other the rate in other sectors. This might be because business transformation could be coming from strategic and managerial levels. By comparison, in the 'Transportation and Logistic' sector, green jobs might be contingent on the policy and regulatory landscape and availability of specific infrastructure, which may explain why the percentage of green jobs in this sector are quite low compared to others.

## 6.2.3 Limitations of the empirical data

First, the coverage of green job postings under this database might not be complete as data was only gathered from 12 websites. Second, conventional job advertisement websites might not fully represent the total demand for green jobs as some job advertising might be conducted through other platforms, such as social media or closed groups. Third, the data available from this study's job advertisement database has only been processed up to Q4 of 2020.

## 6.3 Policy recommendations on green jobs and green skills

Policy recommendations related to green jobs and green skills are as follows:

### 6.3.1 Definition and classification of green jobs and green skills

1. Related agencies need to establish clear definitions of green skills and green jobs, and the relation between them, to enhance understanding of these terms. This will benefit the planning of skills audit or forecasting as well as formulation of policies to promote green skills and green jobs.
2. Relevant agencies could consider updating The Thailand Standard Industrial Classification (TSIC) to reflect the changing industry landscape. This will potentially aid the identification of new industries and benefit the assessment of the economic impact of green jobs.
3. A sectoral approach for identifying and anticipating the skills needed for workers to transition to a green economy could aid policy planning, although it might not be sufficient as it could potentially ignore current skills that also benefit green jobs. Thus, different approaches for categorization should also be used to allow the development of a database that highlights cross-sectoral skills. Categorization to distinguish between new green occupations, existing occupations that require new green skills, and those require retraining is needed. This categorization will also help formulate and update relevant policies on education and training.
4. The categorization and classification need to be periodically updated to reflect the current status of particular industries, green jobs and skill training. This will help to guide policy planning, allocate necessary resources where needed, and provide clear communication to different stakeholders.

### 6.3.2 National skills audit and responsible agencies

1. The government needs to conduct a national skills audit and gap analysis between the required skillsets for current/future green jobs and the existing skillsets of children and youth. Both transferable and cross-sectoral skills should be included in the skills audit.
2. Integration of the skills audit with different policies for transitioning to green economy could aid the forecast of skills needs.
3. A working group on green jobs and green skills development should be established, potentially under the Department of Skill Development. This working group should be responsible for both long term skill development planning and ad-hoc projects related to green skills development and green jobs promotion.

### 6.3.3 Education and training

1. Climate change awareness and knowledge need to be integrated into school curricula, covering all levels and types of education and training (including both technical and vocational training).
2. Skills or competencies mapping should be established to map green skills needed for each level and type of education. For examples, climate change education as general education and profession/degree-specific education should be framed differently.
3. In short-to-medium term, upgrading and topping up skills, instead of reinventing the wheel, should be prioritized.
4. Capacity building activities should be funded sufficiently, including skills training, more accessible climate change education, and cross-disciplinary pedagogic research to support teachers.

### 6.3.4 Outlets for green jobs and equal-opportunities recruitment

1. Platforms or outlets specifically for green jobs recruitment should be established so that employers are encouraged to post the jobs in such platforms. This will not only provide a database of the demand for green jobs, but also will provide, more or less, equal opportunity for potential employees to find information on available jobs.
2. Campaigns raising awareness about fair hiring and recruitment processes should be reinforced for the green jobs market.
3. Establishing guidelines for consistent keywords for similar types of jobs included in green job advertisements could be helpful for potential employees to search for jobs relevant to their skills. This recommendation is linked to 6.3.1, establishing clear definition and classification of green jobs and green skills.

### 6.3.5 Dialogue and partnership enhancement

1. Strengthened public-private collaboration could help the forecast of skills needs. The government and private sector need to collaborate to inform workers and employees about job positions that may be lost due to the green economy transition. This information will benefit workers and employees to develop new skills and potentially shorten their unemployment period.
2. The government need to proactively partner with different professional bodies to raise awareness of climate change issues and green skills specific to each profession. Some professions might have more visible links to green skills and green jobs affected by climate change and climate actions; however, all professions should conduct skill mapping specific to their industry.
3. Education and skill training institutions need to collaborate with private sectors in developing training programmes that appropriately integrate climate change knowledge.



# Chapter



# 7

## Stakeholder Mapping and Stakeholder Consultation

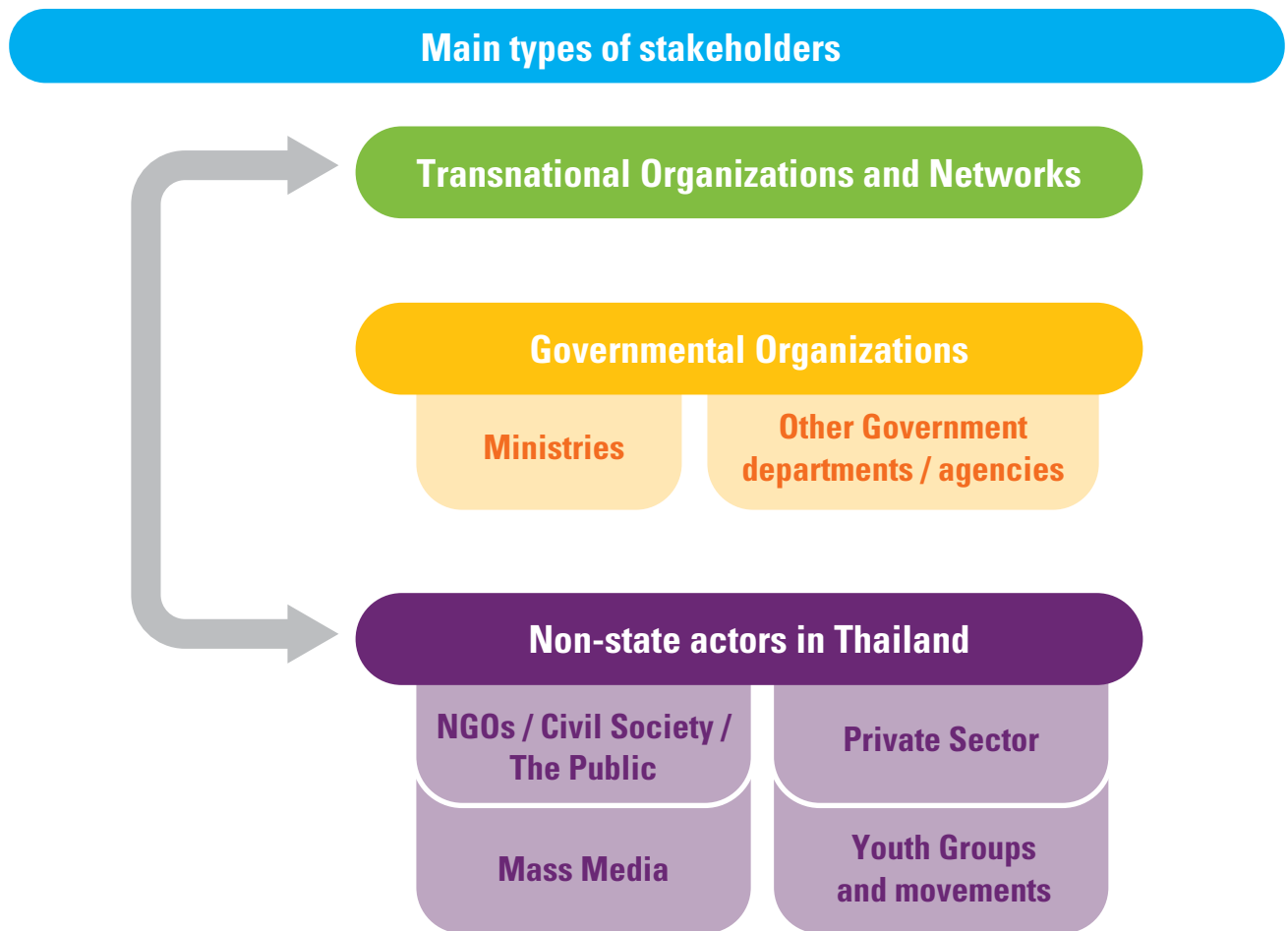
### 7.1 Reasons for a multi-disciplinary and multi-stakeholder reference group

Climate change problems are systemic issues that cause direct risks which can have cascading effects on other areas. For example, besides the health risks resulting from climate change, education and human capital problems might occur through shocks that affect income and wages; poor nutrition from income loss; effects of natural disaster; and physical dangers from pollution and heat (Hanna and Oliva, 2016). An understanding of the interlinkages between different disciplines (i.e., economic, labour, public health, environmental sciences, pollution control, etc.) is needed to tackle these systemic issues. It is also vital that the needs of children and youth are understood by all parties. Thus, a multi-stakeholder and multi-disciplinary stakeholder consultation process can help to capture the all-round aspects of the issues at hand. The process should engage all possible relevant stakeholders so that a range of views are considered.

### 7.2 Multi-stakeholder and multi-disciplinary stakeholder consultation process

Stakeholders included in the consultation process were divided into six main types, namely transnational actors, governmental organizations, private sector, NGO and civil society organizations, mass media and youth groups as shown in Figure 7.1. The consultation process engaged diverse groups of stakeholders with different expertise and interests related to different facets of climate change, environmental degradation and children/youth. The consultation process involved stakeholders and experts from multi-disciplinary fields in order to be informed about the issues and to encourage collaborative help to tackle climate change-related problems.

Figure 7.1 Main stakeholder types under this study



Source: Thailand Development Research Institute



The following sections provide more information about the key stakeholders identified for this study.

## 7.2.1 Transnational actors

There are several transnational actors that are interested in climate change issues and/or the impacts on children and youth, such as UNICEF and UN Global Compact. These actors might have different interests and have different policy impacts related to climate change, environmental degradation and children.

### United Nations Children’s Fund (UNICEF)

UNICEF is a United Nations (UN) agency responsible for providing humanitarian and developmental aid to children worldwide. UNICEF is mandated by the UN General Assembly to advocate the protection of children’s rights, to help meet their basic needs and to expand their opportunities to reach their full potential. As children and youth are among the groups that suffer most from the impacts of climate change and environmental degradation, “UNICEF has set out to examine current national climate policies/plans to ascertain how child-sensitive they are and provide recommendations on how to strengthen the focus on children’s rights, including actionable and measurable results for children. Despite the many ways climate change and environmental degradation have impacted them, children are consistently overlooked in the design and content of climate policies and related processes” (UNICEF, 2019). UNICEF proposes four principles to guide the revision and development of policies to help address children’s issues: 1) Ambitious and urgent; 2) Right-based; 3) Holistic and multi-sectoral; and 4) Inclusive (UNICEF, 2019). Moreover, Goal Area 4 of UNICEF’s Strategic Plan 2022-2025 recognizes that children are affected by climate change and environmental degradation, including increasingly frequent and severe natural disasters, air pollution, hazardous waste and water scarcity. UNICEF aims to prevent and address the impact of climate change on children based on four areas, namely climate change adaptation, low carbon growth and climate change mitigation, disaster risk reduction and environmental sustainability.

### UN Global Compact (UNGC)

UNGC is the world’s largest network for corporate sustainability initiative. It urges companies to align strategies and operations with universal principles on human rights, labour, environment, and anti-corruption. Currently, there are more than 12,000 companies in over 160 countries involved in this collective effort. UNGC’s mission to ensure that businesses respect and support children’s right is potentially aligned with the issues of climate change impact on children.

## 7.2.2 Governmental organizations

Governmental organizations include ministries and other agencies that have roles in public policy planning and formation. Different ministries and departments might have different focuses on climate change and environmental degradation related to children and youth. Thus, government agencies are among the key stakeholder groups driving policies and response to much-needed climate adaptation and mitigation activities.

### Office of Natural Resources and Environmental Policy and Planning (ONEP)

ONEP is an agency under the Ministry of Natural Resources and Environment. ONEP's mission is to formulate policies and plans to promote and maintain the quality of the environment. The activities of ONEP include suggesting policies and plans for conservation and management of natural resources and the environment, as well as conducting environmental impact assessments to support sustainable development and good quality of life.

Although the National Adaptation Plan (NAP) identifies children as a vulnerable group, the focus has been placed mainly on the health impacts of climate change on children and other vulnerable groups. Thus, the specific focus of climate change impact on children and youth could be strengthened both in terms of the policy formation and implementation.

### Pollution Control Department (PCD)

The PCD is part of the Ministry of Natural Resources and Environment. Their responsibility is to manage, control, supervise, and preserve the environment in Thailand to prevent pollution. The main missions of the PCD are to develop laws, standards, tools, and mechanisms for pollution and waste management that are appropriate for the economy, society, and available technology. Although the PCD has some produced some activities and guidelines for waste management that are specifically aimed at children,<sup>8</sup> to engage them in the process and raise awareness about waste management, the Action Plan for the fiscal year 2565 B.E. does not seem to have any particular focus on children and youth in relation to pollution control.

### Department of Environmental Quality Promotion (DEQP)

The DEQP is part of the Ministry of Natural Resources and Environment. The mission of the DEQP is to raise public awareness and participation, build network cooperation, provide environmental information services, and conduct research and innovation to improve environmental quality in Thailand. DEQP has several projects that involve children and youth including ACE Youth Camp, Eco-School project, Mahingsa Sai Sueb project, and Green Youth. DEQP's engagement with children and youth is reflected in its annual reports and 20-year plan (2561-2580 B.E.).

<sup>8</sup> Pollution Control Department. (2021). Guide for reducing, sorting, and utilizing solid waste – Youth Edition. Retrieved from <https://www.pcd.go.th/publication/15013/>

## Department of Health (DOH)

The DOH is part of the Ministry of Public Health (MOPH) and is the key focal point for climate change in the public health sector. The DOH has developed health policies and strategies for health promotion, prevention, control, treatment, rehabilitation of people, as well as other duties as prescribed by law. One of the central goals of the National Adaptation Plan – Public Health (2564-2573 B.E.) is to decrease the health impacts from climate change, and for Thailand become the central hub in Asia to address climate change risks on health. The four strategic issues under this plan are as follows:

1. Strengthening community capacity and skills in health literacy to cope with health risks from climate change.
2. Integrating capacity of all sectors to drive public health implementation and climate change.
3. Strengthening public health climate change preparedness to enhance national social development and security.
4. Strengthening national public health system to deal with climate change.

These strategic issues are specific to the impact of climate change on public health and it would be useful if children's health could be specifically mentioned. The aforementioned DOH report specifies the weaknesses of the implementation of the National Adaptation Plan in the Thai context (Department of Health, 2021, p. 61), including the lack of in-depth study of climate change impact on public health according to specific areas, population groups, and events. Also, a more proactive plan detailing the impact of climate change on public health is still needed.

The identified weaknesses support the argument that policies focusing on climate change impact on children's health need to be specifically formulated. Vulnerability analyses of different population groups, especially children, should be conducted to tailor the implementation plan to help each group adapt to the impact of climate change and also to mitigate the impact on their specific health needs.

## Thai Health Promotion Foundation (ThaiHealth)

ThaiHealth is an autonomous government agency established by the Health Promotion Foundation Act in 2001. The foundation aims to “inspire, motivate, coordinate, and empower individuals and organizations in all sectors for the enhancement of health promotive capability as well as healthy society and environment to support health promotion movement in Thailand” so that “all people living in Thailand have capability and live in a society and environment conducive to good health” (ThaiHealth, n.d. -a). Among its eight plans, the Health Risk Control Plan (ThaiHealth, n.d. -b), which includes environmental health promotion, is directly related to the impact of climate change on children in terms of their physical health and well-being.

### Office of the National Economic and Social Development Council (NESDC)

The NESDC is a government department reporting directly to the Office of the Prime Minister. It is responsible for formulating national strategic planning; and aspires to be a “central planning agency responsible for strategy formulation towards balanced and sustainable development while upholding national interests and keeping up with unexpected changes with high efficiency” (NESDC, n.d.).

### Office of the Permanent Secretary, Ministry of Education (MOE)

The Office of the Permanent Secretary is part of the MOE. The main mission is to promote, support, and develop the quality of educational management in formal and informal educational systems to meet the needs of twenty-first century learners. This includes enhancing the quality of educational personnel and educational institutions in Thailand. Currently, the issues of climate change, early warning, and disaster risk management are integrated into primary, secondary and tertiary curricula.

### Office of the Basic Education Commission (OBEC)

OBEC is part of the MOE. Their mission is to organize and promote basic education from primary school to high school. This consists of three levels: 1) pre-primary education for children aged 3 to 6 years to lay foundations for their future; 2) primary education to provide children with moral, ethical, and basic abilities; and 3) secondary education to provide children with additional development beyond primary school, as well as to educate them according to their aptitudes and interests. Thailand has integrated climate change mitigation, adaptation, impact reduction and early warning into primary and secondary curricula, particularly in science and technology, social studies, religion and culture, and health and physical education.

### Department of Skill Development

The Department of Skill Development is part of the Ministry of Labour. The organization is responsible for several missions, including the development of labour skill standards, the development of a skill development system to support innovation and technological change, the promotion of network cooperation for skill development, and the development of a management system for efficient organization. The Department of Skill Development has provided training on green skills in 76 provinces across Thailand. Skills developed through green skill training programmes include training on waste recycling, designing solar panels, etc. Approximately 5,500 people are trained on green skills each year by the Department of Skill Development.

### Thailand Greenhouse Gas Management Organization (TGO)

TGO is a public organization which aims to be the key agency on greenhouse gas mitigation and in guiding Thailand towards becoming a sustainable low-carbon economy and society. Strategy 5 of TGO focuses on building capacity and developing knowledge on climate change management. In addition, according to TGO's short-term action plan (2020-2022), the direction mentioning of children and youth is a part of the project (Project No. 12) to raise awareness and develop knowledge on climate change through different activities.

### The Children and Youth Council of Thailand (CYCT)

CYCT operates under the DCY, MSDHS. The CYCT constitutes of youth representatives from the local to national levels. The CYCT aims to be the coordinating centre to drive research and activities that promote children and youth protection and development (CYCT, n.d). This council facilitates links between children and youth in different parts of Thailand and governmental agencies so that children and youth have actual engagement with policy formation and implementation. Environmental and pollution issues have been discussed through the social media channels of CYCT, for example Facebook.

## 7.2.3 Private sector

### Thai Listed Company Association (TLCA)

TLCA is a not-for-profit organization comprised of listed companies on The Stock Exchange of Thailand (SET) and the Market for Alternative Investment (MAI). In collaboration with several partner organizations, the TLCA have organized several events and seminars to support ESG (Environment, Social and Governance) among listed companies in Thailand.

### Global Compact Network Thailand (GCNT)

Global Compact Network Thailand (GCNT) was founded in November 2016 by 15 founding corporate members. This group is one of the local networks of the UN Global Compact that aims to encourage companies to engage with the sustainability agenda. The GCNT also aims to promote principles for responsible business both in terms of strategic planning and business operations in accordance with UNGC's 10 principles, focusing on human rights, labour, environment, and anti-corruption.

## 7.2.4 NGO and civil society organizations

### Green World Foundation (GWF)

Green World Foundation was founded in 1990 by Narisa Chakrabongse, under the patronage of Her Royal Highness Princess Galyani Vadhana, with the aim to provide easily accessible knowledge on the Thai environment through various media formats. GWF works in collaboration with an array of specialists and players in many fields, in particular scientists, educators, practitioners, youths, schools and families, to create learning experiences in real outdoor situations, which empower citizens of all ages and backgrounds to assess the state of the local environments independently.

Through a train-the-trainers programme, GWF have built a country-wide network of environmental detectives who spread the knowledge and skills further across communities and generations. Reviews by third parties have found the activities to be highly effective, providing springboards for creative care of local environments.

GWF is committed to developing innovative shared learning experiences that connect human, nature and wildlife, supporting the drive of empowered citizens to achieve a sustainable future.

### Thailand Environment Institute (TEI)

TEI is a non-profit, non-governmental, organization, focusing on environmental and sustainable development issues. It was established in May 1993 to drive sound environmental policies; assist community on natural resources management; raise public awareness on environmental and sustainable development; and provide training to strengthen environmental management capacity. TEI strives to develop knowledge; serve as a reliable and modern source of information; and promote collaboration and coordination among multi-sectoral partners on the environment and sustainable development.

Collaborating closely with partners in the private sector, government agencies, local communities, civil society, academia and international organizations, TEI has contributed to the formulation and implementation of several environmental policies and meaningful sustainable development progress in Thailand.

## 7.2.5 Mass media

### Green News

Green News is a news agency in which focuses on environmental issues and advocates just environmental policy. The reported issues include climate change, pollution, biodiversity, energy, human rights etc.

### Thai PBS

Thai PBS is a mass media that also has a strong social media platform. This presence encourages dialogue, the exchange of ideas and information integrity. Thai PBS reports on a wide range of news stories covering economics, social, environmental, and human rights issues.

### The Standard

The Standard is a news agency that aims to create positive changes for society. It offers news and information through various platforms including online content, video, and podcasts so that it can reach as many groups of people as possible. The news coverage includes wide-ranging issues, namely economic, social, political, art, culture, entertainment, fashion and lifestyle issues, presented in a creative, up-to-date format, providing knowledge, viewpoints and inspiration.

## 7.2.6 Youth groups

It is crucial that we engage children and youth and provide them with an opportunity to voice their requirements and participate in the policy process that will affect their future. Also, it is important to engage more than one youth group in the stakeholder consultation process as children and youth are not homogenous groups. They are instead diverse in culture, background, profession, and education.

### Global Youth Biodiversity Network (GYBN Thailand)

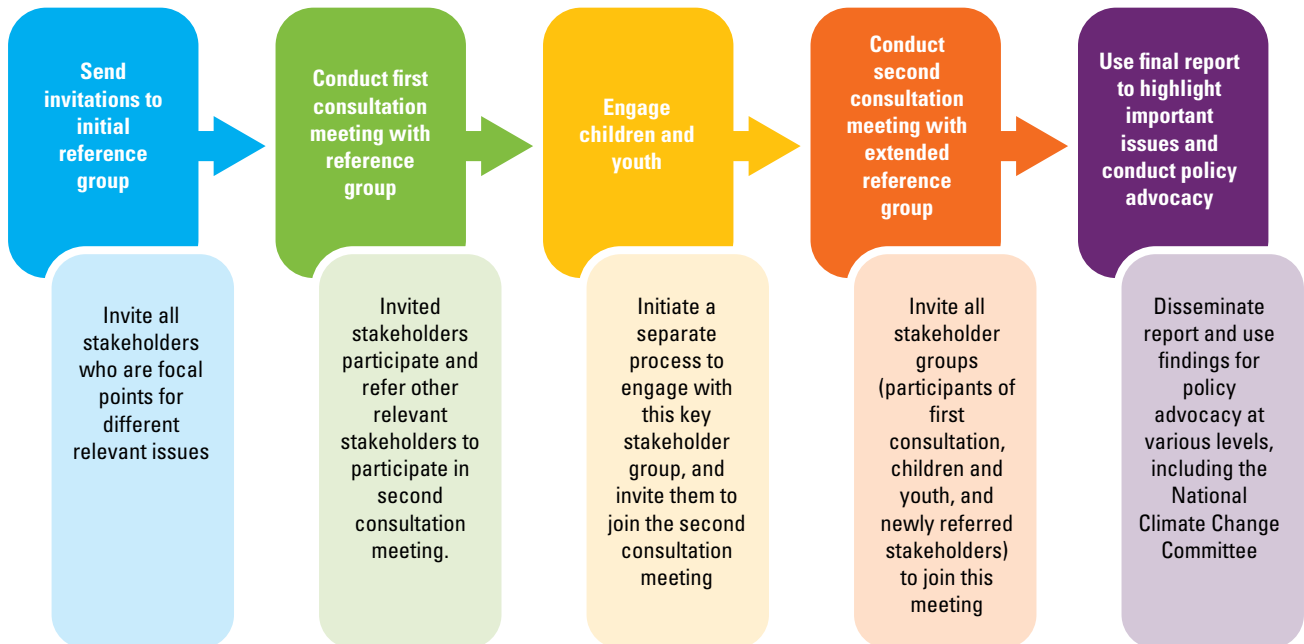
Global Youth Biodiversity Network is an assembly of Thai youth who are passionate about biodiversity conservation. It is a network comprising youth from all regions of Thailand. The main mission of GYBN Thailand is to promote the role of youth in policy advocacy, capacity building, and networking.

### Climate Strike Thailand

This is a network of young environmental activists and advocates for climate change and environmental issues. Climate Strike Thailand has mainly called for better and environmentally friendly public transportation, urban green space, clear air, and renewable energy as the main source of power. They aim to create positive impact on the environment and the future of their generation.

## 7.3 Stakeholder consultation process

Figure 7.2 Stakeholder consultation process



Source: Thailand Development Research Institute

The stakeholder consultation process was divided into three main stages: first consultation meeting, children and youth engagement, and second consultation meeting.

**The first stage:** The first stakeholder consultation meeting was organized on the 15 February 2022 and took place online. The list of stakeholders in this first-round consultation involved governmental agencies who were identified as relevant parties to the national climate change committee and/or national policy advocacy. In the first consultation meeting, stakeholders were provided with project objective and information. At the same time, they were asked to provide some information on their climate change policies specifically related to children. After the first stakeholder consultation, the list of stakeholders to be included in the second stakeholder consultation was expanded.

**The second stage:** Children and youth engagement was conducted through two focus groups discussions which took place on 11 March 2022 and 4 April 2022.

**The third stage:** More stakeholders were invited to join the second consultation meeting. The second stakeholder consultation meeting took place on 21 April 2022. The purpose of this stakeholder consultation meeting was to present and validate the findings and seek further recommendations.

## 7.4 Stakeholder mapping

The research team identified, categorized and mapped the stakeholders based on stakeholder type and issues. Examples of issues considered include climate change, pollution, health, education, and children and youth. The stakeholder mapping is presented in Table 7.1.

**Table 7.1 Stakeholder mapping**

No.	Type of Stakeholder	Organization	Climate change focus	Pollution focus	Health focus	Education focus	Child & Youth focus
1	Transnational actor	UNICEF	•	•	•	•	•
2	Transnational actor	UN Global Compact	•	•			
3	Government agency	Office of Natural Resources and Environmental Policy and Planning (ONEP)	•				
4	Government agency	Pollution Control Department		•			
5	Government agency	Department of Environmental Quality Promotion (DEQP)	•	•		•	•
6	Government agency	Ministry of public health (MOPH)		•	•		
7	Government agency	Thai Health Promotion Foundation		•	•		
8	Government agency	Office of the National Economic and Social Development Council (NESDC)	•			•	
9	Government agency	Office of the Permanent Secretary, Ministry of Education (OPS-MOE)				•	•
10	Government agency	Office of the Basic Education Commission (OBEC)				•	•
11	Government agency	Department of Skill Development				•	•



No.	Type of Stakeholder	Organization	Climate change focus	Pollution focus	Health focus	Education focus	Child & Youth focus
12	Government agency	Thailand Greenhouse Gas Management Organization (Public Organization) (TGO)	•	•			
13	Government agency	The Children and Youth Council of Thailand (CYCT)			•	•	•
14	Government agency	Department of Children and Youth					•
15	Government agency/Mass Media	The Government Public Relations Department				•	
16	Government agency	Department of Disease Control			•		
17	Government agency	Department of Health			•		
18	Government agency	Office of the Vocational Education Commission				•	
19	NGO and civil society organizations	Green World Foundation	•	•			
20	NGO and civil society organizations	Thailand Environment Institute	•	•			
21	Private sector	Green Collar					

Source: Thailand Development Research Institute

## 7.5 Issues from stakeholder consultation meetings

### 7.5.1 First stakeholder consultation meeting

The first stakeholder consultation meeting was organized on 15 February 2022. Government agencies that were identified as relevant organizations to the focal points issues (i.e., climate change, pollution, health, education, and children and youth) were invited to this round of consultation.

The main objectives of this first stakeholder consultation were as follows:

1. To introduce the project “Impacts of Climate Change and Environmental Degradation on Children in Thailand”.
2. To gain policy insights from the participating organizations on current plan and policies (if any) that are directly relevant to the impact of climate change on children and youth.
3. To gain insights from the participating organizations on the challenges and limitations in policy planning and implementation relevant to the impact of climate change on children and youth.
4. To obtain recommendations on extending the list of stakeholder groups to be included in the following consultation meetings, and on other issues relevant to the project.

Eleven government agencies as shown in Table 7.2 were invited to this first stakeholder consultation meeting, out of which 19 participants from 9 government agencies attended.

**Table 7.2 Participants in the first stakeholder consultation meeting**

No.	Organizations	Number of representatives
1	Department of Children and Youth (DCY)	1
2	Pollution Control Department (PCD)	2
3	Department of Skill Development	1
4	Department of Environmental Quality Promotion (DEQP)	3
5	Department of Health (DOH)	4
6	The Children and Youth Council of Thailand (CYCT)	1
7	Office of the Basic Education Commission (OBEC)	1
8	Office of Natural Resources and Environmental Policy and Planning (ONEP)	2
9	Office of the National Economic and Social Development	4

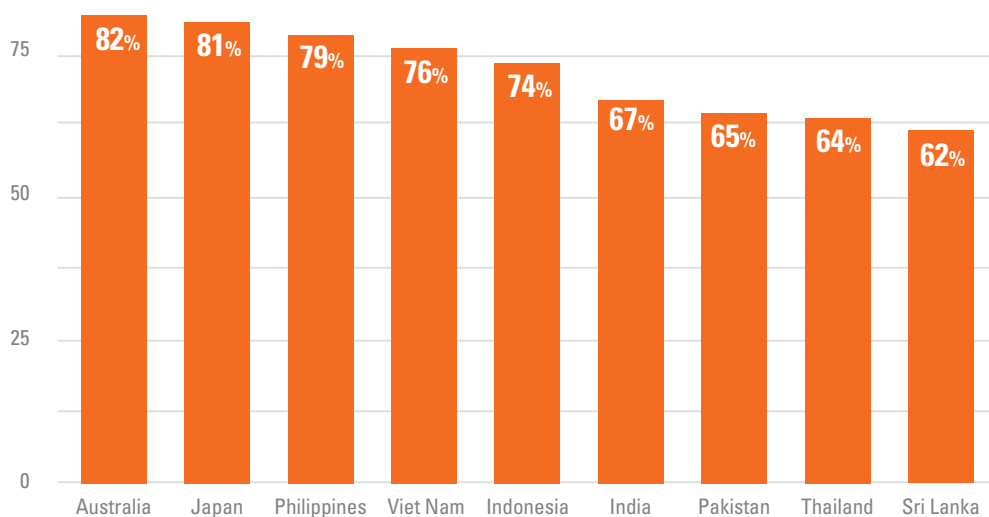
### Summary of current policies according to participants

According to the representative from the DOH, the Health National Adaptation Plan (HNAP) prepared by the DOH includes children and youth as the vulnerable groups. In terms of the promotion of environmental health relating to air pollution, the DOH collaborates with ThaiHealth to educate and build capacity of children and youth on air pollution issues.

According to the ONEP representative, although ONEP has developed the Climate Change Master Plan 2015-2050 and the National Adaptation Plan, the agency looks at the holistic picture of climate change adaptation and mitigation, instead of having a specific focus on particular population groups, such as children and youth. Similarly, according to the representative from the NESDC, the 13th National Economic and Social Development Plan considers climate change at the macro level. There is no specific focus on impacts of climate change on children and youth. As commented by the representative the PCD, while the PCD and pollution-related plans do not have a specific focus on children and youth, the PCD is exploring the possibility of collaborating with other agencies to focus on these issues.

According to representatives from the DEQP, the DEQP has several projects relevant to children and youth in different age ranges, and also has projects which focus on educating teachers on climate change issues. Examples of these projects include the Eco School project, Green Scout project, and ACE Youth Camp. According to UNDP (2021), Thai children and youth have less awareness of climate change emergency than children and youth in other countries. As shown in Figure 7.3, only 64 per cent of surveyed youth under the age of 18 in Thailand believe that climate change is an emergency. The representative from DEQP expressed concern over this survey's results. Although there are some projects that try to address climate change issues, further efforts and collaborations are clearly still needed.

**Figure 7.3 Public Belief in the Climate Emergency Among Under-18s in Nine Countries in Asia and the Pacific<sup>9</sup>**



<sup>9</sup> <https://www.undp.org/publications/peoples-climate-vote#modal-publication-download>

According to representative from the Department of Skill Development, the agency is collaborating with ILO on the project “Young Future Maker”; which focuses on children and youth outside of the formal education system and those who are in vulnerable groups. Such a project can help enhance youth employability. Additionally, there is a project with GIZ that aims to provide training for mechanics and equip them with knowledge about natural and environmental-friendly refrigerants. With regards to green jobs and green skills, in the context of climate change adaptation and mitigation context, there seem to be no training programme that can directly be labelled as “green”. However, there are elements of some training programmes that promote green economy, such as waste management and the use of environmental-friendly substances.

### Policy planning challenges relating to climate change impact and children

Tackling climate change requires collaboration between different agencies. For ONEP, there are limited projects, activities and initiatives that directly focus on children. The representative highlighted that a direct link between climate change issues and children might not be at first obvious. Thus, in their plan, there is no specific focus on a particular population group. It would be useful if good practices on relevant policies from other countries could be provided as case studies. The ONEP representative raised an example of gender and climate change, as gender is an issue which is embedded and highlighted in many funding calls. Another reason that ONEP does not have a specific plan which focuses on children and youth is that ONEP has limited expertise on this group.

### Other recommendations from participants

It was highlighted that different agencies are focusing on their key areas. However, climate change problems are complex, requiring systemic change and a greater focus on vulnerable groups. So, this kind of forum or meeting is helpful to bring together different agencies to enhance collaboration. Some participants in the first stakeholder consultation meeting admitted that the specific focus on children and youth is challenging. In many plans and policies, they are labelled as “vulnerable groups”. Such treatment of children and youth as homogenous to other vulnerable groups could imply that their specific needs might not be sufficiently addressed.

### Additional stakeholders

Additional agencies were invited to attend to the second stakeholder consultation meeting, including the Department of Mental Health, Department of Disease Control, and National Statistical Office. In addition, children and youth groups were consulted to empower the groups and enhance their involvement in the policy making sphere.

## 7.5.2 Second stakeholder consultation meeting

The second stakeholder consultation meeting was held on 21 April 2022. All relevant stakeholder groups, including government agencies, children and youth representation, NGOs and other experts, were invited to this consultation meeting.

The main objectives of this second stakeholder consultation meeting were as follows:

1. To present the findings of the research project, split into three main areas:
  - a. Climate change risks and impacts of climate change and environmental degradation on children in Thailand;
  - b. Child-sensitive policy recommendations; and
  - c. Green jobs and green skills trends in Thailand.
2. To obtain comments from stakeholders on the research findings and the proposed child-sensitive recommendations.

A total of 29 participants attended this second stakeholder consultation meeting, including representatives from government agencies, transnational organizations and networks, NGOs, and relevant experts (Table 7.3).

**Table 7.3 List of participants in the second stakeholder consultation meeting**

No.	Organizations	Number of representatives
1	Department of Children and Youth	1
2	Pollution Control Department	1
3	Department of Skill Development	1
4	Department of Environmental Quality Promotion (DEQP)	1
5	Department of Health and Department of Disease Control	2
6	The Children and Youth Council of Thailand	1
7	Thai Health Promotion Foundation	1
8	Office of the Basic Education Commission	3
9	Department of Vocational Education	1
10	Office of Natural Resources and Environmental Policy and Planning (ONEP)	2
11	Office of the Permanent Secretary, Ministry of Education	1
12	Office of the National Economic and Social Development	1
13	The Public Relations Department	3

No.	Organizations	Number of representatives
14	Thailand Greenhouse Gas Management Organization	1
15	National Research Council of Thailand (NRCT)	1
16	Global Compact Thailand	1
17	UNICEF	4
18	Expert (Green collar)	1
19	Academic (PRO-green Center)	1
20	NGOs (Green World Foundation)	1

Source: Thailand Development Research Institute

### Summary of observations from second stakeholder consultation meeting

#### **1. Potential benefits from the child-sensitive climate change risk maps and child-sensitive climate change policy recommendations**

Participants highlighted the potential benefits of the risk maps developed under this project on resource allocation planning and the identification of climate change risks. The climate change risk maps, which incorporate child and youth factors, would allow each government agency to consider a more child-sensitive climate change policy. The risk maps potentially also aid the collaboration between different actors.

Regarding the development of child-sensitive climate change policy, a national focal point agency like ONEP needs to provide technical assistance to local administrations, especially regarding climate change risk data, to enable the local administration to take climate action at the local level. However, the plan and key performance indicators for child-sensitive climate change policy should be established jointly by all relevant agencies.

#### **2. Policy planning challenges relating to climate change impact and children**

Cooperation and collaboration between different government agencies to establish child-sensitive climate change policy was one of the main challenges raised by participants in the second stakeholder consultation meeting. Although ONEP has climate change policies, such as the Climate Change Master Plan 2015-2050 and the National Adaptation Plan, these climate change-related policies do not provide a specific focus on children and youth groups. The policy recommendation to address this challenge should be a hybrid approach, namely using both top-down (i.e., agencies responsible for climate change policy and planning should consider impacts of climate change on child and youth and develop measures to mitigate these impacts) and bottom-up approaches (i.e., LGOs can play a key role in providing a platform to connect stakeholders to formulate child-sensitive climate change mitigation and adaptation plans suitable for each area as well as to implement such plans). Good practices that are implemented in one area could then be adapted and applied to other areas.

The importance of the promotion of climate change issues was also highlighted by participants in the second stakeholder consultation meeting. This is related to points raised in the first stakeholder consultation meetings regarding the digesting and publicizing of information, so that public awareness and knowledge about climate change issues can be enhanced.

### **3. Issues relevant to green jobs and green skills**

It was noted that green jobs and green skills require wider definition as the skills required to perform future green jobs are varied. However, general skills such as English language skills and computer literacy are required for all future work, not just green jobs. This should be taken into consideration when promoting future jobs and green jobs.

It was confirmed that some available jobs are advertised outside conventional job posting portals or job advertisement platforms. Thus, it is important to have a platform where green jobs, or other future jobs, can be found, so that equal opportunity for job application is provided to wider groups of job seekers.

# References

- Akachi, Y., Goodman, D., & Parker D. (2009). "Global Climate Change and Child Health: A review of pathways, impacts and measures to improve the evidence base." Innocenti Discussion Papers, No. 2009-03. Retrieved from [https://www.unicef-irc.org/publications/pdf/idp\\_2009\\_03.pdf](https://www.unicef-irc.org/publications/pdf/idp_2009_03.pdf)
- Akresh, R., Lucchetti, L., & Thirumurthy, H. (2012). "Wars and Child Health: Evidence from the Eritrean-Ethiopian Conflict." *Journal of Development Economics* 99, no. 2 (November 1, 2012): 330–40. <https://doi.org/10.1016/j.jdeveco.2012.04.001>.
- Akresh, R. "Climate Change, Conflict, and Children." *The Future of Children* 26, no. 1 (2016): 51–71. <https://doi.org/10.1353/foc.2016.0003>.
- Amponsem J., Doshi, D., Salazar Toledo, A. I., Schudel, L., & Delali-Kemeh, S. (2019). *Adapt for our Future: Youth and Climate Change Adaptation*. Rotterdam and Washington, DC. Doi: 10.13140/RG.2.2.20718.97606
- Anderko, L., & Pennea, E. (2022). "Climate Changes Children's Health: Improving Clinical Practice to Address Changing Health Needs." *The Journal for Nurse Practitioners*, Volume 18, Issue 4, April 2022, pp. 395-398.
- Arceo, E., Hanna, R., & Oliva, P. (2012). Does the effect of pollution on infant mortality differ between developing and developed countries? Evidence from Mexico City. *The Economic Journal*, 126(591), 257–280. <https://doi.org/10.1111/eoj.12273>
- Basagaña, X., Sartini, C., Barrera-Gómez, J., Dadvand, P., Cunillera, J., Ostro, B., Sunyer, J., and Medina-Ramón, M. (2011). "Heat Waves and Cause-Specific Mortality at All Ages." *Epidemiology* 22 (6): 765–72.
- Basu, R., & Ostro, B.D. (2008). "A Multicounty Analysis Identifying the Populations Vulnerable to Mortality Associated with High Ambient Temperature in California." *American Journal of Epidemiology* 168, no. 6 (September 15, 2008): 632–37. <https://doi.org/10.1093/aje/kwn170>.
- Battistella, G. & Conaco, M.C. (1998). "The impact of labour migration on the children left behind: A study of elementary school children in the Philippines." *SOJOURN: Journal of Social Issues in Southeast Asia*: 220-241.
- Bellinger D. C. (2008). "Very low lead exposures and children's neurodevelopment." *Current Opinion in Pediatrics*, 20(2), 172–177. <https://doi.org/10.1097/MOP.0b013e3282f4f97b>



- Bennett, C. M., & Friel, S. "Impacts of Climate Change on Inequities in Child Health." *Children* 1, no. 3 (December 2014): 461–73. <https://doi.org/10.3390/children1030461>.
- Berse, K. (2017). "Climate change from the lens of Malolos children: perception, impact and adaptation." *Disaster Prevention and Management*, 26(2), 217-229. <https://doi.org/10.1108/DPM-10-2016-0214>
- Bharadwaj, P., Gibson, M., Graff Zivin, J., & Neilson, C. (2017). "Gray matters: Fetal pollution exposure and human capital formation." *Journal of the Association of Environmental and Resource Economists*, 4(2), 505-542. <https://doi.org/10.1086/691591>
- Bhushan, B., & Kumar, J. S. (2007). "Emotional Distress and Posttraumatic Stress in Children Surviving the 2004 Tsunami." *Journal of Loss and Trauma*, 12, p.245-257.
- Bohra-Mishra, P., Oppenheimer, M., & Hsiang, S.M. (2014). "Nonlinear Permanent Migration Response to Climatic Variations but Minimal Response to Disasters." *Proceedings of the National Academy of Sciences* 111, no. 27 (July 8, 2014): 9780–85. <https://doi.org/10.1073/pnas.1317166111>.
- Bowen, D. J., Kreuter, M., Spring, B., Cofta-Woerpel, L., Linnan, L., Weiner, D., Bakken, S., Kaplan, C. P., Squiers, L., Fabrizio, C., & Fernandez, M. (2009). "How we design feasibility studies." *American Journal of Preventive Medicine*, 36(5), 452–457. <https://doi.org/10.1016/j.amepre.2009.02.002>
- Brown, M.R.G., Agyapong, V., Greenshaw, A.J., Cribben, I., Brett-MacLean, P., Drolet, J., McDonald-Harker, C., Omeje, J., Mankowski, M., Noble, S., Kitching, D.T., & Silverstone, P.H. (2019). "Significant PTSD and Other Mental Health Effects Present 18 Months After the Fort McMurray Wildfire: Findings From 3,070 Grades 7–12 Students." *Frontiers in Psychiatry* 10 (2019): 623. <https://doi.org/10.3389/fpsy.2019.00623>.
- Buka, I., & Shea, K.M. (2019). "Global climate change and health in Canadian children." *Paediatrics and Child Health*, 24 (2019), pp. 557-558.
- Bundervoet, T., Verwimp, P., & Akresh, R. (2009). "Health and Civil War in Rural Burundi." *Journal of Human Resources* 44, no. 2 (March 31, 2009): 536–63. <https://doi.org/10.3368/jhr.44.2.536>.
- Burgess, R., Deschenes, O., Donaldson, D., & Greenstone, M. (2011). "Weather, Climate Change and Death in India." Retrieved from <https://www.lse.ac.uk/economics/Assets/Documents/personal-pages/robin-burgess/weather-climate-change-and-death.pdf>
- Burke, S. E. L., Sanson, A. V., and Van Hoorn, J. (2018). "The Psychological Effects of Climate Change on Children." *Current Psychiatry Reports* 20 (5): 35. <https://doi.org/10.1007/s11920-018-0896-9>.
- Butterfield, B., Leffers, J., & Díaz Vásquez, M. (2021). Nursing's pivotal role in global climate action. *British Medical Journal*, 373 (2021), p. N1049. doi: 10.1136/bmj.n1049
- Bytomski, J. R., & Squire, D.L. (2003). "Heat Illness in Children." *Current Sports Medicine Reports* 2, no. 6 (December 2003): 320–24. <https://doi.org/10.1249/00149619-200312000-00007>.
- Cook, C., Demorest, S.L., & Schenk, E. (2019). "Nurses and climate action." *American Journal of Nursing*, 119 (2019), pp. 54-60.
- Centers for Disease Control and Prevention. (2020a). "How are Children Different from Adults?" Retrieved from <https://www.cdc.gov/childrenindisasters/differences.html>
- Centers for Disease Control and Prevention. (2020b). "Your Child Is At Risk for Mental Health Issues After a Disaster." Retrieved from <https://www.cdc.gov/childrenindisasters/features/disasters-mental-health.html>

## References

- Chai, M. (2019). "Drought drives Pokot girls to miss school." The Star. Retrieved from <https://www.the-star.co.ke/sasa/2019-03-12-drought-drives-pokot-girls-to-miss-school/>
- Chaimontree, W. A., & Durnnian, T. (2010). Living with disasters and changing climate: children in Southeast Asia telling their stories about disaster and climate change. Save the Children. Retrieved from <https://resourcecentre.savethechildren.net/pdf/3243.pdf>
- Chang, G., Novella, R., & Favara, M. (2020). "The Origins of Cognitive Skills and Noncognitive Skills: The Long-Term Effect of in-Utero Rainfall Shocks in India." Discussion paper series, IZA DP No. 13960. Retrieved from <https://ftp.iza.org/dp13960.pdf>
- Chay, K. F., & Greenstone, M. (2003a). Air quality, infant mortality, and the Clean Air Act of 1970. DOI: 10.2139/ssrn.509182
- Chay, K. F., & Greenstone, M. (2003b). "The Impact Of Air Pollution On Infant Mortality: Evidence From Geographic Variation In Pollution Shocks Induced By A Recession." Quarterly Journal of Economics, 118(3), 1121-1167. DOI: 10.1162/00335530360698 513
- Chevalier et al. (2013). "The impact of parental income and education on the schooling of their children." IZA Journal of Labor Economics, 2(1), p.8. Retrieved from <https://izajole.springeropen.com/articles/10.1186/2193-8997-2-8>
- Child Rights International Network. (2018). "Children's Rights and the SDGs." Retrieved from <https://archive.crin.org/en/home/what-we-do/policy/childrens-rights-and-sdgs.html>
- Coneus, K., & Spiess, K. (2012). "Pollution exposure and child health: evidence for infants and toddlers in Germany." Journal of Health Economics, 31(1), 180–196. <https://doi.org/10.1016/j.jhealeco.2011.09.006>
- Cruz, F. T., Narisma, G. T., Dado, J. B., Singhruck, P., Tangang, F., Linarka, U. A., Wati, T., Juneng, L., Phan-Van, T., Ngo-Duc, T., Santisirisomboon, J., Gunawan, D., & Aldrian, E. (2017). "Sensitivity of temperature to physical parameterization schemes of RegCM4 over the CORDEX-Southeast Asia region." International Journal of Climatology. DOI: <https://doi.org/10.1002/joc.5151>
- Currie, J., & Neidell, M. (2005). "Air Pollution and Infant Health: What Can We Learn from California's Recent Experience?" The Quarterly Journal of Economics, 120(3), 1003–1030. <https://doi.org/10.1093/qje/120.3.1003>
- Currie, J., & Walker, R. (2011). "Traffic Congestion and Infant Health: Evidence from E-ZPass." American Economic Journal: Applied Economics, 3(1), 65–90. <http://www.jstor.org/stable/25760246>
- Currie, J., Greenstone, M., & Moretti, E. (2011). "Superfund Cleanups and Infant Health." American Economic Review, 101(3), 435–441. <https://doi.org/10.1257/aer.101.3.435>
- Currie, J., Hanushek, E. A., Kahn, E. M., Neidell, M., & Rivkin, S. G. (2009a). "Does Pollution Increase School Absences?" The Review of Economics and Statistics, 91(4), 682–694. <https://doi.org/10.1162/rest.91.4.682>
- Currie, J., Neidell, M., & Schmieder, J. F. (2009b). "Air pollution and infant health: Lessons from New Jersey." Journal of Health Economics, 28(3), 688–703. <https://doi.org/10.1016/j.jhealeco.2009.02.001>
- Currie, J., Zivin, J. G., Mullins, J., & Neidell, M. (2014). "What Do We Know About Short- and Long-Term Effects of Early-Life Exposure to Pollution?" Annual Review of Resource Economics, 6, 217–47. <https://doi.org/10.1146/annurev-resource-100913-012610>
- Currie, J., & Olivier Deschênes. "Children and Climate Change: Introducing the Issue." The Future of Children 26, no. 1 (2016): 3–9.

- Daoud, A., Halleröd, B., & Guha-Sapir, D. (2016). "What Is the Association between Absolute Child Poverty, Poor Governance, and Natural Disasters? A Global Comparison of Some of the Realities of Climate Change." *PLOS ONE* 11, no. 4 (April 14, 2016): e0153296. <https://doi.org/10.1371/journal.pone.0153296>.
- De Janvry, A., Finan, F., Sadoulet, E., & Vakis, R. (2004). "Can Conditional Cash Transfers Serve as Safety Nets to Keep Children at School and Out of the Labor Market?" *Journal of Development Economics* 79 (2006): 349–73. Retrieved from [https://eml.berkeley.edu/~ffinan/Finan\\_Shocks.pdf](https://eml.berkeley.edu/~ffinan/Finan_Shocks.pdf)
- Dell, M., Jones, B.F., & Olken, B.A. (2012). "Temperature Shocks and Economic Growth: Evidence from the Last Half Century." *American Economic Journal: Macroeconomics* 4, no. 3 (July 1, 2012): 66–95. <https://doi.org/10.1257/mac.4.3.66>.
- Department of Health. (2021). National Adaptation Plan – Public Health (2564-2573 B.E.). Bangkok: Health Impact Assessment, Department of Health, Ministry of Public Health.
- Ebi, K. L., & Paulson, J.A. (2007). "Climate Change and Children." *Pediatric Clinics of North America, Children's Health and the Environment: Part II*, 54, no. 2 (April 1, 2007): 213–26. <https://doi.org/10.1016/j.pcl.2007.01.004>.
- Edwards, N. M., Meyer, G. D., Kalkwarf, H. J., Woo, J. G., Khoury, P. R., Hewett, T. E., and Daniels, S. R. (2015). "Outdoor Temperature, Precipitation, and Wind Speed Affect Physical Activity Levels in Children: A Longitudinal Cohort Study." *Journal of Physical Activity & Health* 12 (8): 1074–81. <https://doi.org/10.1123/jpah.2014-0125>.
- European Centre for the Development of Vocational Training (CEDEFOP). (2010). Skills for green jobs; European synthesis report. Retrieved from: [http://www.cedefop.europa.eu/EN/Files/3057\\_en.pdf](http://www.cedefop.europa.eu/EN/Files/3057_en.pdf)
- Fleming, P. J., Azaz, Y., & Wigfield, R. "Development of Thermoregulation in Infancy: Possible Implications for SIDS." (1992). *Journal of Clinical Pathology* 45, no. 11 Suppl (November 1, 1992): 17–19.
- French, M. A., Barker, F. S., Taruc, R. R., Ansariadi, A., Duffy, G. A., Saifuddaolah, M., Zulkifli Agussalim, A., Awaluddin, F., Zainal, Z., Wardani, J., Faber, P.A., Fleming, G., Ramsay, E.E., Henry, R., Lin, A., O'Toole, J., Openshaw, J., Sweeney, R., Sinharoy, S.S., Kolotelo, P., Jovanovic, D., Schang, C., Higginson, E.E., Prescott, M.F., Burge, K., Davis, B., Ramirez-Lovering, D., Reidpath, D., Greening, C., Allotey, P., Simpson, J.A., Forbes, A., Chown, S.L., McCarthy, D., Johnston, D., Wong, T., Brown, R., Clasen, T., Luby, S., Leder, K., & RISE consortium. (2021). "A planetary health model for reducing exposure to fecal contamination in urban informal settlements: Baseline findings from Makassar, Indonesia." *Environment International*, 155:106679. doi: 10.1016/j.envint.2021.106679.
- Gilliland, F. D., Berhane, K., Rappaport, E. B., Thomas, D. C., Avol, E., Gauderman, W. J., London, S.J., Margolis, H.G., McConnell, R., Islam, K. T., & Peters, J.M. (2001). "The effects of ambient air pollution on school absenteeism due to respiratory illnesses." *Epidemiology*, 43-54.
- Graff Zivin, J., and Shrader, J. (2016). "Temperature Extremes, Health, and Human Capital." *Future of Children* 26, no. 1 (2016): 31–50.
- Hamlin, A. (2017). "Feasibility Four Ways." *Social Philosophy and Policy*, 34(1), 209-231. <https://doi.org/10.1017/S0265052517000103>
- Hanna, R., & Oliva, P. (2016). "Implications of Climate Change for Children in Developing Countries." *The Future of Children*. 26(1), pp. 115-132. DOI:10.1353/foc.2016.0006.
- Hickman, C., Marks, E., Pihkala, P., Clayton, S., Lewandowski, R. E., Mayall, E. E., Wray, B., Mellor, C., & van Susteren, L. (2021). "Climate anxiety in children and young people and their beliefs about government responses to climate change: a global survey." *The Lancet Planetary Health*, 5(12), e863-e873. [https://doi.org/10.1016/S2542-5196\(21\)00278-3](https://doi.org/10.1016/S2542-5196(21)00278-3)

## References

- Holm, S. M., Miller, M.D., & Balmes, J.R. "Health Effects of Wildfire Smoke in Children and Public Health Tools: A Narrative Review." *Journal of Exposure Science & Environmental Epidemiology* 31, no. 1 (January 2021): 1–20. <https://doi.org/10.1038/s41370-020-00267-4>.
- Huo, X., Peng, L., Xu, X., Zheng, L., Qiu, B., Qi, Z., Zhang, B., Han, D., & Piao, Z. (2007). "Elevated blood lead levels of children in Guiyu, an electronic waste recycling town in China." *Environmental Health Perspectives*, 115(7), 1113-1117.
- IFRC. (2020a). We need to do better: Policy brief for enhancing laws and regulations to protect children in disasters. Retrieved from [https://disasterlaw.ifrc.org/sites/default/files/media/disaster\\_law/2020-08/We-Need-To-Do-Better-Final-En.pdf](https://disasterlaw.ifrc.org/sites/default/files/media/disaster_law/2020-08/We-Need-To-Do-Better-Final-En.pdf)
- IFRC. (2020b). World Disasters Report 2020: Come Heat or High Water. Tackling the Humanitarian Impacts of the Climate Crisis Together. Retrieved from <https://reliefweb.int/report/world/world-disasters-report-2020-come-heat-or-high-water-tackling-humanitarian-impacts>
- ILO. (2016). "What is a green job?" Retrieved from: [https://www.ilo.org/global/topics/green-jobs/news/WCMS\\_220248/lang-en/index.htm](https://www.ilo.org/global/topics/green-jobs/news/WCMS_220248/lang-en/index.htm)
- ILO. (2021). "Thailand labour market update. Concern remains over the drawn out impact of COVID-19." ILO Brief. Retrieved from: [https://www.ilo.org/wcmsp5/groups/public/-/asia/-/ro-bangkok/documents/briefingnote/wcms\\_829228.pdf](https://www.ilo.org/wcmsp5/groups/public/-/asia/-/ro-bangkok/documents/briefingnote/wcms_829228.pdf)
- International Save the Children Alliance. (2008). *In the Face of Disaster: Children and Climate Change*. London: International Save the Children Alliance.
- IPCC. (2018). Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: *Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty* [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. Doi: 10.1017/9781009157940.008
- Isen, A., Rossin-Slater, M., and Walker, W. R. (2017). "Every Breath You Take—Every Dollar You'll Make: The Long-Term Consequences of the Clean Air Act of 1970." *Journal of Political Economy* 125 (3): 848–902. <https://doi.org/10.1086/691465>.
- Jensen, R. (2000). "Agricultural Volatility and Investments in Children." *American Economic Review* 90 (2000): p.399–404. doi: 10.1257/aer.90.2.399.
- Juneng, L., Tangang, F., Chung, J.X., Ngai, S.T., Tay, T.W., Narisma, G., Cruz, F., Phan-Van, T., Ngo-Duc, T., Santisirisomboon, J., Singhruck, P., Gunawan, D., & Aldrian, E. (2016). "Sensitivity of the Southeast Asia Rainfall Simulations to Cumulus and Ocean Flux Parameterization in RegCM4." *Climate Research*. doi: 10.3354/cr01386
- Kandel, W., & Kao, G. (2001). "The impact of temporary labor migration on Mexican children's educational aspirations and performance." *International Migration Review*, 35(4), p.1205-1231.
- Karpudewan, M., Roth, W.-M., & Abdullah, M. N. S. B. (2015). "Enhancing Primary School Students' Knowledge about Global Warming and Environmental Attitude Using Climate Change Activities." *International Journal of Science Education*, 37(1), 31-54. <https://doi.org/10.1080/09500693.2014.958600>

- Kellenberg, D. K., & Mobarak, A. M. (2008). "Does Rising Income Increase or Decrease Damage Risk from Natural Disasters?" *Journal of Urban Economics* 63, no. 3 (2008): 788–802.
- Kelly, P. M., & Adger, W. N. (2000). "Theory and Practice in Assessing Vulnerability to Climate Change and Facilitating Adaptation." *Climatic Change*, 47(4), 325-352. <https://doi.org/10.1023/A:1005627828199>
- Knittel, C. R., Miller, D. L., & Sanders, N. J. (2016). "Caution, drivers! children present: Traffic, pollution, and infant health." *Review of Economics and Statistics*, 98(2), 350–366. doi:10.1162/REST\_a\_00548
- Kousky, C. (2016). "Impacts of Natural Disasters on Children." *The Future of Children* 26 (1): 73–92. Retrieved from <https://doi.org/10.1353/foc.2016.0004>.
- Kudamatsu, M., Persson, T., & Strömberg, D. "Weather and Infant Mortality in Africa." CEPR Discussion Paper. C.E.P.R. Discussion Papers, November 2012. Retrieved from <https://econpapers.repec.org/paper/cprceprdp/9222.htm>.
- Lai, B. S., & La Greca, A. (2020). Understanding the Impacts of Natural Disasters on Children. Society for Research in Child Development (SRCD). Retrieved from <https://www.srcd.org/research/understanding-impacts-natural-disasters-children>
- Landrigan, P. J., Fuller, R., Fisher, S., Suk, W. A., Sly, P., Chiles, T. C., & Bose-O'Reilly, S. (2019). "Pollution and children's health." *Science of the Total Environment*, 650, 2389-2394. DOI: 10.1016/j.scitotenv.2018.09.375
- Landrigan, P. J., Fuller, R., Acosta, N. J. R., Adeyi, O., Arnold, R., Basu, N., Baldé, A. B. (2018). "The Lancet Commission on Pollution and Health." *The Lancet* 391 (10119): 462–512. [https://doi.org/10.1016/S0140-6736\(17\)32345-0](https://doi.org/10.1016/S0140-6736(17)32345-0).
- Langkulsen, U., and Rwodzi, D. (2016). "Heat Effects and Coastal Vulnerability of Population in Thailand.": 173–206. <https://doi.org/10.1007/978-3-319-23684-1-11>.
- Larr, A. S., & Neidell, M. "Pollution and Climate Change." *The Future of Children* 26, no. 1 (2016): 93–113.
- Lawler, J., & Patel, M. (2012). "Exploring children's vulnerability to climate change and their role in advancing climate change adaptation in East Asia and the Pacific." *Environmental Development*, 3(1), 123-136. <https://doi.org/10.1016/j.envdev.2012.04.001>
- Le, T. G., Ngo, L., Mehta, S., Do, V. D., Thach, T. Q., Vu, X. D., Nguyen, D. T., & Cohen, A. (2012). "Effects of short-term exposure to air pollution on hospital admissions of young children for acute lower respiratory infections in Ho Chi Minh City, Vietnam." *Res Rep Health Eff Inst* (169), 5-72; discussion 73-83.
- Leffers, J., & Butterfield, P. (2018). "Nurses play essential roles in reducing health problems due to climate change." *Nursing Outlook*, 66 (2018), pp. 210-213.
- Leffers, J. M. "Climate Change and Health of Children: Our Borrowed Future." (2022). *Journal of Pediatric Health Care, Planetary Health, Environmental Justice, and Child Health*, 36, no. 1 (January 1, 2022): 12–19. <https://doi.org/10.1016/j.pedhc.2021.09.002>.
- Manisalidis, I., Stavropoulou, E., Stavropoulos, A., & Bezirtzoglou, E. (2020). "Environmental and Health Impacts of Air Pollution: A Review." *Frontiers in Public Health*, 8, 14. <https://doi.org/10.3389/fpubh.2020.00014>
- Manyena, B., Fordham, M., & Collins, A. (2008). "Disaster Resilience and Children: Managing Food Security in Zimbabwe's Binga District." *Children, Youth and Environments*, 18(1), 302-331.

## References

- Martin, G., Reilly, K., Everitt, H., & Gilliland, J. A. (2021). "Review: The Impact of Climate Change Awareness on Children's Mental Well-Being and Negative Emotions – a Scoping Review." *Child and Adolescent Mental Health*. <https://doi.org/10.1111/camh.12525>.
- Martinez-Fernandez, C., Hinojosa, C., & Miranda, G. (2010). "Greening Jobs and Skills: Labour Market Implications of Addressing Climate Change." *OECD Local Economic and Employment Development (LEED) Papers*, No. 2010/02. DOI: <https://doi.org/10.1787/5kmbjgl8sd0-en>.
- Matthews, C. E., Freedson, P. S., Hebert, J. R., Stanek III, E. J., Merriam, P. A., Rosal, M. C., Ebbeling, C. B., and Ockene, I. S. (2001). "Seasonal Variation in Household, Occupational, and Leisure Time Physical Activity: Longitudinal Analyses from the Seasonal Variation of Blood Cholesterol Study." *American Journal of Epidemiology* 153 (2): 172–83. <https://doi.org/10.1093/aje/153.2.172>.
- Maurya, P. K., Ali, S. A., Ahmad, A., Zhou, Q., Castro, J., Khan, E., & Ali, A. (2020). "An introduction to environmental degradation: Causes, consequence and mitigation." In *Environmental Degradation: Causes and Remediation Strategies*, pp. 1-20. DOI: 10.26832/aesa-2020-edcrs-01
- Miguel, E., and Kremer, M. "Worms: Identifying Impacts on Education and Health in the Presence of Treatment Externalities." *Econometrica* 72, no. 1 (2004): 159–217. <https://doi.org/10.1111/j.1468-0262.2004.00481.x>.
- Miller, S., & Vela, M. (2013). "The Effects of Air Pollution on Educational Outcomes: Evidence from Chile." *IDB Working Paper Series*, No. IDB-WP-468. Retrieved from <https://www.econstor.eu/bitstream/10419/89160/1/IDB-WP-468.pdf>
- Montgomery, H. (2011). "Rumours of Child Trafficking after Natural Disasters." *Journal of Children and Media*, 5, 395-410. <https://doi.org/10.1080/17482798.2011.587142>
- Mort, M., Walker, M., Williams, A. L., and Bingley, A. (2016). "Final Project Report for 'Children, Young People and Flooding: Recovery and Resilience'." Retrieved from <http://repo.floodalliance.net/jspui/handle/44111/3028>.
- Mort, M., Walker, M., Williams, A. L., and Bingley, A. (2018). "From Victims to Actors: The Role of Children and Young People in Flood Recovery and Resilience." *Environment and Planning C: Politics and Space* 36 (3): 423–42. <https://doi.org/10.1177/2399654417717987>.
- Murga-Menoyo, M. Á. (2014). "Learning for a Sustainable Economy: Teaching of Green Competencies in the University." *Sustainability* 2014, 6, pp. 2974-2992. DOI: <https://doi.org/10.3390/su6052974>
- Myles, P., Swenshon, S., Haase, K., Szeles, T., Jung, C., Jacobi, F., & Rath, B. (2018). "A comparative analysis of psychological trauma experienced by children and young adults in two scenarios: evacuation after a natural disaster vs forced migration to escape armed conflict." *Public Health*, 158, 163-175. <https://doi.org/10.1016/j.puhe.2018.03.012>
- Needleman, H. L., Gunnoe, C., Leviton, A., Reed, R., Peresie, H., Maher, C., & Barrett, P. (1979). Deficits in psychologic and classroom performance of children with elevated dentine lead levels. *The New England Journal of Medicine*, 300(13), 689–695. <https://doi.org/10.1056/NEJM197903293001301>
- Neugebauer, R., Hoek, H. W., & Susser, E. (1999). "Prenatal Exposure to Wartime Famine and Development of Antisocial Personality Disorder in Early Adulthood." *JAMA* 282, no. 5 (August 4, 1999): 455–62. <https://doi.org/10.1001/jama.282.5.455>.
- Ngo-Duc, T., Tangang, F., Santisirisomboon, J., Cruz, F., Trinh-Tuan, L., Nguen-Xuan, T., Phan-Van, T., Juneng, L., Narisma, G., Patama, S., Gunawan, D., & Aldrian, E. (2016). "Performance evaluation of RegCM4 in simulating extreme rainfall and temperature indices over the CORDEX-Southeast Asia region." *International Journal of Climatology*, Volume 37, Issue 3, pp. 1634-1647. <https://doi.org/10.1002/joc.4803>

- OECD. (2018). "Child well-being and the Sustainable Development Goals." Retrieved from: <https://www.oecd.org/sdd/Child-Well-Being-and-SDGs.pdf>
- Office of Environmental Policy and Planning. (2000). Thailand's Initial National Communication under the United Nations Framework Convention on Climate Change. Retrieved from <https://unfccc.int/documents/144678>
- Office of the National Economic and Social Development Council. (n.d.). About NESDB. Retrieved from [https://www.nesdc.go.th/nesdb\\_en/ewt\\_news.php?nid=4255](https://www.nesdc.go.th/nesdb_en/ewt_news.php?nid=4255)
- Ojala, M. (2012). "How Do Children Cope with Global Climate Change? Coping Strategies, Engagement, and Well-Being." *Journal of Environmental Psychology* 32, no. 3 (2012): 225–33. <https://doi.org/10.1016/j.jenvp.2012.02.004>.
- Ojala, M. (2013). "Coping with Climate Change among Adolescents: Implications for Subjective Well-Being and Environmental Engagement." *Sustainability* 5, no. 5 (May 2013): 2191–2209. <https://doi.org/10.3390/su5052191>.
- Oppenheimer, M., & Anttila-Hughes, J. K. (2016). "The Science of Climate Change." *Future of Children*, 26 (2016), pp. 11-30.
- Orlowsky, B., and Seneviratne, S. (2012). "Global Changes in Extreme Events: Regional and Seasonal Dimension." *Climatic Change* 110 (February): 669–96. <https://doi.org/10.1007/s10584-011-0122-9>.
- Owa, F. D. (2013). *Water Pollution: Sources, Effects, Control and Management*. *Mediterranean Journal of Social Sciences*, 4(8), 65-65. DOI: 10.5901/mjss.2013. v4n8p65
- Oxford Poverty and Human Development Initiative, National Economic and Social Development Council and United Nations Children's Fund. (2019). *Child Multidimensional Poverty in Thailand*. Retrieved from [https://ophi.org.uk/wp-content/uploads/NESDC\\_UNICEF-Thailand\\_2019\\_Child\\_MDP\\_in\\_Thailand.pdf](https://ophi.org.uk/wp-content/uploads/NESDC_UNICEF-Thailand_2019_Child_MDP_in_Thailand.pdf)
- Palabrica F. R., Tolentino C, Laroza M, et al. (2015). Effect of air pollution of the lung function of high school students at a public school in Quezon City, Metromanila, Philippines. *Phil J of Allergy Asthma Immunol*, 18: 27–36.
- Pandey, S. (2006). Water pollution and health. *Kathmandu University Medical Journal (KUMJ)*, 4(1), Issue 13, 128-134. Retrieved from <http://www.kumj.com.np/issue/13/128-134.pdf>
- Pandey, S., Bhandari, H., and Hardy, B. (2007). "Economic Costs of Drought and Rice Farmers Coping Mechanisms: A Cross-Country Comparative Analysis." *International Rice Los Baños (Philippines): International Rice Research Institute (IRRI)*, January.
- Panyasing, S., Yongvanit, S., Nurmandi, A., and Prabnok, P. (2021). "Collaborative Partnership and New Farm Management for Solving Drought According to Different Geo-Social Environment in the Northeast of Thailand." *International Journal of Rural Management*, October, 097300522110436. <https://doi.org/10.1177/09730052211043689>.
- Pawankar, R., Wang, J.Y., Wang, I.J., Thien, F., Chang, Y.S., Latiff, A.H.A., Fujisawa, T., Zhang, L., Thong, B.Y., Chatchatee, P., Leung, T.F., Kamchaisatian, W., Rengganis, I., Yoon, H.J., Munkhbayarlakh, S., Recto, M.T., Neo, A.G.E., Le Pham, D., Lan, L.T.T., Davies, J.M., & Oh, J.W. (2020). *Asia Pacific Association of Allergy Asthma and Clinical Immunology. White Paper 2020 on climate change, air pollution, and biodiversity in Asia-Pacific and impact on allergic diseases*. *Asia Pac Allergy*. 2020 Feb 7;10(1):e11. doi: 10.5415/apallergy.2020.10.e11.
- Peek, L. (2008). "Children and Disasters: Understanding Vulnerability, Developing Capacities, and Promoting Resilience – An Introduction." *Children, Youth and Environments*, 18(1), pp. 1-29.

## References

- Pelling, M. (2011). *Adaptation to Climate Change: From Resilience to Transformation*. London: Routledge.
- Perera, F., Ashrafi, A., Kinney, P., & Mills, D. (2019). Towards a fuller assessment of benefits to children's health of reducing air pollution and mitigating climate change due to fossil fuel combustion. *Environmental Research*, 172, 55–72. <https://doi.org/10.1016/j.envres.2018.12.016>
- Pfefferbaum, B., Jacobs, A. K., Van Horn, R. L., and Houston, J. B. (2016). "Effects of Displacement in Children Exposed to Disasters." *Current Psychiatry Reports* 18 (8): 71. <https://doi.org/10.1007/s11920-016-0714-1>.
- Phalkey, R. K., Aranda-Jan, C., Marx, S., Höfle, B., & Sauerborn, R. (2015). "Systematic Review of Current Efforts to Quantify the Impacts of Climate Change on Undernutrition." *Proceedings of the National Academy of Sciences* 112, no. 33 (August 18, 2015): E4522–29. <https://doi.org/10.1073/pnas.1409769112>.
- Piyasil, V., Ketuman, P., Plubrukarn, R., Jotipanut, V., Tanprasert, S., Aowjinda, S., & Thaeeromanophap, S. (2007). "Post traumatic stress disorder in children after tsunami disaster in Thailand: 2 years follow-up." *J Med Assoc Thai*, 90(11), 2370-2376.
- Piyasil, V., Ketumarn, P., Prubrukarn, R., Pacharakaew, S., Dumrongphol, H., Rungsri, S., Sitdhiraksa, N., Pitthayratsathien, N., Prasertvit, J., Sudto, K., Theerawongseree, S., Aowjinda, S., Thaeramanophab, S., Jotipanu, V., & Chatchavalitsakul, W. (2008). Psychiatric disorders in children at one year after the tsunami disaster in Thailand. *J Med Assoc Thai*. 2008 Oct;91 Suppl 3:S15-20. PMID: 19253496.
- Plan International. (2005). *Children and the Tsunami: Engaging with children in disaster response, recovery, and risk reduction – Learning from children's participation in the tsunami response*. Retrieved from <https://resourcecentre.savethechildren.net/pdf/4073.pdf/>
- Plan International & The Research Base. (2014). *Green Skills for Rural Youth in South East Asia*. Retrieved from: <https://plan-international.org/publications/green-skills-rural-youth-south-east-asia>
- Plush, T., Wecker, R., & Ti, S. (2020). "Youth Voices from the Frontlines: Facilitating Meaningful Youth Voice Participation on Climate, Disasters, and Environment in Indonesia." In J. Servaes (Ed.), *Handbook of Communication for Development and Social Change* (pp. 833-845). DOI: 10.1007/978-981-15-2014-3\_134
- Pollution Control Department. (2021). *Guide for reducing, sorting, and utilizing solid waste – Youth Edition*. Retrieved from <https://www.pcd.go.th/publication/15013/>.
- Pongpiachan, S., Tipmanee, D., Khumsup, C., Kittikoon, I., & Hirunyatrakul, P. (2015). "Assessing Risks to Adults and Preschool Children Posed by PM2.5-Bound Polycyclic Aromatic Hydrocarbons (PAHs) during a Biomass Burning Episode in Northern Thailand." *Science of The Total Environment*, Volume 508 (March 1, 2015): 435–44. <https://doi.org/10.1016/j.scitotenv.2014.12.019>.
- Porterfield S. P. (1994). "Vulnerability of the developing brain to thyroid abnormalities: environmental insults to the thyroid system." *Environmental Health Perspectives*, 102 Suppl 2(Suppl 2), 125–130. <https://doi.org/10.1289/ehp.94102125>
- Quante, M., Wang, R., Weng, J., Kaplan, E., Rueschman, M., Taveras, E., Rifas-Shiman, S., Gillman, M., and Redline, S. (2017). "Seasonal and Weather Variation of Sleep and Physical Activity in 12-14-Year Old Children." *Behavioral Sleep Medicine* 17 (September). <https://doi.org/10.1080/15402002.2017.1376206>.
- Rattanakhomfu, S. (2021). "Meeting new job demands in the post-Covid economy." Retrieved from <https://tdri.or.th/en/2021/12/meeting-new-job-demands-in-the-post-covid-economy/>
- Ray, P. (2009). "The participation of children living in the poorest and most difficult situations." In *A Handbook of Children and Young People's Participation* (pp. 85-94). London: Routledge.



- Reisinger, A., Garschagen, M., Mach, K.J., Pathak, M., Poloczanska, E., van Aalst, M., Ruane, A.C., Howden, M., Hurlbert, M., Mintenbeck, K., Pedace, R., Rojas Corradi, M., Viner, D., Vera, C., Kreibiehl, S., O'Neill, B., Pörtner, H.-O., Sillmann, J., Jones, R., and Ranasinghe, R. (2020). The Concept of Risk in the IPCC Sixth Assessment Report: A Summary of Cross-Working Group Discussions: Guidance for IPCC Authors. Intergovernmental Panel on Climate Change.
- Rigby, P. (2011). "Separated and Trafficked Children: The Challenges for Child Protection Professionals." *Child Abuse Review*, 20(5), 324-340. <https://doi.org/10.1002/car.1193>
- Ruchirawat, M., Settachan, D., Navasumrit, P., Tuntawiroon, J., & Autrup, H. (2007). "Assessment of Potential Cancer Risk in Children Exposed to Urban Air Pollution in Bangkok, Thailand." *Toxicology Letters*, Volume 168, Issue 3, 200-209. <https://doi.org/10.1016/j.toxlet.2006.09.013>.
- Sanders, N. J. (2012). "What Doesn't Kill You Makes You Weaker: Prenatal Pollution Exposure and Educational Outcomes." *The Journal of Human Resources*, 47(3), 826–850. doi: 10.3368/jhr.47.3.826
- Sanson, A. V., Wachs, T. D., Koller, S. H., and Salmela-Aro, K. (2018). "Young People and Climate Change: The Role of Developmental Science." In *Developmental Science and Sustainable Development Goals for Children and Youth*, edited by Suman Verma and Anne C. Petersen, 115–37. Social Indicators Research Series. Cham: Springer International Publishing. [https://doi.org/10.1007/978-3-319-96592-5\\_6](https://doi.org/10.1007/978-3-319-96592-5_6).
- Save the Children. (2016). *Education Disrupted: Disaster Impacts on Education in the Asia Pacific Region in 2015*. Retrieved from <https://reliefweb.int/report/world/education-disrupted-disaster-impacts-education-asia-pacific-region-2015>
- Save the Children. (2022). "The Desperation of Drought: Facts, Causes and How to Help." Retrieved from <https://www.savethechildren.org/us/charity-stories/drought>
- Seal, A., and Chakrapani V. (2011). "Climate Change and Child Health." *Archives of Disease in Childhood* 96, no. 12 (December 1, 2011): 1162–66. <https://doi.org/10.1136/adc.2010.186213>.
- Senarath, S.K. (2021). "Well-being of Students Affected by Disaster: A Case Study of 2004 Tsunami in Sri Lanka." *International Journal of Disaster Management*, ISSN: 2527-4341, Vol. 3, No. 2, 2020, p.58-71. Retrieved from <http://jurnal.unsyiah.ac.id/IJDM/article/view/18638>
- Sheffield, P. E., and Landrigan, P. J. (2011). "Global Climate Change and Children's Health: Threats and Strategies for Prevention." *Environmental Health Perspectives* 119, no. 3 (March 1, 2011): 291–98. <https://doi.org/10.1289/ehp.1002233>.
- Shuman, E. (2010). "Global Climate Change and Infectious Diseases." *New England Journal of Medicine* 2010, 362, pp. 1061–3. DOI: 10.1056/NEJMp0912931
- Sin-ampol, P. (2018). "Collaborating Micro-level Stakeholders to Child-centered Climate Change Adaptation: A Pathway to Climate Change Governance in Northern Thailand." Paper presented at the 13th International Conference of Thai Studies. Retrieved from [https://www.researchgate.net/publication/324599668\\_Collaborating\\_Micro-level\\_Stakeholders\\_to\\_Child-centered\\_Climate\\_Change\\_Adaptation\\_A\\_Pathway\\_to\\_Climate\\_Change\\_Governance\\_in\\_Northern\\_Thailand](https://www.researchgate.net/publication/324599668_Collaborating_Micro-level_Stakeholders_to_Child-centered_Climate_Change_Adaptation_A_Pathway_to_Climate_Change_Governance_in_Northern_Thailand)
- Sneeringer, S. (2009). "Does Animal Feeding Operation Pollution Hurt Public Health? A National Longitudinal Study of Health Externalities Identified by Geographic Shifts in Livestock Production." *American Journal of Agricultural Economics*, 91(1), 124–137. <http://www.jstor.org/stable/20492413>

## References

- Sricharoen, T. (2011). "A Quantitative Assessment on Vulnerability to Poverty and Risk Management of Rural Farm Household in Northeastern of Thailand." *International Journal of Trade, Economics and Finance* Vol. 2 (August): 331–40. <https://doi.org/10.7763/IJTEF.2011.V2.127>.
- St Clair, D., Xu, M., Wang, P. Yu, Y., Fang, Y., Zhang, F., Zheng, X., Gu, N., Feng, G., Sham, P., & He, L. (2005). "Rates of Adult Schizophrenia Following Prenatal Exposure to the Chinese Famine of 1959-1961." *JAMA* 294, no. 5 (August 3, 2005): 557–62. <https://doi.org/10.1001/jama.294.5.557>.
- Stoklosa, H., Burns, C. J., Karan, A., Lyman, M., Morley, N., Tadee, R., & Goodwin, E. (2021). "Mitigating trafficking of migrants and children through disaster risk reduction: Insights from the Thailand flood." *International Journal of Disaster Risk Reduction*, 60, 102268. <https://doi.org/10.1016/j.ijdr.2021.102268>
- Swartz, M. K. (2019). "Taking on climate change through a health care lens." *Journal of Pediatric Health Care*, 33 (2019), p. 623.
- Sutummakid, N., & Kulkolkarn, K. (2018). *A Study on Just Transition: Preliminary Study on Impact of Climate Change on Labour in Thailand*. Bangkok: Friedrich-Ebert-Stiftung. (translated Thai Reference).
- Thai Health Promotion Foundation. (n.d. -a). Who We Are. Retrieved from [https://en.thaihealth.or.th/WHO\\_WE\\_ARE/THAIHEALTH\\_INTRO/](https://en.thaihealth.or.th/WHO_WE_ARE/THAIHEALTH_INTRO/).
- Thai Health Promotion Foundation. (n.d. -b). What We Do – Health Risk Control Plan. Retrieved from <https://en.thaihealth.or.th/THAIHEALTHPLANS/24/Health%20Risk%20Control%20Plan/?id=24>
- The Children and Youth Council of Thailand. (n.d.). "The Children and Youth Council of Thailand". Retrieved from <https://www.facebook.com/CYCT.Thailand>.
- Thienkrua, W., Cardozo, B. L., Chakkraband, M. L. S., Guadamuz, T. E., Pengjuntr, W., Tantipiwatanaskul, P., Sakornsatian, S., Ekassawin, S., Panyayong, B., Varangrat, A., Tappero, J. W., Schreiber, M., & van Griensven, F. (2006). "Symptoms of Posttraumatic Stress Disorder and Depression Among Children in Tsunami-Affected Areas in Southern Thailand." *JAMA*, 296(5), 549-559. <https://doi.org/10.1001/jama.296.5.549>
- Thompson, C. N., Zelter, J. L., Nhu, T. D. H., Phan, M. V. T., Hoang Le, P., Nguyen Thanh, H., Vu Thu, D., Minh Nguyen, N., Ha Manh, T., Minh, T. V. H., Lan, V. L., Nguyen Van Vinh, C., Tran Tinh, H., von Clemm, E., Storch, H., Thwaites, G., Grenfell, B. T., & Baker, S. (2015). "The impact of environmental and climatic variation on the spatiotemporal trends of hospitalized pediatric diarrhea in Ho Chi Minh City, Vietnam." *Health & Place*, 35, 147-154. <https://doi.org/10.1016/j.healthplace.2015.08.001>
- Trentacosta, C. J., Davis-Kean, P., Mitchell, C., Hyde, L., and Dana Dolinoy, D. (2016). "Environmental Contaminants and Child Development." *Child Development Perspectives* 10 (4): 228–33. <https://doi.org/10.1111/cdep.12191>.
- UNICEF (2016). "Clear the Air for Children." ISBN: 978-92-806-4854-6. United Nations Children's Fund (UNICEF). [https://www.unicef.org/media/49966/file/UNICEF\\_Clear\\_the\\_Air\\_for\\_Children\\_30\\_Oct\\_2016.pdf](https://www.unicef.org/media/49966/file/UNICEF_Clear_the_Air_for_Children_30_Oct_2016.pdf).
- United Nations Children's Fund. (2011). "Children's Vulnerability to Climate Change and Disaster Impacts in East Asia and the Pacific." Retrieved from <https://reliefweb.int/report/world/children's-vulnerability-climate-change-and-disaster-impacts-east-asia-and-pacific>
- United Nations Children's Fund. (2019a). "One month on from Cyclone Idai, 1.6 million children still reeling from its impact." Retrieved from <https://www.unicef.org/press-releases/one-month-cyclone-idai-16-million-children-still-reeling-its-impact-unicef>
- United Nations Children's Fund. (2019b). "It is getting hot: Call for education systems to the respond to the climate crisis." Retrieved from <https://www.unicef.org/eap/reports/it-getting-hot>

- United Nations Children's Fund. (2019). Are climate-change policies child-sensitive? A Guide for Action: Summary. New York: Office of Global Insight and Policy, United Nations Children's Fund.
- United Nations Climate Change. (2021a). National Communication Submissions from Non-Annex I Parties. Retrieved from <https://unfccc.int/non-annex-I-NCs>
- United Nations Climate Change. (2021b). National Reports from non-Annex I Parties. Retrieved from <https://unfccc.int/national-reports-from-non-annex-i-parties>
- United Nations Development Programme. (2021). The Peoples' Climate Vote. Retrieved from <https://www.undp.org/publications/peoples-climate-vote#modal-publication-download>.
- United Nations Office for Disaster Reduction and Plan International. (2012). Children's Action for Disaster Risk Reduction: Views from Children in Asia. Retrieved from <https://www.unccllearn.org/wp-content/uploads/library/unisdr41.pdf>
- U.S. Department of Homeland Security. (n.d). "Natural Disasters." Retrieved from <https://www.dhs.gov/natural-disasters>
- U.S. Global Change Research Program. The Impacts of Climate Change on Human Health in the United States: A Scientific Assessment. Retrieved from <https://health2016.globalchange.gov>
- van Vuuren, D.P., Edmonds, J., Kainuma, M., Riahi, K., Thomson, A., Hibbard, K., Hurtt, G.C., Kram, T., Krey, V., Lamarque, J.-F., Masui, T., Meinshausen, M., Nakicenovic, N., Smith, S.J. and Rose, S. K. (2011). "The representative concentration pathways: an overview." *Climatic Change*, 109, 5–31. <https://doi.org/10.1007/s10584-011-0148-z>.
- van Wendel de Joode, B., Mora, A. M., Lindh, C. H., Hernández-Bonilla, D., Córdoba, L., Wesseling, C., Hoppin, J. A., & Mergler, D. (2016). "Pesticide exposure and neurodevelopment in children aged 6-9 years from Talamanca, Costa Rica." *Cortex*, Volume 85, pp. 137–150. <https://doi.org/10.1016/j.cortex.2016.09.003>
- Vince Cruz, C. C. E., Espedido, F. A. V. C., & Abeledo, R. B. (2015). "Shaping minds to action: an evaluation of the environmental influences of primary school students in an urbanizing community." *Environment, Development and Sustainability*, 17(3), 641-652. <https://doi.org/10.1007/s10668-014-9551-8>
- Walker, S. P., Wachs, T. D., Meeks Gardner, J., Lozoff, B., Wasserman, G. A., Pollitt, E., Carter, J. A., & International Child Development Steering Group. (2007). "Child Development: Risk Factors for Adverse Outcomes in Developing Countries." *Lancet* 369, no. 9556 (January 13, 2007): 145–57. [https://doi.org/10.1016/S01406736\(07\)60076-2](https://doi.org/10.1016/S01406736(07)60076-2).
- Walker, M., Whittle, R., Medd, W., Burningham, K., Moran-Ellis, J., and Tapsell, S. (2010). Children and Young People 'after the Rain Has Gone' – Learning Lessons for Flood Recovery and Resilience: Hull Children's Flood Project Final Report. Lancaster: Lancaster University. Retrieved from <https://eprints.lancs.ac.uk/id/eprint/49462/>.
- Wang, C. L., Chuang, H. Y., Ho, C. K., Yang, C. Y., Tsai, J. L., Wu, T. S., & Wu, T. N. (2002). "Relationship between blood lead concentrations and learning achievement among primary school children in Taiwan." *Environmental Research*, 89(1), 12–18. <https://doi.org/10.1006/enrs.2002.4342>
- Wang, X., Miller, G., Ding, G., Lou, X., Cai, D., Chen, Meng, J., Tang, J., Chu, C., Mo, Z., & Han, J. (2012). "Health risk assessment of lead for children in tinfoil manufacturing and e-waste recycling areas of Zhejiang Province, China." *Science of the Total Environment*, 426, 106-112. doi: 10.1016/j.scitotenv.2012.04.002

## References

- Watts, N., Amann, M., Arnell, N., Ayeb-Karlsson, S., Belesova, K., Boykoff, M., et al. (2019). "The 2019 report of The Lancet Countdown on health and climate change: Ensuring that the health of a child born today is not defined by a changing climate." *Lancet*, Volume 394, Issue 10211, pp. 1836-1878.
- Watts, M. N., Amann, Arnell, N., S. Ayeb-Karlsson, K. Belesova, M. Boykoff, H. Montgomery
- Narksompong, J., & Limjirakan, S. (2015). "Youth Participation in Climate Change for Sustainable Engagement." *Review of European, Comparative & International Environmental Law*, 24(2), 171-181. <https://doi.org/10.1111/reel.12121>
- Whittle, R., Walker, M., Medd, W., and Mort, M. (2012). "Flood of Emotions: Emotional Work and Long-Term Disaster Recovery." *Emotion, Space and Society* 5 (1): 60–69. <https://doi.org/10.1016/j.emospa.2011.08.002>.
- Witvorapong, N., Muttarak, R., & Pothisiri, W. (2015). "Social Participation and Disaster Risk Reduction Behaviors in Tsunami Prone Areas." *PLOS One*, 10(7), e0130862. <https://doi.org/10.1371/journal.pone.0130862>
- World Bank. (2020). "World Development Indicators Database." Retrieved from [https:// data.worldbank.org/](https://data.worldbank.org/)
- World Health Organization. (2018). "How air pollution is destroying our health." Retrieved from <https://www.who.int/news-room/spotlight/how-air-pollution-is-destroying-our-health>
- World Health Organization. Regional Office for Europe & European Centre for Environment and Health. (2005). *Effects of air pollution on children's health and development: a review of the evidence*. Copenhagen: WHO Regional Office for Europe. Retrieved from <https://apps.who.int/iris/handle/10665/107652>
- Xu, Z., Sheffield, P. E., Hu, W., Su, H., Yu, W., Qi, X., & Tong, S. (2012). "Climate Change and Children's Health—A Call for Research on What Works to Protect Children." *International Journal of Environmental Research and Public Health* 9 (9): 3298–3316. <https://doi.org/10.3390/ijerph9093298>.
- Xu, Z., Etzel, R. A., Su, H., Huang, C., Guo, Y., and Tong, S. (2012). "Impact of Ambient Temperature on Children's Health: A Systematic Review." *Environmental Research* 117 (August): 120–31. <https://doi.org/10.1016/j.envres.2012.07.002>.
- Yoon, D. (2018). "The policy research of preliminary feasibility study for the government R&D innovation strategy." *International Journal of Engineering Business Management*, 2018, 10. <https://doi.org/10.1177/1847979018778696>
- Zaveri, E. D., Russ, J. D., Desbureaux, S. G., Damania, R., Rodella, A., & Ribeiro Paiva De Souza, G. (2020). "The Nitrogen Legacy: The Long-Term Effects of Water Pollution on Human Capital." *World Bank Policy Research Working Paper No. 9143*. Retrieved from <https://ssrn.com/abstract=3533562>
- Zeng, X., Xu, X., Boezen, H. M., & Huo, X. (2016a). "Children with health impairments by heavy metals in an e-waste recycling area." *Chemosphere*, 148: 408-415. doi: 10.1016/j.chemosphere.2015.10.078.
- Zeng, X., Xu, X., Zheng, X., Reponen, T., Chen, A., & Huo, X. (2016b). "Heavy metals in PM2.5 and in blood, and children's respiratory symptoms and asthma from an e-waste recycling area." *Environmental Pollution*, 210: 346-353. doi: 10.1016/j.envpol.2016.01.025

# Appendices

## Appendix 1: Focus group discussion

The first focus group discussion (FGD) was held online via Zoom Cloud Meeting on Friday 11 March 2022 between 09.00-12.00 hours under the topic “Formulating policy recommendations on climate change and pollution focusing on children and youth.” The following section contains detailed information about the FGD, including participants, the scope of the discussion, and recommendations and suggestions to the draft recommendations for child-sensitive climate and environmental actions from all stakeholders.

### 1. Participants

A total of 23 people attended the meeting, including 5 representatives of children and youth, 2 experts, 13 representatives from government agencies, and 3 representatives from non-governmental organizations involved in climate change, environmental, and children’s issues. The following is a detailed description of each participant group.

#### 1.1 Representatives of children and youth

This group consisted of two Child and Youth Council representatives, one youth residing in one of the three southern border provinces that promote environmental activities in the community, one climate change youth activist, and one outstanding academic student.

#### 1.2 Experts

Two experts participated in the FGD, one of whom has expertise in climate change and the environment and the other who is dedicated to educating children and youth about environmental issues.

### 1.3 Representatives from government agencies

The FGD was attended by representatives from the Office of Natural Resources and Environmental Policy, the Office of the National Economic and Social Development Board, the Department of Environmental Quality Promotion, the Thai Health Promotion Foundation, the Office of the Permanent Secretary, the Ministry of Education, the Department of Pollution Control, the Department of Disease Control, the Department of Health, and the Department of Child and Youth.

### 1.4 Representatives from non-governmental organizations

Two non-governmental organizations were represented by three delegates, one from an organization that works with children, and the other two from an organization that focuses on the environment.

## 2. Objectives of the focus group discussion

The objectives of the FGD were as follows:

1. To introduce the project “Impacts of Climate Change and Environmental Degradation on Children in Thailand”;
2. To introduce the situation of climate change and pollution, including the impact of climate change and pollution on children and youth;
3. To present draft policy recommendations on climate change and pollution focusing on children and youth;
4. To get opinions and suggestions from representatives of children and youth, representatives from government agencies, experts, and NGOs involved in the draft policy recommendations to lead to further improvements.

## 3. Recommendations and suggestions to the draft recommendations for child-sensitive climate and environmental actions from all stakeholders

The issues used to elicit feedback from focus group participants were divided into three categories: (1) responding to urgent issues caused by climate change and pollution that affect children and youth; (2) increasing participation of children and youth in the formulation of policies addressing climate change and pollution with a focus on children and youth; and (3) adaptation of stakeholders on climate change and pollution policies with a focus on children and youth. Details of the recommendations and suggestions are as follows.

### 3.1 Responsiveness to urgent issues caused by climate change and pollution that affect children and youth

Three issues were discussed regarding responsiveness to urgent issues caused by climate change and pollution that affect children and youth: (1) current flood and drought mitigation and prevention measures for children and youth; (2) additional measures to reduce risk and mitigate the effects of floods and droughts on children and youth; and (3) measures to reduce risk and prevent impacts of heat due to increasing temperature on children and youth. The following sections provide a detailed description of the discussion.

#### 3.1.1 Current flood and drought mitigation and prevention measures for children and youth

The discussion of current flood and drought mitigation and prevention measures for children and youth in Thailand yielded three major key points. First, participants felt that measures lack mitigation on children and youth, are discrete and unprioritized, and failed to recognize community environmental management. Flooding and drought have a significant impact on youth, causing schools to be closed for extended periods and disrupting teaching activities. It was suggested that the post-disaster relief provided to affected students as a mitigation measure may not be enough to cover the damages. The state, therefore, may increase the student's reimbursement and assistance on an individual basis.

Second, Thailand is prone to floods and droughts. Each ministry has its own set of policies and measures in place, but this issue is not always prioritized. The current measures are primarily intended to aid and respond to emergencies. Measures are not continuous and do not aim for long-term outcomes. Moreover, the issues will be picked up regularly, such as during an election, but will not be followed through.

Third, the government has not paid enough attention to community environmental management. Even though residents in communities are aware of what to do in the event of flood or drought, the government may not have provided the community with the necessary resources. As a result, the government should take this issue seriously and empower communities in areas to enact environmental management. Furthermore, the government should learn from communities around the world that have successfully managed flood and drought issues.

#### 3.1.2 Additional measures to reduce risk and mitigate the effects of floods and droughts on children and youth

Five major key points emerged from the participants' discussion of additional measures to reduce risk and mitigate the effects of floods and droughts on children and youth: (1) Using technology to tackle the problems; (2) intrusive law enforcement; (3) urban planning; (4) management of government agencies; and (5) importance of local authorities. A more detailed explanation follows.

First, advanced technology, such as satellites, which can help predict weather and be utilized to reduce the risk from climate change as well as assess the impact and how to deal with it. Second, Thailand already has numerous laws in force, although participants of the FGD believed that more aggressive law enforcement is required. Third, the issue of city planning is at the core of the problem, as alterations to city planning can result in significant processing delays and an indefinite impact from the problems. Fourth, floods and droughts have been linked to climate change. Thailand is a country that is more concerned with the issue of adaptation. Working on flood and drought issues is mostly unintegrated and passive work, and work related to flood-related public health is disjointed. For example, health promotion work is directly related to child health, whereas the environment management division looks at overall environmental issues, particularly in relation to temporary evacuation centres. As a result, the two areas of work on addressing the impact of floods on health require integration. For the drought situation in Thailand, the problem is that everything is done based on requesting cooperation, such as asking farmers not to plant secondary rice. However, they frequently refuse to cooperate. Cooperation could be requested in exchange for something in return, such as the payment of appropriate compensation. Fifth,

climate change necessitates the involvement of local residents or innovators in order to assist governments. Local administrators must consider both aspects, specifically adjusting their areas to reap the greatest benefits and solve immediate problems. Depending on the management's vision of the measures, some local authorities use sandbags to try to prevent flooding. Foresight, as well as knowledge, will be able to prevent flooding rather than just address immediate issues. Precautions must also be taken, however, such as adjusting the area and transforming the landscape. Drought management should also be the responsibility of local governments. The Ministry of Health should be in charge of the water supply system and adequate water reserves. More hospitals are realizing the importance of having adequate water reserves for hospital care.

### 3.1.3 Measures to reduce risk and prevent impacts of heat due to increasing temperature on children and youth

Four major key points emerged from the participants' discussion of measures to reduce risk and prevent impacts of heat due to increasing temperature on children and youth: (1) consumer awareness/supply side; (2) renewable energy; (3) green economy; and (4) education sector. A more detailed explanation follows below.

First, climate change is a global problem that affects everyone. It is not simply a matter for only the government or the private sector to solve. Everyone must start by reducing their energy consumption. Consumer protection mechanisms must be used. When there are two similar products, for example, products that emit less CO<sub>2</sub> should be promoted or purchased more for market pressures to indirectly push products that emit more CO<sub>2</sub> to the sidelines. A tax mechanism is one tool that can be used. Carbon-intensive products should be subject to higher taxes. Furthermore, reducing energy consumption or improving energy efficiency is also important.

Second, many countries have begun to use renewable energy, such as wind and solar power. This will contribute to the reduction of the greenhouse effect. Cooperation is also required between the public and private sectors to make this happen.

Third, the country should take steps to transition towards a green economy in which the public, corporations, and government all collaborate.

Fourth, the Ministry of Education must embed climate change issues in the learning activities of children in primary and secondary school so that they can learn about the risk of global warming. Concerns have been raised that children may become dehydrated during droughts and extreme heat. A public relations campaign promoting climate change awareness and potential solutions should be launched. Buildings and classrooms in educational institutions must be able to adapt to changing climates in order to keep the classroom at an appropriate temperature, such as installing air conditioners that use renewable energy such as solar energy, or in some places classrooms may be designed to be ventilated to reduce temperature.



### 3.2 Increasing participation of children and youth in the formulation of policies addressing climate change and pollution with a focus on children and youth

FGD participants understood the vital importance of engaging youth through public/private campaigns and through education. Some mentioned the participation of children and youth in policymaking, in which young people were invited to help design how the government would solve problems by proposing solutions to environmental issues, which were later made national policy. Participating in these activities helps raise awareness among children and youth about the impact of change. If other agencies follow the same path, it may lead to long-term sustainability. Second, other participants mentioned an Eco-School programme that seeks to ensure that schools have environmental policies in place for long-term behavior modification, as well as modifying the landscape to facilitate teaching and learning with children about conservation of natural resources and the environment, and also collaborating with communities.

### 3.3 Adaptation of stakeholders on climate change and pollution policies with a focus on children and youth

Four major key points emerged from the participants' discussion on the adaptation of stakeholders on climate change and pollution policies with a focus on children and youth. First, the most important thing to do is to understand the information, including what has been done and what is currently being worked on by various sectors in Thailand, whether government or private. There is still a general absence of public relations and information digestion to facilitate comprehension. Second, to build life skills for children, the participation of children and youth is a critical mechanism for advancing the Convention on the Rights of the Child. Teaching practical skills to children will allow them to learn through experience while also refining children's cognitive processes regarding climate change and environmental issues. Third, inclusive, inter-disciplinary, and holistic work approach should be considered. Allowing children and youth to be primary stakeholders should be extremely important for both government and private organizations. Previously, there may have only been the government, the private sector, and civil society making decisions, but in the future, this collaboration will necessarily require children's participation as well. Children, for example, could be involved in the planning of a hearing meeting to gain a thorough understanding of climate change prevention and mitigation. Fourth, communities should play a greater role. Homes, temples, and educational institutions serve as important places for children. These communities should play an important role in teaching the necessary adaptation and survival skills when confronted with catastrophic events caused by climate change, as well as in building community knowledge on environmental conservation.

# Appendix 2:

## The outcome of the feasibility evaluation

The outcomes of the feasibility evaluation presented below includes information gathered from the second FGD and findings from the feasibility evaluation questionnaire survey.

### 1. The Second FGD

The second FGD was held online via Zoom Cloud Meeting on Monday 4 April 2022 between 13.00-16.00 hours under the topic "Feasibility evaluation of policy recommendations on climate change and pollution focusing on children and youth." The following sub-section provides detailed information on the participants, the objectives of the FGD, and recommendations and suggestions to the draft recommendations for child-sensitive climate and environmental actions from all stakeholders.

#### 1.1 Participants

A total of 31 people attended the meeting, including 4 representatives of children and youth, 5 experts, and 22 representatives from government agencies involved in climate change, environmental, and children's issues. The following is a detailed description of each participant group.

##### 1.1.1 Representatives of children and youth

The FGD was attended by four representatives from children and youth groups.

##### 1.1.2 Representatives of government agencies

Twenty-two representatives from various government agencies involved in climate change, environment, education, health, cross-cutting issues, and organizations that work directly with children and youth attended the FGD. The government agencies represented included the Office of Natural Resources and Environmental Policy, the Office of the National Economic and Social Development Board, the Department of Environmental Quality Promotion, the Thai Health Promotion Foundation, the Office of the Permanent Secretary, the Office of the Basic Education Commission, the Ministry of Education, the Department of Pollution Control, the Department of Disease Control, the Department of Health, the Department of Mental Health, the Department of Child and Youth, the Department of National Parks, Wildlife and Plant Conservation, and Thailand Greenhouse Gas Management Organization.

##### 1.1.3 Expert group

Five experts participated in the FGD, two from academic organizations and three from non-academic organizations. All the experts are specialists in climate change and the environment or educating children and youth about environmental issues.

## 1.2 Objectives of the FGD

The objectives included four main points:

1. To introduce the project “Impacts of Climate Change and Environmental Degradation on Children in Thailand”
2. To present the revised policy recommendations on climate change and pollution focusing on children and youth
3. To evaluate the feasibility of policy recommendations on climate change and pollution focusing on children and youth
4. To get opinions and suggestions from representatives of children and youth, representatives from government agencies, and experts involved in the policy recommendations to lead to further improvements

## 1.3 Recommendations and suggestions to the revised recommendations for child-sensitive climate and environmental actions from all stakeholders

The feedback from focus group participants is divided into four categories: (1) promotion and integration of work related to children and youth; (2) forum for children and youth; (3) raising awareness of climate change and environmental situations; and (4) identifying the work responsibilities of the relevant agencies. The recommendations and suggestions for each issue were used to revise the policy recommendations for child-sensitive climate and environmental actions.

### 1.3.1 Promotion and integration of work related to children and youth

Cooperation between the Children and Youth Council, Local Government Administration, government agencies, private organizations, and civil society is a mechanism for driving and formulating climate change policies or measures in specific areas.

### 1.3.2 Forum for children and youth

It is critical to create a forum where children and youth can express their views on climate change policies and measures. The forum should include listening to opinions, setting common goals, and announcing policies and measures, with local government as the main driving mechanism.

### 1.3.3 Raising awareness of climate change and environmental situations

A campaign to raise awareness of climate change situations should be launched at all levels, including government agencies, local government administration, and educational institutions.

### 1.3.4 Identifying the work responsibilities of the relevant agencies

1. The Office of Natural Resources and Environmental Policy and Planning (ONEP) should be the primary responsible agency. ONEP has a leading role to play in developing climate change policies and measures that benefit children and youth.
2. Provincial driving mechanisms could be supported by the Provincial Office of Natural Resources and Environment, the Office of the Basic Education Commission (OBEC), and the Children and Youth Council. They should oversee related policies and measures to each province's operational plans, as well as develop indicators for implementing policies and measures to achieve results.
3. Local government administrations, as well as children and youth councils, should support local driving mechanisms by implementing policies and measures in the area.

## 2. Feasibility evaluation survey results

The feasibility evaluation survey was conducted with participants of the second focus group discussion on 4 April 2022. While the survey was distributed to all participants, participation in this survey was entirely voluntary.

The survey was divided into three sections, consisting of 14 questions. The first section of the survey asked for the general information of the respondents. The second section of the survey asked the participants to evaluate the proposed policy recommendations according to five key areas of focus. The third section asked for overall suggestions regarding the policy recommendations. The following section reports the overall feasibility evaluation results, as well as the analysis when a related variable such as the participant's representative group is considered.

### 2.1 General information of the respondents

Out of 31 participants who joined the second focus group discussion, 20 participants (accounting for 64.5 per cent) responded to the feasibility evaluation survey. The following sub-section provides the percentage distribution of the survey respondents' representative group, age, and sex.

#### 2.1.1 Representative group

Over half of the respondents were from government agencies, accounting for 55 per cent of all respondents to the feasibility evaluation survey. Experts accounted for 25 per cent of the total, while children and youth accounted for 20 per cent.

**Table A1 Percentage distribution and number of respondents by representative group**

Representative group	%	Number
Children and youth	20.0	4
Government agency	55.0	11
Experts from academic and non-academic	25.0	5
Total	100.0	20

### 2.1.2 Age

Almost half (45 per cent) of the respondents were aged between 40-54 years old, followed by those aged 40-54 years (35 per cent), and those aged between 15-24 years (20 per cent).

**Table A2 Percentage distribution and number of respondents by age group**

Age group	%	Number
15-24 years	20.0	4
25-39 years	35.0	7
40-54 years	45.0	9
Total	100.0	20

### 2.1.3 Gender

Men accounted for 55 per cent of the total, while women accounted for 40 per cent and those who reported other gender accounted for 5 per cent.

**Table A3 Percentage distribution and number of respondents by sex**

Gender group	%	Number
Men	55.0	11
Women	40.0	8
Other gender	5.0	1
Total	100.0	15

## 2.2 Key area focus of feasibility evaluation

This section of the feasibility evaluation survey results is divided into five key areas of focus: (1) Acceptability (2) Demand (3) Implementation (4) Practicality, and (5) Integration. Each focus area is divided into three sub-sections. The first two sub-sections present the outcomes of two main questions, while the third sub-section provides a summary of other suggestions in that area of focus.

### 2.2.1 Acceptability

#### 2.2.1.1 Addressing the effects of climate change and pollution on children and youth

Respondents were asked to rate policy recommendations based on how clearly they address the effects of climate change and pollution on children and youth. Each option was scaled (unclearly = 0, quite unclearly = 1, quite clearly = 2, clearly = 3). The average score was 2.40. The average score was highest among children and youth group, followed by experts (2.60), and government agencies (2.18).

**Table A4 Percentage distribution and average score (Scale 0-3) of respondents according to the acceptability of policy recommendations on addressing the effects of climate change and pollution on children and youth, classified by representative group**

Addressing the effects of climate change and pollution	Representative group			
	Children and youth	Government Agency	Experts from academic and non-academic	Overall
Unclearly	0.0	0.0	0.0	0.0
Quite unclearly	0.0	27.3	0.0	15.0
Quite clearly	25.0	27.3	40.0	30.0
Clearly	75.0	45.5	60.0	55.0
No opinion	0.0	0.0	0.0	0.0
Average score	2.75	2.18	2.60	2.40

### 2.2.1.2 Specific measures for children and youth to address the issues of climate change and pollution

Respondents were asked if they are accepted the policy recommendations based on how clearly they provide specific measures for children and youth to tackle climate change and pollution issues. Each option was scaled (unclearly = 0, quite unclearly = 1, quite clearly = 2, clearly = 3). The average score was 2.05.

**Table A5 Percentage distribution and average score (Scale 0-3) of respondents according to the acceptability of policy recommendations on including specific measures for children and youth to address the issues of climate change and pollution, classified by representative group**

Specific measures for children and youth	Representative group			
	Children and youth	Government Agency	Experts from academic and non-academic	Total
Unclearly	0.0	0.0	0.0	0.0
Quite unclearly	0.0	36.4	40.0	30.0
Quite clearly	50.0	27.3	40.0	35.0
Clearly	50.0	36.4	20.0	35.0
No opinion	0.0	0.0	0.0	0.0
Average score	2.50	2.00	1.80	2.05

### 2.2.1.3 Other suggestions on acceptability

Participants suggested that measures to address climate change impact should be chosen based on the context of different areas and their susceptibility to risk. Furthermore, a time limit should be established for policy recommendations, emphasizing urgent measures that must be implemented as soon as possible, and, as well as clearly specifying which agencies should be involved in order to achieve the implementation goals.

Lastly, participants recognized the critical importance of identifying measures that are specific to children and youth. This should take the form of raising awareness about climate issues for children and youth to gain a thorough understanding before inspiring children and youth to become involved. This will result in a long-term solution to the problem.

2.2.2 Demand

2.2.2.1 Demand for child-sensitive climate change and environmental policies from stakeholders

Respondents were asked to measure the level of their demand for child-sensitive climate change and environmental policies. Each level of demand was scaled (no demand = 0, low demand = 1, average demand = 2, high demand = 3). The average score was 2.85.

**Table A6 Percentage distribution and average score (Scale 0-3) of respondents according to the acceptability of policy recommendations on the demand for child-sensitive climate change and environmental policies from stakeholders, classified by representative group**

Demand from stakeholders	Representative group			
	Children and youth	Government Agency	Experts from academic and non-academic	Total
No demand	0.0	0.0	0.0	0.0
Low demand	0.0	9.1	0.0	5.0
Average demand	0.0	9.1	0.0	5.0
High demand	100.0	81.8	100.0	90.0
No opinion	0.0	0.0	0.0	0.0
Average score	3.00	2.73	3.00	2.85



### 2.2.2.2 Demand for child-sensitive climate change and environmental policies from society

Respondents were asked to rate the societal demand for child-sensitive climate change and environmental policies. Each level of demand was scaled (no demand = 0, low demand = 1, average demand = 2, high demand = 3). The average score was 2.53.

**Table A7 Percentage distribution and average score (Scale 0-3) of respondents according to the acceptability of policy recommendations on the demand for child-sensitive climate change and environmental policies from society, classified by representative group**

Demand from society	Representative group			
	Children and youth	Government Agency	Experts from academic and non-academic	Total
No demand	0.0	0.0	0.0	0.0
Low demand	0.0	9.1	0.0	5.0
Average demand	0.0	45.5	40.0	35.0
High demand	75.0	45.5	60.0	55.0
No opinion	25.0	0.0	0.0	5.0
Average score	3.00	2.36	2.60	2.53

### 2.2.2.3 Other suggestions on demand

Generally, it was suggested that the public is still unaware of the problem of climate change, making policy solutions unsustainable. As a result, knowledge and integrated cooperation from all sectors and people of all ages are required to drive policy toward sustainability.

## 2.2.3 Implementation

### 2.2.3.1 Policy implementation

Respondents were asked if the proposed policy recommendations can be implemented successfully. Each option was scaled (cannot be implemented successfully = 0, probably can be implemented successfully = 1, can be implemented successfully = 2). The average score was 1.32.

**Table A8 Percentage distribution and average score (Scale 0-2) of respondents according to the level of success of policy implementation, classified by representative group**

Policy Implementation	Representative group			
	Children and youth	Government Agency	Experts from academic and non-academic	Total
Cannot be implemented successfully	0.0	0.0	0.0	0.0
Probably can be implemented successfully	25.0	81.8	60.0	65.0
Can be implemented successfully	50.0	18.2	40.0	30.0
No opinion	25.0	0.0	0.0	5.0
Average score	1.67	1.18	1.40	1.32

### 2.2.3.2 Impact on children and youth

Respondents were asked to rate the impact on children and youth if the proposed policy recommendations are not implemented. Each option was scaled (no impact = 0, low impact = 1, moderate impact = 2, high impact=3). The average score was 2.30.

**Table A9 Percentage distribution and average score (Scale 0-3) of respondents according to the impact of climate change and pollution on children and youth, classified by representative group**

Impact on children and youth	Representative group			
	Children and youth	Government Agency	Experts from academic and non-academic	Total
No impact	0.0	9.1	0.0	5.0
Low impact	0.0	9.1	20.0	10.0
Moderate impact	25.0	45.5	20.0	35.0
High impact	75.0	36.4	60.0	50.0
No opinion	0.0	0.0	0.0	0.0
Average score	2.75	2.09	2.40	2.30

### 2.2.3.3 Other suggestions on implementation

Participants felt that climate change policy should be implemented as soon as possible, because Thailand has set international goals to reduce greenhouse gas emissions. As a result, multiple agencies will need to collaborate to implement the policy. Furthermore, the roles and responsibilities of each agency should be clearly stated. It is also possible to conduct a pilot project to assess the policy before it is implemented.

## 2.2.4 Practicality

### 2.2.4.1 Benefit on stakeholders

Respondents were asked to rate the benefit of policy recommendations on stakeholders. Each option was scaled (no benefit = 0, likely to benefit = 1, benefit = 2). The average score is 1.89.

**Table A10 Percentage distribution and average score (Scale 0-2) of respondents according to the benefits of policy recommendations on stakeholders, classified by representative group**

Benefit on stakeholders	Representative group			
	Children and youth	Government Agency	Experts from academic and non-academic	Total
No benefit	0.0	0.0	0.0	0.0
Likely to benefit	0.0	9.1	20.0	10.0
Benefit	100.0	81.8	80.0	85.0
No opinion	0.0	9.1	0.0	5.0
Average score	2.00	1.90	1.80	1.89

### 2.2.4.2 Government support

Respondents were asked their perception on government support on implementing policy recommendations. Each option was scaled (no support = 0, likely to support = 1, support = 2). The average score was 1.39.

**Table A11 Percentage distribution and average score (Scale 0-2) of respondents according to perception of government support, classified by representative group**

Government support	Representative group			
	Children and youth	Government Agency	Experts from academic and non-academic	Total
No support	0.0	0.0	0.0	0.0
Likely to support	50.0	45.5	80.0	55.0
Support	50.0	45.5	0.0	35.0
No opinion	0.0	9.1	20.0	10.0
Average scale	1.50	1.50	1.00	1.39

### 2.2.4.3 Other suggestions on practicality

Findings suggest that government support is critical in making the policy feasible to implement.

## 2.2.5 Integration

### 2.2.5.1 Application to existing measures

Respondents were asked to rate the application of the policy recommendations to existing measures. Each option was scaled (cannot be applied = 0, probably can be applied = 1, can be applied = 2). The average score was 1.30.

**Table A12 Percentage distribution and average score (Scale 0-2) of respondents according to the application of policy recommendations to existing measures, classified by representative group**

Application to existing measures	Representative group			
	Children and youth	Government Agency	Experts from academic and non-academic	Total
Cannot be applied	0.0	0.0	0.0	0.0
Probably can be applied	50.0	63.6	100.0	70.0
Can be applied	50.0	36.4	0.0	30.0
No opinion	0.0	0.0	0.0	0.0
Average score	1.50	1.36	1.00	1.30

### 2.2.5.2 Sustainability

Respondents were asked to rate the sustainability of the proposed policy recommendations. Each option was scaled (cannot operate sustainably = 0, probably can operate sustainably = 1, can operate sustainably = 2). The average score was 1.21.

**Table A13 Percentage distribution and average score (Scale 0-2) of respondents according to the sustainability of recommendations, classified by representative group**

Sustainability	Representative group			
	Children and youth	Government Agency	Experts from academic and non-academic	Total
Cannot operate sustainably	0.0	0.0	0.0	0.0
Probably can operate sustainably	75.0	72.7	80.0	75.0
Can operate sustainably	25.0	18.2	20.0	20.0
No opinion	0.0	9.1	0.0	5.0
Average score	1.25	1.20	1.20	1.21

### 2.2.5.3 Other suggestions on integration

To be able to adapt to existing measures and social disruption, policy recommendations must be clear and flexible. However, it is critical to go over the current work. Because implementing new policies can be difficult if the current policy is not well supported. Furthermore, genuine integration from all sectors, including executive-level agencies such as the Ministry of Interior and the Ministry of Education, is required for the policy to be sustainable. It should also include the surrounding communities, such as homes, temples, and schools, as a policy-making mechanism.

## 2.3 Other suggestions for overall policy recommendations regarding child-sensitive climate and environmental actions

Policy recommendations should provide comprehensive climate change content, including a review of related plans and policies as well as future climate forecasts. The responsible agency or agencies should be clearly identified.

Furthermore, measures involving children and youth should be segmented based on age range and socioeconomic background. Communication with children and youth, including knowledge and technical information, should be age appropriate and easy to understand.

Regarding public health, there are various preventive measures and medical treatments available for climate change-related health problems. It is important to recognize that the health impacts of climate change and environmental degradation in adults and children may differ. As some issues may not directly affect the child, specific measures for children may not be available in all cases. Because the impacts vary according to behavioural characteristics, age, and gender, recommendations and policies should be adapted accordingly.

# Appendix 3:

## Questionnaire on the feasibility of child-sensitive actions

Thailand Development Research Institute (TDRI) and United Nations Children’s Fund (UNICEF) invite you to evaluate the feasibility of policy recommendations for child-sensitive climate change and environmental actions under the research project “Impact of Climate Change and Environmental Degradation on Children in Thailand.” This evaluation consists of 3 parts and contains 14 questions. This survey does not collect any personally identifiable information. All data will be analyzed for academic purposes only.

### Section 1: General information of the respondent

1.1 Which group do you represent?

- Children and youth
- Government agency
- Private or civil society organization
- Academics or experts in climate change and environmental, children and youth, or public policy
- Other (please specify) .....

1.2 Please specify your age group

- Less than 15 years
- 15-24 years
- 25-39 years
- 40-54 years
- 55-64 years
- 65 years and older

1.3 Please specify your sex

- £ Men
- £ Women
- £ Other gender
- £ Prefer not to say

**Section 2: Feasibility evaluation of policy recommendations on climate change and pollution focusing on children and youth**

This feasibility evaluation includes five key areas.

1. Acceptability: How stakeholders who are targeted and involved in policy implementation react to the proposed draft actions.
2. Demand: Determining whether stakeholders and society want the intervention.
3. Implementation: The degree to which an action is likely to be carried out as planned and proposed.
4. Practicality: Investigating how an intervention can be delivered, considering the necessary resources, time, and commitment.
5. Integration: Determining whether a new initiative can be integrated into an existing policy or programme, organizational setting, or social environment.

2.1 Acceptability

2.1.1 Do policy recommendations clearly address the effects of climate change and pollution on children and youth?

(0)	(1)	(2)	(3)	
Unclearly	Quite unclearly	Quite clearly	Clearly	No opinion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other suggestions on 2.1.1 (if any)

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2.1.2 Do policy recommendations include specific measures for children and youth to address the issues of climate change and pollution?

(0)	(1)	(2)	(3)	
Unclearly	Quite unclearly	Quite clearly	Clearly	No opinion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other suggestions on 2.1.2 (if any)

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2.2 Demand

2.2.1 Do you have a demand for climate change and pollution policies, as well as measures that prioritize children and youth, as proposed?

(0)	(1)	(2)	(3)	
No demand	Low demand	Average demand	High demand	No opinion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other suggestions on 2.2.1 (if any)

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2.2.2 Do you think there is a societal demand for climate change and pollution policies, as well as measures that prioritize children and youth, as proposed?

(0)	(1)	(2)	(3)	
No demand	Low demand	Average demand	High demand	No opinion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other suggestions on 2.2.2 (if any)

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2.3 Implementation

2.3.1 Can the measures outlined in the policy recommendations be successfully implemented?

(0)	(1)	(2)	
Cannot be implemented successfully	Probably can be implemented successfully	Can be implemented successfully	No opinion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other suggestions on 2.3.1 (if any)

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2.3.2 Do you think that if climate change and pollution mitigation measures are not implemented immediately, the impact on children and youth will be worse?

(0)	(1)	(2)	(3)	
No impact	Low impact	Moderate impact	High impact	No opinion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other suggestions on 2.3.2 (if any)

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2.4 Practicality

2.4.1 Would stakeholders, who are the targeted audience, benefit from the implementation of the policy recommendations?

(0)	(1)	(2)	
No benefit	Likely to benefit	Benefit	No opinion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other suggestions on 2.4.1 (if any)

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2.4.2 Will the government support the implementation of the measures outlined in the policy recommendations?

(0)	(1)	(2)	
No support	Likely to support	Support	No opinion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other suggestions on 2.4.2 (if any)

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2.5 Integration

2.5.1 Can the measures identified in the policy recommendations be applied to existing measures?

(0)	(1)	(2)	
Cannot be applied	Probably can be applied	Can be applied	No opinion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other suggestions on 2.5.1 (if any)

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2.5.2 Can the measures identified in policy recommendations operate sustainably?

(0)	(1)	(2)	
Cannot operate sustainably	Probably can operate sustainably	Can operate sustainably	No opinion
<input type="radio"/>	<input type="radio"/>	<input type="radio"/>	<input type="radio"/>

Other suggestions on 2.5.2 (if any)

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**Section 3: Other suggestions**

Other suggestions on overall policy recommendations for child-sensitive climate and environmental actions

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# Appendix 4:

## Review of structures, authorities, and functions in the related government agency

### 1. The National Committee on Climate Change Policy (NCCC)

The Government has established the NCCC, chaired by the Prime Minister, as a key mechanism for the implementation of climate change objectives. The NCCC is responsible for (1) national climate change policy and strategy; (2) determination of national positions in international negotiations under the UNFCC and any relevant international agreements; and (3) monitoring and evaluating implementation results of government agencies, as stated in the national policy and strategy.

#### 1.1 Structures

**1.1.1 Chairman:** The NCCC is chaired by the Prime Minister or Deputy Prime Minister (if assigned by the Prime Minister).

**1.1.2 Vice-Chairmen:** The two Vice-Chairmen of the NCCC are the Minister of National Resources and Environment and Minister of Foreign Affairs.

**1.1.3 NCCC members:** NCCC members include the Prime Minister's Office, Ministry of Finance, Ministry of Agriculture and Cooperative, Ministry of Transport, Ministry of Digital Economy and Society, Ministry of Energy, Ministry of Commerce, Ministry of Interior, Ministry of Science and Technology, Ministry of Education, Ministry of Public Health, Ministry of Industry, Bangkok Metropolitan Administration, Office of the National Economic and Social Development Board (NESDB), Bureau of Budget, and 5–9 experts from economics, environment, science, and other related to climate change background.

**1.1.4 NCCC subcommittees:** There are four subcommittees under the NCCC: the Subcommittee on Climate Change Policy and Planning Integration, the Subcommittee on Climate Change Knowledge and Database, the Subcommittee on Climate Change Negotiation and International Cooperation, and the Subcommittee on Action for Climate Change Empowerment and Public Relations.

#### 1.2 Authorities and functions

The NCCC has the following authorities and functions:

1. Formulate policies and strategies for the prevention and resolution of climate change problems in Thailand including emissions of greenhouse gases as well as research and development on climate change
2. Establish policies, guidelines, criteria, and mechanisms for international cooperation on climate change management in accordance with the economic, social, and interests of the country including relevant international agreements

3. Suggest amendments or changes to laws that are necessary or beneficial to various operations that Thailand is bound by and to perform the obligations set out in the Convention and Protocol according to its principles and objectives
4. Establish guidelines and negotiating positions for conventions and protocols, considering socio-economic conditions and national interests, as well as relevant international agreements
5. Supervise the operation of government agencies in accordance with the policies, strategies, guidelines, rules, and operating mechanisms outlined in this regulation
6. Consider and support appropriate budget allocations for government agencies to take climate change action
7. Implement measures to improve cooperation and coordination on climate change operations between government agencies and the private sector
8. Consider and make recommendations to the Cabinet for members of the Greenhouse Gas Management Organization Committee
9. To form a sub-committee or working group to carry out the regulations or as assigned by the committee
10. To carry out any other actions necessary to comply with regulations or other laws, or as directed by the Cabinet or the Prime Minister

## 2. Office of National Resources and Environmental Policy and Planning (ONEP)

ONEP is an agency under the Ministry of Natural Resources and Environment. ONEP's mission is to develop policies and plans to promote and maintain environmental quality by proposing policies and plans for the conservation and management of natural resources and the environment, including supporting management for concrete implementation, as well as monitor measures and impact assessment, to strengthen the country's economy and support sustainable development and high quality of life.

### 2.1 Structures

#### 2.1.1 Secretary-General of ONEP

There are two groups working directly under the Secretary-General of ONEP as follows.

1. Position under the Secretary-General: The position working directly under the Secretary-General includes the Secretaries-General and a group of experts in the environmental specialization.
2. Division under the Secretary-General: There are four divisions under the Secretary-General: Legal Division, Internal Audit Division, Public Sector Development Division, and Ethics Division.

## 2.1.2 Division

There are 10 divisions under ONEP:

1. Strategy and Planning Division
2. Environmental Fund Division
3. Cultural and Natural Environment Management Bureau
4. Urban Environment and Area Planning Division
5. Biodiversity Management Division
6. Environmental Impact Assessment Division
7. Environmental Impact Assessment Development Division
8. Climate Change and Coordination Division
9. Environmental Monitoring and Evaluation Division
10. Office of the Secretary

## 2.2 Authorities and functions

ONEP has the following authorities and functions:

1. Develop policies and plans for natural resource conservation and environmental management
2. Coordinate and develop natural resource and environmental management plans, as well as other actions in accordance with the law on the promotion and preservation of national environmental quality
3. Study, analyze, coordinate, and carry out the announcement of the area and measures to protect natural resources and the environment
4. Follow up, inspect, and evaluate performance in accordance with policies, plans, and measures, and prepare an environmental quality report
5. Conduct assessments of the environmental impact of public or private projects or activities
6. Manage the environmental fund effectively to assist in the implementation of policy plans and measures, as well as a natural resource and environmental management
7. Collaborate with international and international organizations in the joint implementation of policies and plans for natural resource conservation and management
8. Propose suggestions for consideration in developing national policies and strategies to prevent and solve climate change problems
9. Make suggestions for policies and plans for conservation and sustainable use of biodiversity, as well as compliance with international biodiversity and wetlands agreements
10. To perform any other acts specified by law as the authorities and functions of ONEP, or as assigned by the Minister or the Cabinet

## 3. Ministry of Social Development and Human Security (MSDHS)

The MSDHS is a Thai government body responsible for the oversight of Social Development and Human Security, established in 2002 in accordance with the Reorganization of Ministry, Sub-Ministry, and. Department Act, B.E. 2002.

### 3.1 Structures

The MSDHS has the following affiliated government agencies:

1. Office of the Minister
2. Office of the Permanent Secretary
3. Department of Children and Youth
4. Department of Older Persons
5. Department of Women's Affairs and Family Development
6. Department of Social Development and Welfare
7. Department of Empowerment of Persons with Disabilities

### 3.2 Authorities and functions

MSDHS has powers and duties relating to social development; creation of social fairness and equality; promotion and development of quality of life, human security, family institution, and communities; as well as other civil service prescribed by law to be the powers and duties of the MSDHS or its affiliated government agencies.

## 4. Department of Children and Youth (DCY)

The DCY is responsible for determining policies and undertaking duties with a focus on the capability enhancement and development for children and youth, right protection for children and youth, and welfare promotion for children, youth, and families. In this regard, policies, measures, and mechanisms have been developed to support the public and private sectors; and results from policy implementation have been followed up and evaluated to ensure the well-being and life security of children and youth.

### 4.1 Structures

The DCY has an Internal Audit Group responsible for auditing and supporting the department's operations, and has a Public Sector Development Group to perform the primary role of developing the Department's management to achieve efficient and worthwhile results, by taking responsibility directly to the Director-General.

The DCY is divided into five departments as follows:

1. Office of the Secretary
2. Strategy and Plan Division
3. Development Promotion and Welfare for Child, Youth, and Family Division
4. Child and Youth Protection Division
5. Child Adoption Center

### 4.2 Authorities and functions

1. Recommend policies, and guidelines, strengthen measures and mechanisms for promoting and developing capacity, protecting the rights of children and youth, and promoting the welfare of children and families.
2. Set standards for promotion and development of capacity, protection of child and youth rights, and the promotion of child and family welfare in line with global social change trends, obligations, agreements, and international cooperation; and to monitor and evaluate performance in accordance with standards
3. Enhance the understanding of the promotion and development of capacity, protection of the rights of children and youth, and the promotion of child and family welfare.
4. Promote and support the organization of activities to promote and develop the protection of children and youth rights, promotion of child and family welfare, and the social role of children and youth.
5. Manage and develop information technology systems as well as to serve as an information centre for children and youth, including socially vulnerable and social problem groups, groups in need of support, welfare assistance, protection, development and rehabilitation, and adoption of children.
6. Provide social welfare services, social work, counselling, assistance, and problem-solving for children and youth in socially vulnerable groups, as well as coordinating referrals to related agencies.
7. Develop models and methods of social welfare services, and social work for children, youth, and families, in accordance with specified standards.



8. Provide shelters for children and families, nurseries, welfare centres, welfare protection centres, and development and rehabilitation centres, and social services to children and families experiencing problems.
9. Provide assistance for the protection and adoption of children.
10. Monitor and evaluate the performance of children and youth empowerment and development, protection of children and youth rights, and the promotion of child and family welfare.
11. Coordinate, promote, and support technical, information, technology, consulting, and assistance, as well as monitor and evaluate the implementation of relevant networks for the promotion and development of capacity, protection of the rights of children and youth under the law, and the promotion of the welfare of children and families.
12. Perform any other tasks as required by law to be the duty of the Department or as assigned by the Minister or the Cabinet.

## 5. Provincial Social Development and Human Security Office (PSDHS)

The PSDHS Office is an agency of the provincial government under the Office of Permanent Secretary, MSDHS, according to the Ministerial Regulation on Government Office Division, the Office of the Permanent Secretary, Ministry of Social Development and Human Security, B.E. 2545 (No. 2). The primary goal of the PSDHS is to promote social development, fairness, and equality in society, as well as the development of quality and stability in institutional, family, and community life, and other civil services as prescribed by law to be the authorities and functions of the MSDHS.

### 5.1 Structures

The work divisions of the PSDHS can be divided into four major groups, which are as follows:

**5.1.1 General Administration Division:** This division executes job-related tasks such as general administration, administrative work, documentary work, officer work, budget work, finance and accounting work, supplies, equipment, vehicles, and buildings.

**5.1.2 Policy and Academic Division:** The responsibilities of this division include analyzing and reporting on social and economic situations, establishing policies at the provincial level and proposing solutions, disseminating progress and performance results to the Ministry, and driving agency/provincial level strategies for social development and human security work on MSDHS indicators.

**5.1.3 Social Development and Welfare Division:** This division's role is to promote and coordinate operations with public and private network organizations in the province, promote and support a strong surveillance system to accommodate all types of violence at the provincial and area levels, and provide social assistance through various fund works for underprivileged populations.

**5.1.4 Provincial Disability Service Center:** This division works on the authorities and functions associated with providing social welfare under the law including tasks under the Act on the Promotion and Development of the Quality of Life of Persons with Disabilities B.E. 2550, as well as consulting on work, social, and family problems and receiving various complaints from people with disabilities, as well as collaborating with or supporting other related organizations

## 5.2 Authorities and functions

PSDHS has the following authorities and functions:

1. Prepare provincial policies and strategies for social development and human security, including social situation reporting, and make suggestions for improvements
2. Coordinate and plan activities on social development and human security at the provincial level to be in accordance with the policy of the Ministry
3. Promote, coordinate and organize various activities according to the missions and goals of the Ministry
4. Promote, support, and coordinate operations with provincial network organizations from both the public and private sectors
5. Promote and coordinate assistance for people experiencing social problems including referral to other relevant public and private sector agencies with duties and powers in social welfare provision
6. Supervise and support the operations of the PSDMS in the provinces and ministries, ensuring that they adhere to the Ministry's policies, as well as monitoring and evaluating performance
7. To serve as a provincial information centre on social development and human security
8. Publicize and campaign for activities related to social development and human security, including the Ministry's progress and performance
9. Receive complaints and solve social problems at the provincial level
10. Work with or support the operations of other related agencies, or as assigned by the Permanent Secretary

## 6. Ministry of Education (MOE)

The MOE is a Thai governmental agency responsible for the oversight of education in Thailand. The primary mission of the MOE is to improve educational quality and standards at all levels, increase access to education services, and develop an educational management system based on good governance principles.

### 6.1 Structures

The structure within the MOE includes four main parts:

#### 6.1.1 Board of Directors involved in the audit

1. Audit and Evaluation Committee of the Ministry of Education
2. Monitoring, Examination and Evaluation Committee of Education Management of the Ministry of Education

### 6.1.2 Related Organizations

1. Public Organizations
2. Regulatory Organizations

### 6.1.3 Office of the Minister

### 6.1.4 Regulatory Agency

1. Office of the Permanent Secretary
2. Office of the Education Council
3. Office of the Basic Education Commission
4. Office of the Vocational Education Commission

## 6.2 Authorities and functions

1. Consider and propose a national education plan that integrates religion, arts, culture, and sports into all levels of education
2. Consider and propose policies, plans, and educational standards for bringing the plan into action
3. Consider proposing policies and plans to support educational resources
4. Provide opinions or advice on educational laws and ministerial regulations
5. Consider and propose basic education policies, development plans, standards, and establish a core curriculum in accordance with the National Economic and Social Development Plan and the National Education Plan
6. Conduct monitoring and evaluation of basic education management resources
7. Propose a policy, standard development plan, and vocational courses at all levels in accordance with the National Economic and Social Development Plan
8. Identify the criteria and methods for assessing readiness in the educational management of LGOs
9. Coordinate LGOs to provide education in accordance with educational policies and standards
10. Allocate budgets to local administrative organizations to support education management

## 7. Office of the Basic Education Commission (OBEC)

OBEC was established in B.E. 2546 as a result of the MOE public administration restructuring in accordance with the National Education Act B.E. 2542 and its amendments (No.2) and the Administrative Regulations Act of the Ministry of Education B.E. 2546. The mission of OBEC is to develop quality learners for a sustainable future society, as well as to organize education to strengthen human security, develop safe educational institutions, create opportunities, and reduce inequality for students. Furthermore, OBEC intends to include training for administrators, teachers, and educational personnel, as well as the use of digital technology to manage education.

### 7.1 Structures

#### 7.1.1 Groups

1. Internal Auditing Group
2. Public Sector Development Group

#### 7.1.2 Bureaus

1. General Administration Bureau
2. Finance Bureau
3. Monitoring and Evaluation Bureau
4. Educational Testing Bureau
5. Technology for Teaching and Learning Bureau
6. Policy and Planning Bureau
7. Special Education Bureau
8. Educational Innovation Development Bureau
9. Personnel Administration Development and Legal Affairs Bureau
10. Academic Affairs and Educational Standards Bureau

## 7.2 Authorities and functions

1. Establish a policy proposal for educational development, educational management standards, and core courses in basic education
2. To support basic education management, establish rules and guidelines, and act on resource assistance, as well as resource allocation and budget administration
3. Create a system for management and promotion, information network coordination, information technology use in teaching and learning, and supervision promotion
4. Follow up on, investigate, and evaluate the outcomes of basic education management in the educational field
5. Develop educational innovations, as well as coordinate, promote, support, and supervise basic education management, education for the disabled, the underprivileged, and people with special abilities; and to coordinate and promote basic education management in the private sector, local government organizations, individuals, families, community organizations, non-governmental organizations, religious institutions, and other social institutions
6. Perform secretarial duties for the OBEC
7. To carry out any other tasks prescribed by law as OBEC's powers, duties, and responsibilities, or as assigned by the Minister or Cabinet

## 8. Local Government Organizations (LGOs)

LGOs have specific powers and responsibilities under the provisions of the Kingdom of Thailand Constitution B.E. 2560 (2017), which states that LGOs have the duty and power to supervise and provide public services and public activities for the benefit of the people in accordance with the principles of sustainable development, as well as to promote and support education management for local people.

### 8.1 Structures

#### 8.1.1 Provincial Administrative Organizations (PAOs)

#### 8.1.2 Municipalities (MPs)

1. City Municipality
2. Town Municipality
3. Subdistrict Municipality

#### 8.1.3 Subdistrict Administration Offices (SAOs)

#### 8.1.4 Other local governments as prescribed by law

### 8.2 Authorities and functions

1. Prepare local development plans, as well as town planning
2. Arrange and maintain waterways and drainage channels
3. Establish and manage various commercial activities
4. Oversee public utilities and other community-benefiting construction
5. Promote education and employment
6. Promote tourism, sports, education, and public health
7. Conduct social work to improve the quality of life of children, women, the elderly, and underprivileged people
8. Ensure preservation of arts, customs, and local wisdom, as well as good local culture
9. Conduct poor urban rehabilitation and housing management
10. Promote democracy, equality, and people's rights and liberties
11. Maintain the cleanliness and orderliness of areas
12. Manage, maintain, and utilize forests, land, natural resources, and the environment
13. Conduct disaster preparedness and mitigation



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