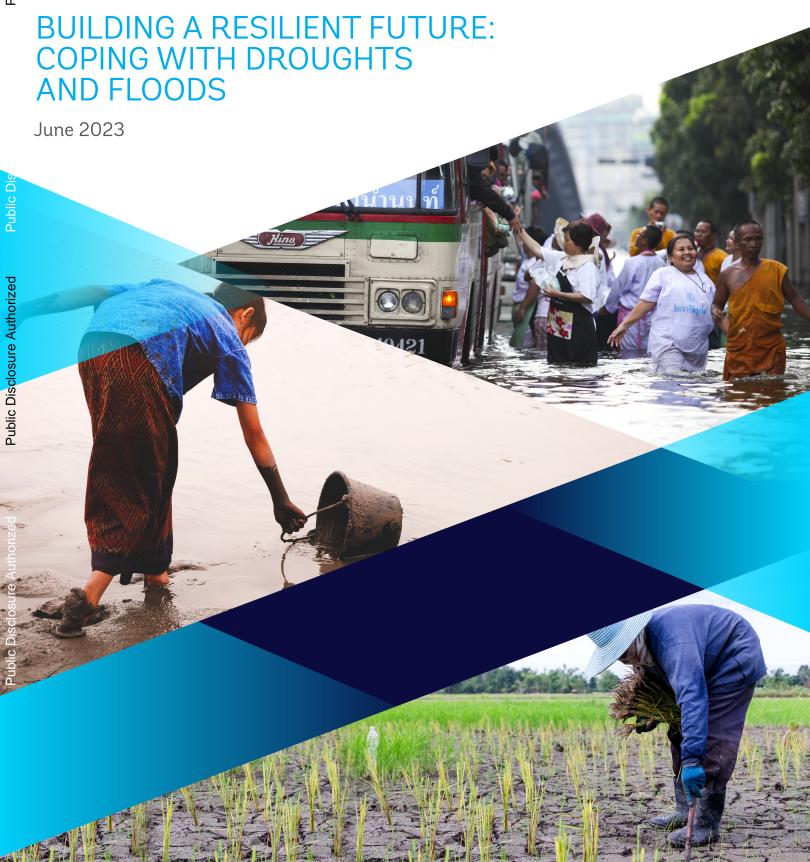


THAILAND ECONOMIC MONITOR



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Preface

The Thailand Economic Monitor (TEM) reports on key developments in Thailand's economy over the past six months, situates these changes in the context of global trends and Thailand's longer-term economic trajectory, and updates Thailand's economic and social welfare outlook. Each edition of the TEM also provides an in-depth examination of selected economic and policy issues and an analysis of Thailand's medium-term development challenges. The TEM is intended for a wide audience, including policymakers, business leaders, financial-market participants, and the community of analysts and professionals engaged in Thailand's evolving economy.

The TEM is produced by the staff of the World Bank's Bangkok office, consisting of Kiatipong Ariyapruchya, Georges Comair, Shelley Mcmillan, Hector Pollitt, (Task Team Leaders), Warunthorn Puthong, Thanapat Reungsri, Yus Medina Pakpahan, Tanida Arayavechkit, Carl Christian Dingel, Migle Petrauskaite, Pongsak Suttinon, Ou Nie, Biying Zhu, Ratchada Anantavrasilpa, Uzma Khalil, Kwanpadh Suddhi-Dhamakit, Sonskuln Thaomohr, Buntarika Sangarun and Parichart Atcharerk. Fabrizio Zarcone, Lars Christian Moller, Madhu Raghunath, Souleymane Coulibaly and Ronald Upenyu Mutasa provided overall guidance. The team is grateful to Wael Mansour, Ergys Islamaj, Fan Zhang and Eileen Burke. for their constructive peer review comments. Clarissa Crisostomo David, Kanitha Kongrukgreatiyos, and Piathida Poonprasit are responsible for external communications related to the TEM, as well as the production and design of this edition.

The findings, interpretations, and conclusions expressed in this report do not necessarily reflect the views of the Executive Directors of the World Bank or the governments they represent. The latest data that inform this report date from May 12, 2023, and include data from authorities as well as World Bank staff calculations. The boundaries, colors, denominations, and other information shown on any map in this work do not imply any judgment on the part of the World Bank concerning the legal status of any territory or the endorsement or acceptance of such boundaries.

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Previous editions of the TEM:

December 2022: Fiscal policy for a resilient and equitable future

• June 2022: Building back greener: the circular economy

December 2021: <u>Living with COVID in a digital world</u>

■ July 2021: The road to recovery

January 2021: Restoring incomes; recovering jobs
 July 2020: Thailand in the time of COVID-19

January 2020: <u>Productivity for prosperity</u>

■ July 2019: <u>Harnessing fintech for financial inclusion</u>

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ABBREVIATIONS

ASEAN Association of Southeast Asian Nations

BCA Business Collateral Act
BCG Bio-Circular-Green

BIM buildings information modelling
BMA Bangkok Metropolitan Administration

BOI Board of Investment Thailand

CE circular economy

CECI Circular Economy in Construction Industry

CGE Computable General Equilibrium

CP Charoen Pokphand

CPSD Country Private Sector Diagnostic

CPTPP Comprehensive and Progressive Agreement for Trans-Pacific Partnership

CEWT Circular Economy for Waste-Free Thailand
DAE Department of Agricultural Extension

DAEDE Department of Alternative Energy Development and Efficiency

DDPM Department of Disaster Prevention and Mitigation
DEPA Digital Economy Promotion Agency (Thailand)

DGR Department of Groundwater Resources
DLA Department of Local Administration

DOF Department of Fisheries
DOH Department of Highways
DORR Department of Rural Roads

DPIM Department of Primary Industries and Mines

DPW Department of Public Works and Town & Country Planning

DWR Department of Water Resources

EAP East Asia and Pacific

EAE Electrical appliance and electronics

EEC Eastern Economic Corridor

EEI Electrical and Electronics Institute

EESD Environmental Education for Sustainable Development Partnership

EGAT Electricity Generating Authority of Thailand

ENSO El Niño Southern Oscillation
EPR Extended Producer Responsibility

ERIA The Economic Research Institute for ASEAN and East Asia

ESCAP Economic and Social Commission for Asia

EV Electric vehicle

e-waste Electrical and Electronics waste
GCR Global Competitiveness Report

GDP gross domestic product

GHG greenhouse gas

GISDA Geo-Informatics and Space Technology Development Agency

GPP green public procurement
G2G Government to government
HII Hydro Informatics Institute
INFORM Index for Risk Management

IPCC Intergovernmental Panel on Climate Change

ITCZ Inter-Tropical Convergence Zone

IoT Internet of the Things
JJA June-July-August

KPI Key performance indicator

LDD Land Development Department

L3F Livelihood Fund for Family Farming

MD The Marine Department

MDES Ministry of Digital Economy and Society

MHESI Ministry of Higher Education, Science, Research, and Innovation

MONRE Ministry of Natural Resources and Environment

MOA Ministry of Agriculture and Cooperatives

MOC Ministry of Commerce
MOE Ministry of Education
MOF Ministry of Finance
MOI Ministry of Interior
MOL Ministry of Labor
MOT Ministry of Transport

MRAs Mutual Recognition Agreements

MSDHS Ministry of Social Development and Human Security

MSMEs Micro-, small- and medium-Size enterprises

MWA Metropolitan Waterworks Authority

NA National Assembly

NBTC Office of the National Broadcasting and Telecommunications Commission

NDCs nationally determined contributions

NESDB National Economic and Social Development Plan

NGO non-governmental organization

NSO National Statistical Office

NXPO The Office of National Higher Education Science Research and Innovation

Policy Council

NWRC National Water Resources Committee
ONWR Office of the National Water Resources

PCD Pollution Control Department PDNA Post Disaster Needs Assessment

PM Prime Minister

PWA Provincial Waterworks Authority

R&D research and development
RID Royal Irrigation Department

SCG Siam Cement Group

SDG Sustainable Development Goals

SEA Southeast Asia

SRI Science Research and Innovation

SRT State Railway of Thailand

TMD Thailand Meteorological Department
TSRI Thailand Science Research and Innovation

UN United Nations

UNDRR United Nations Office for Disaster Risk Reduction

UNESCO United Nations Educational, Scientific and Cultural Organisation

USD United States Dollar VAT Value added tax

WEEE Waste Electrical and Electronic Equipment

WMO World Meteorological Organisation

WRMP Water Resources Management Master Plan

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EXECUTIVE SUMMARY

Recent Developments

Economic growth rebounded in 2023 Q1 by 4.5 percent due to domestic demand and tourism but still trailed behind peers due to external challenges. Economic reopening and the authorities' measures to mitigate cost-of-living pressures supported the recovery. Tourism arrivals reached 70 percent of the prepandemic level in April, surpassing Indonesia and the Philippines following the reopening of China but remained below the global average. However, because of the economy's heavy reliance on tourism and trade, the recovery only surpassed pre-pandemic levels in 2023 Q1 (Figure ES 1) and lagged that of its ASEAN peers, most of which returned to pre-pandemic levels by late 2021. Thailand experienced a sharp contraction in goods exports growth in 2022 Q4, similar to ASEAN peers as global demand slowed (Figure ES 2).

The current account returned to surplus in line with the recovery of the tourism sector and falling oil prices. The current account surplus reached 3.0 percent of GDP in Q1 2023, its highest in more than two years, after turning positive in the previous quarter, supported by both goods and a trade surplus. The financial account in Q4 2022 was positive for the first time in three quarter as foreign direct investments continued to increase and portfolio accounts turned positive. The increased portfolio inflows were boosted by stronger confidence over Thailand's economic outlook post-China reopening. The Real Effective Exchange Rate (REER) appreciated by 4.1 percent in the last quarter of 2022 on the positive current account and improved investor confidence about Thailand's economic outlook but depreciated slightly in 2023 Q1 amid concerns over Fed tightening. International reserves remained ample at 47 percent of GDP, the highest among Emerging Asian economies, covering 10 months of imports.

Inflation has peaked and fallen back into the central bank's target range but underlying price pressures persist. Headline inflation slowed to 2.7 percent in April, having remained within the target range of 1-3 percent for the third consecutive month amid declines in core and raw food inflation (Figure ES 3). The government continued to impose caps on other energy prices, including electricity and cooking gas, which also helped contain inflation pressure. Core inflation declined, reaching 1.8 percent, but remained higher than its pre-pandemic average of 0.7 percent over 2016-2019. While market-based forward-looking measures of inflation expectations remain well-anchored at around 2.4 percent, continued monitoring of pass-through from producer prices to consumer prices will be necessary to determine whether core inflation will persist. The central bank has stayed the course on gradual monetary normalization to contain still-elevated core inflation while supporting the economic recovery.

Fiscal responses to high energy price have supported the recovery but slowed the path to consolidation, while a long political transition may slow public investment. The central government's deficit narrowed in first half of FY23 (Oct 2022- Mar 2023) to 6.7 percent of GDP from 9.6 percent the same period last year. A smaller deficit reflected the falling government expenditures to 22.8 percent of GDP, down from 25.8 percent last year as spending need for COVID relief waned. However extended cost-of-living support measures through social benefits, subsidies, and price controls have constrained fiscal consolidation and maintained fiscal deficit at above the 2019 pre-pandemic level. Despite recent economic recovery, revenue collection has remained relatively low at 15.8 percent in the same period. Public debt rose to 61.2 percent of GDP at the end of March 2023, 20 percentage points higher than the pre-pandemic period, and remained sustainable. Continued price controls applied to energy and public transport helped contain cost of living pressures, but such controls tend to be an inefficient method of redistributing income, are often regressive in their impact and may delay efficient reallocation of resources and distort the inflation process, thereby complicating monetary policy.

The financial system remains stable overall, although risks associated with high levels of household debt remain. Capital and liquidity buffers at commercial banks remain well above regulatory requirements, with profitability rising. Indicators of asset quality continued to improve. Gross non-performing loan (NPL) ratio declined to 2.8 percent as of 2022 Q4, comparable to regional peers and reflects the continued support of banks for their borrowers through debt restructuring and loan profile management. However, the continued relaxation of loan classification norms to support borrowers may mask further deterioration of balance sheets and lead to an increase in NPLs. Special mention loans stood at 6.1 percent of total loans, though lower than the peak of 7.7 percent during pandemic, remains significantly higher than the prepandemic levels of 2.8 percent in December 2019. High household debt—at 85.7 percent of GDP as of 2022 Q4—stands well above major ASEAN economies and is comparable to advanced economies. The composition of household debt in Thailand warrants particular attention due to the large share of uncollateralized lending.

Labor market conditions have improved due to the recovery of sectors related to tourism-trade and hospitality. Employment in trade and hospitality continued to trend up supported by a strong rebound in tourism. Manufacturing employment remained relatively stable, despite a decline in manufacturing exports for two consecutive quarters. The unemployment rate stood at 1.1 percent, down from 1.5 percent in the same quarter last year and almost returning to its pre-pandemic level at 1.0 percent in Q1 2020. The underemployment rate stood at 8.4 percent of the labor force in Q1 2023, falling to below the pre-pandemic level of 9.5 percent in Q1 2020. Poverty is expected to have declined in 2022, underpinned by the labor market recovery.

Outlook and Risks

The recovery momentum will strengthen in 2023 supported by tourism recovery before slowing due to global headwinds. Growth is projected to accelerate from 2.6 percent in 2022 to 3.9 percent in 2023 (Table ES 1), 0.3 percentage points higher than expected in April 2023 mainly due to tourism recovery and stronger-than-expected demand from China. However, goods exports is projected to contract due to weakening demand in major advanced economies. After rebounding in 2022 following domestic reopening, private consumption growth will slow but remain solid, supported by the ongoing recovery, with improved labor market and strong pent-up tourism demand from China. Public investment will remain weak due to the long transition towards a new government. Growth in 2024 and 2025 are expected to expand at 3.6 percent and 3.4 percent, respectively, with tourism and private consumption remaining the major drivers as external demand weakened. Long-term potential growth is estimated at 3.0 percent, slower than 3.6 percent estimated over 2010-2019.

The current account balance is expected to reverse from its deficit of the past two years and return to positive territory in 2023 at 2.5 percent of GDP due to both goods and services trade. Although the goods export outlook remains weak, the lower import bill amid easing global oil prices will contribute to a stronger trade surplus. The tourism sector recovery and the normalization of shipping costs will also support the current account surplus.

Headline inflation is projected to moderate to 2.0 percent in 2023, below most emerging markets amid easing global energy prices, price caps and below-potential growth. The deceleration in inflation from 6.1 percent in 2022 the previous year, reflects the lowered energy price inflation, which is projected to fall from 25 percent in 2022 to just 1.9 percent, as well as below-potential growth until 2025. Brent crude oil prices are forecasted to average USD 84 per barrel in 2023 amid weaker global demand. Continued caps on energy prices, including electricity and cooking gas, are expected to remain until Q3 2023 and will help contain inflation pressure in the rest of year. However, underlying price pressures persist as core inflation remains higher than its pre-pandemic average. Continued price controls applied to energy and public transport helped contain cost of living pressures, but such controls tend to be a costly method of redistributing income, are often regressive in their impact and may delay efficient reallocation of resources and distort the inflation process, thereby complicating monetary policy.

Public debt is projected to peak at slightly above 60 percent in the medium term. Over the medium term, public debt is projected to remain sustainable as the narrowing fiscal deficit and recovering output would contribute to a gradually declining debt to GDP ratio. Largely denominated in local currency, Thailand's debt is also resilient to foreign currency risk.

Despite recent resurgent growth, the output level is unlikely to return to the pre-pandemic path and is expected to remain below its potential level from 2023 to 2025. This path could be dampened further by the difficult external environment and possible re-escalation of energy prices. Delays in government formation may set back public investment. Structural challenges, such as an aging population, climate change, low capital investment accumulation, declining export competitiveness, and high household debt, may further limit potential growth (Figure ES 5). The EAP region, including Thailand, is exposed to climate risks, particularly floods and droughts, in part because of the high density of population and economic activity along the coasts (see part 2 on *Coping with Floods and Droughts*). Unlike many other emerging markets, Thailand still has the fiscal space to meet rising spending needs associated with aging and climate change if expenditure and revenue reforms are undertaken (Figure ES 6) (see WB *Thailand Public Revenue and Spending Assessment* 2023).

Coping with Floods and Droughts in Thailand

Thailand, like many ASEAN economies, is already acutely vulnerable to floods and droughts. In recent decades, Thailand has been subjected to frequent floods and droughts. Thailand currently ranks ninth globally in the INFORM index of risks from floods, below Vietnam, Myanmar and Cambodia. The 2011 floods caused 680 deaths, affected nearly 13 million people, and resulted in damages and losses to the economy worth an estimated THB 1.43 trillion (USD 46.5 billion), equivalent to 12.6 per cent of GDP. UNDRR (2020) estimates the average annual losses related to flooding at USD 2.6 billion. Bangkok and the export industries around it remain especially vulnerable to flooding, despite the introduction of flood control measures. Thailand also frequently suffers from droughts resulting from shortage of rainfall, reduced flow in surface and sub-surface rivers, and poor land management practices (Figure ES 4). The entire country was affected by severe droughts in 1979, 1994, and 1999; the north-eastern region, which has the highest poverty rates, is particularly vulnerable to drought.

Climate change will increase the frequency and intensity of floods in the coming decades. Changes in weather patterns resulting from climate change are increasing the impacts of floods. Although there remains considerable uncertainty in the modelling, current projections suggest that there will be an increase in the annual precipitation rates in Thailand. Moreover, the increases in rainfall are predicted to occur during the wet season, suggesting an increase in susceptibility to flooding. In 2017, rainfall anomalies exceeded those of 2011. Without climate adaptation measures, the potential impacts of another 1-in-50-year flood event similar to the one in 2011 could double.

Climate change will also increase the intensity and frequency of future droughts. The average from a combination of future climate projections suggests that average daily temperatures in Thailand could increase by 1.8°C by 2050. Although total precipitation is expected to increase, there will be more dry days outside the wet season, leading to an increase in the frequency and severity of future droughts. Thailand will be susceptible to El Niño-related droughts and the frequency of 'severe meteorological droughts' will increase substantially after 2050 in high emission scenarios. Higher average temperatures will exacerbate the effects, as will rising sea levels and saline incursion.

The public costs of floods and droughts are already substantial and will grow in the future. The Thai government lost an estimated 3.7 percent of tax revenues in 2011 and 2.6 percent of revenues in 2012 because of floods. The public sector faced THB 141 billion of losses to property and an estimated reconstruction bill of THB 388 billion (3.4 percent of GDP). In 2019, it was reported that the government provided THB 25

Executive Summary

billion (0.15 percent of GDP) to farmers to compensate directly for damage to crops from drought and flooding. Further measures to support affected farmers were also announced with a cost of THB 60 billion (0.36 percent of GDP). Future costs to the government in providing compensation (mainly to farmers) are expected to increase over time.

The macroeconomic costs of floods will grow; a 1-in-50 year flood (i.e. the 2011 floods) in 2030 would cost more than 10 percent of GDP in lost production. As climate change increases the severity and frequency of floods, the economic costs will also grow. If floods cover wider areas, more businesses will be forced to reduce production during the flood and recovery period. Businesses that are not directly affected by the floods may still be forced to reduce production because of supply-chain problems. Loss of income could also have further demand-side effects on the economy. Overall, the effects of a 1-in-50 year flood is likely to be a loss of 10 percent of production. If supply chains are unable to adapt, the impact could be a 15 percent loss of production. Businesses can therefore offset some of the effects of floods by maintaining supply-chain flexibility. However, impacts will remain substantial without centralized adaptation measures.

Progress has been made to better cope with floods and droughts but certain challenges remain. Since the establishment of the Office of the National Water Resources (ONWR), the coordination of the different entities involved in flood and drought management has substantially improved and ONWR has increasingly supported the planning of flood and drought mitigation measures. However, several other recommendations of the Post Disaster Needs Assessment of the 2011 floods still have not been addressed. The institutional and legal reform process started in 2017 with the enactment of the Water Resources Act (2018) is incomplete and the institutional landscape remains fragmented as each institution has protected its traditional mandate that it has spearheaded. Furthermore, the different ministries, departments and agencies often face funding and staffing challenges with resulting implications on fulfilling their mandate, provision of services as well as proper operation and maintenance of aging infrastructure.

Robust cost-benefit assessments are needed to identify and prioritize suitable flood and drought prevention measures. This is especially important for the provinces which are most vulnerable to the risk of such events, including the Greater Bangkok area which accounts for a significant part of the population and economy. Measures should include both infrastructure investments and softer ones, such as effective early warning and community-based adaptation systems.

An integrated comprehensive framework is needed for climate adaptation. The four key points highlighted in An EPIC Response: Innovative Governance for Flood and Drought Risk Management (Browder et al., 2020) include: i) an enabling environment, ii) prioritized risk mitigation planning, iii) investment in water resources infrastructure, and iv) controlling land and water use. The latest advancements to improve water use efficiency, promote a circular economy, and integrate nature-based solutions can also significantly contribute to enhancing resilience to floods and droughts.

Recent Developments and Medium-Term Outlook

exports.

Figure ES 1: Thailand's recovery picked up due to private consumption and tourism while...

(Percentage-point contribution to real GDP growth, year-on-year) 10.0 0.0 -10.0 -20.0 2019 2020 2021 2022 2023 Investment Change in inventories Net Exports of Goods Net Exports of Services gdp growth (y-o-y)

Source: NESDC.

(THB million)

Note: Change in inventories include statistical discrepancies.

(left: diffusion index; right: Percent year-on-year)

Figure ES 2:...weak global demand weighed on goods



Source: CEIC: World Bank staff calculations.

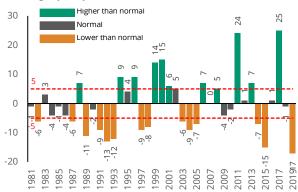
Figure ES 3: Headline inflation declined after peaking last August but core inflation remained elevated.

(Contribution to headline inflation, % change y-o-y) 8.0 Core inflation 6.0 Raw Food Energy 4.0 Headline inflation 2.0 0.0 -2.0 -4.0 Jan-22 Jan-20 Jan-21 lan-23

Source: CEIC; World Bank staff calculations.

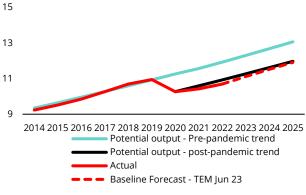
Figure ES 4: Rainfall anomalies in Thailand are rising (1981-2019).

(Percentage of rainfall anomalies in Thailand, mm.)



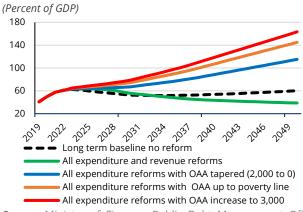
Source: HII, 2019: Thailand Water Situation 2019 (ThaiWater.net)

Figure ES 5: Weak global demand, aging and climate change weigh on the outlook.



Source: Haver Analytics; World Bank staff projections

Figure ES 6: Spending needs related to aging and climate adaptation can be met under fiscal reforms.



Source: Ministry of Finance, Public Debt Management Office; World Bank staff projections.

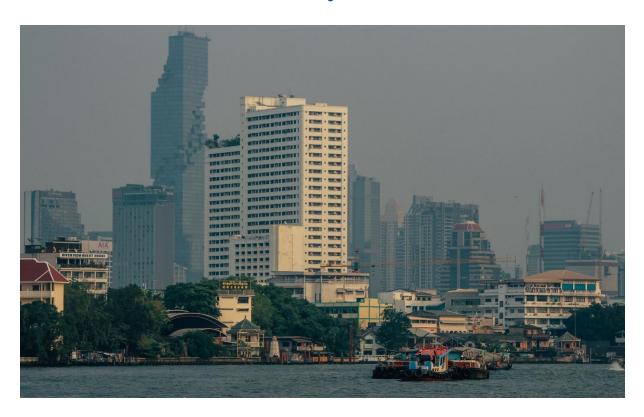
Executive Summary

Table ES 1: Macroeconomic Indicators

	2020	2021	2022	2023f	2024f	2025f
Real GDP Growth Rate (at constant market prices)	-6.1	1.5	2.6	3.9	3.6	3.4
Private Consumption	-0.8	0.6	6.3	3.8	3.4	3.0
Government Consumption	1.4	3.7	0.2	-2.6	1.1	2.5
Gross Fixed Capital Investment	-4.8	3.1	2.3	2.1	2.1	3.7
Exports of Goods and Services ¹	-19.7	11.1	6.8	7.3	6.4	4.3
Imports of Goods and Services	-13.9	17.8	4.1	1.5	4.2	4.0
Real GDP Growth Rate						
(at constant factor prices)						
Agriculture	-2.9	2.6	0.5	1.4	2.0	2.2
Industry	-5.1	6.0	-1.0	0.7	2.8	3.6
Services	-5.6	-0.5	4.9	6.4	4.6	3.7
Inflation (Consumer Price Index)	-0.8	1.2	6.1	2.0	1.9	1.3
Current Account Balance (% of GDP)	4.2	-2.1	-3.5	2.5	4.4	4.9
Fiscal Balance (General Government, % of GDP)	-4.7	-7.0	-4.5	-2.1	-1.9	-1.9
Debt (% of GDP)	50.2	57.8	59.7	59.0	58.5	58.7

Note: 1/ Exports of goods and services accounted for 69.4 percent of GDP in 2022. See more details in the outlook section. **Source:** NESDC; World Bank staff calculations.

Part 1. Recent Economic Developments and Outlook: Recovery amid Global Headwinds



1. Recent Economic Developments: Maintaining Recovery amid Global Headwinds

i. The Global Economy

The resilience that the global economy exhibited earlier this year is expected to fade. Global growth is set to slow substantially in 2023, to 2.1 percent, amid continued monetary tightening to rein in high inflation, before a tepid recovery in 2024, to 2.4 percent (Figure 1). Forecasts for most countries have been revised down, with upgrades due to stronger-than-expected data at the beginning of 2023 more than offset by downgrades thereafter. Inflation has been persistent but should decline as demand weakens and commodity prices moderate, provided longer-term inflation expectations remain anchored. Global economic activity could be weaker than anticipated in the event of more widespread banking sector stress, or if more persistent inflation pressures prompt tighter-than-expected monetary policy.

Global goods trade growth decelerated.

Global goods trade slowed in the first half 2023 in tandem with weaking global industrial production. Services trade, by contrast, continued to strengthen following the easing of pandemic-induced mobility restrictions. International tourist arrivals are expected to approach 95 percent of 2019 levels in 2023, an increase from 63 percent in 2022 (UNWTO 2023).

Growth in the East Asia and Pacific (EAP) region is projected to strengthen to 5.5 percent in 2023 from 3.5 percent in 2022, as a recovery in China offsets slowing activity in most other regional economies.

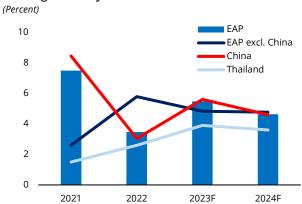
Projected growth in China this year has been revised upward following a fasterthan-expected reopening of the economy, which is bolstering near-term consumer spending, including on services and tourism in Thailand (Figure 2). Growth in the region excluding China is set to slow to 4.8 percent in 2023, down from 5.8 percent in 2022, as the boost from earlier reopening fades in several large economies. Regional trade growth will remain subdued amid weak global demand and domestic services-led growth in China. While external borrowing in EAP is generally lower than in other EMDE regions, overall debt levels have ratcheted up over the past decade, owing to increased borrowing by governments, households, and nonfinancial corporations and will weigh on the recovery. Downside risks to the outlook include tighter-than-expected global financial conditions; stubbornly high inflation; protracted weakness in China's property sector; geopolitical tensions; and climate-change-related extreme weather events.

reflecting a deceleration in advanced economies (Percentage points)

8 ■ Advanced Economies ■ EMDEs excl. China China 6 ◆ World (RHS) 2 2021

Source: World Bank Global Economic Prospect (June 2023)

Figure 1: Global activity is projected to slow in 2023 Figure 2: Growth is projected to diverge across the **EAP** region this year



Source: World Bank Global Economic Prospect (June 2023)

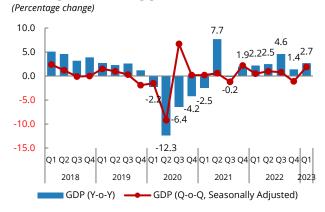
Growth and Real Sector Developments: Growth Rebounds but Global Headwinds ii.

Economic growth rebounded in 2023 Q1 due to domestic demand and tourism while goods export fell close to prepandemic levels.

GDP grew by 2.7 precent, beating expectations and rebounding from a disappointing 1.4 percent in the previous quarter (Figure 3). Domestic demand, particularly private consumption (5.4 percent), as well as the continuing tourism recovery proved to be the key drivers (Figure 4). Though private investment continued to expand with supports from the recovery of the Foreign Direct Investment (FDI), it slowed slightly as investment in equipment and exports weakened. Public consumption contracted due to the phasing out of COVIDrelated spending. Goods export continued to contract (-6.4 percent) in line with shrinking global demand. High frequency indicators show that private consumption and services continued to diverge from manufacturing, which has fallen close to pre-pandemic levels (Figure 5).

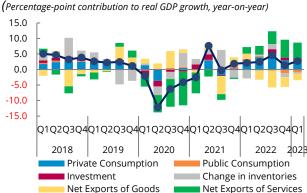
The Thai recovery continued to lag behind major ASEAN economies due to the Major ASEAN economies such as Indonesia, Malaysia and Philippines reached their pre-pandemic GDP levels around late 2021 to early 2022, approximately a year ahead of Thailand (Figure 6). The twin shocks of the pandemic and slowing global trade has particularly impacted Thailand due to the country's position as economy's exposure to tourism and goods trade. a trade and tourism hub. Thai goods exports account for 50 percent of GDP in 2019 while the tourism sector accounted for a large share of the economy at 13 percent. While global trade in services has recovered, Thailand's tourism arrivals has yet to do so, reaching only 70 percent of pre-pandemic levels in April.

Figure 3: Growth rebounded in Q1 2023 after faltering amid slowing global trade.



Source: NESDC

Figure 4: Goods exports contracted and continued to weigh on the recovery.



Source: NESDC

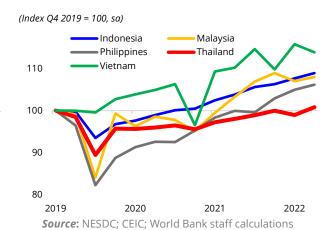
Figure 5: Manufacturing has fallen below pre-covid levels and diverged from private consumption and services.



Source: CEIC; World Bank staff calculations

Figure 6: Thailand has struggled to reach pre-COVID levels of output, lagging regional peers.

gdp growth (y-o-y)



Net foreign direct investment inflows recovered to an average 2.7 percent of GDP over 2021-2022, rebounding from the lowest among ASEAN peers but still remaining below Malaysia and Vietnam (Figure 7). Applications for investment promotion, especially in Electric Vehicles (EV) and Smart Electronics in the Eastern Economic Corridor (EEC) area, also signaled a further pick up in FDI, going forward (Figure 8). EV and parts producers from China and Taiwan, in particular benefited from investment promotion as well as tax and subsidy measures¹ to support EV usage.

direct investment supported private investment, including in the Eastern Economic Corridor.

Recovery of foreign

¹ In August 2022, the government offers a subsidy for EV producers ranging from THB 70,000 to 150,000 per unit on a

Figure 7: Thailand FDI improved but remained below Malaysia and Vietnam

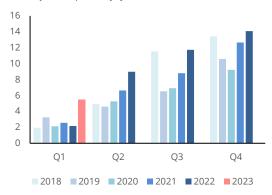
(Percent of GDP)



Source: CEIC; World Bank staff calculations

Figure 8: Applications for investment promotions in Q1 reached a six-year high

(Percent of GDP, quarterly, year-to-date)



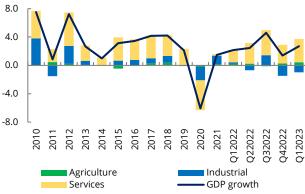
Source: Board of Investment; World Bank staff calculations

On the supply side, services and agriculture drove the recovery while manufacturing weakened.

A broad-based expansion in the services sector continued to be the key driver of growth amid resurgent tourism and employment while manufacturing faltered (Figure 9Figure 9). The manufacturing sector, particularly industries associated with exports, contracted for the second quarter, in line with weak global demand. Agriculture saw favorable weather and bountiful harvests, reaching prepandemic levels. However, agriculture and manufacturing are vulnerable to intensifying cycles of floods and droughts. Agriculture contracted due to droughts (2015, 2020) (Figure 10) while manufacturing supply chains, particularly hard disk drives, were disrupted due to flood (e.g. 2011).²

Figure 9: Services drove the recovery amid relaxation of mobility and travel restrictions.

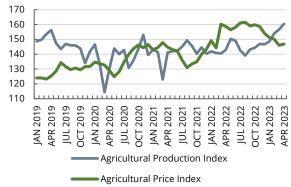
(Percentage-point contribution to real GDP growth, year-on-year)



Source: NESDC

Figure 10: Agricultural production has recovered to pre-pandemic levels.

(Base year 2005 = 100, seasonally adjusted)



Source: Office of Agricultural Economics, Ministry of Agriculture and Cooperatives

purchase of battery EV passenger cars and THB 18,000 per unit for electric motercycle purchase. The measure is expected to expire in September 2023. In addition, the annual EV car tax has been lowered by 80 percent.

² Winkler and Taglioni (2019). Making Global Value Chains Work for Development.

iii. The Current-Account Returned to Surplus and Reserves Remained Ample

The current account returned to a surplus in line with the recovery of the tourism sector and falling oil prices.

The Real Effective Exchange Rate has strengthened since Q4 2022, with supports from the current account and financial account surpluses.

The current account surplus reached 3.0 percent of GDP in Q1 2023, the highest surplus in more than two years, after turning positive in the previous quarter (Figure 11). The surplus reflected both goods and services trade surplus. The fall in the oil import bill contributed to goods trade surplus. Services trade surplus was supported by improved tourism revenue and a significant decline in shipping costs from the second half of 2022. The latter was boosted by the economic slowdown and the easing of port congestion post-pandemic³.

The financial account in Q4 2022 turned positive for the first time in three quarter as foreign direct investments continued to increase and portfolio accounts turned positive (Figure 12). The increased portfolio inflows were boosted by stronger confident over Thailand's economic outlook after the reopening of China. The Real Effective Exchange Rate (REER) appreciated by 4.1 percent in the last quarter of 2022 following the positive current account and improved investor confidence regarding Thailand's economic outlook (Figure 13). However, in Q1 2023, the REER depreciated slightly as Thailand's equity and bond markets recorded outflows due to expectations regarding stronger-than-expected Fed's tightening and global risk aversion caused by the Silicon Valley bank failure. The REER depreciated similar to Malaysian ringgit, while Indonesian rupiah and Philippine peso strengthened (Figure 14). Despite rising foreign exchange volatility, international reserves remained ample at 47 percent of GDP, the highest among Emerging Asian economies, covering 10 months of imports (Figure 15).

Figure 11: The current account returned to surplus due to tourism sector recovery and falling oil prices

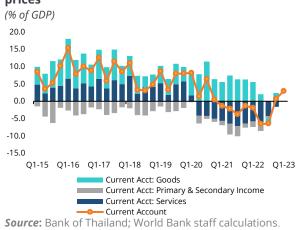
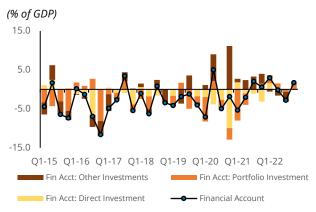


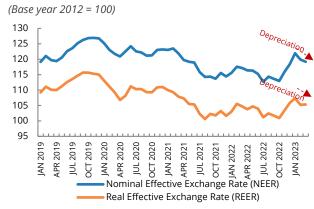
Figure 12: The net financial account surplus was driven by portfolio investment.



Source: Bank of Thailand; World Bank staff calculations.

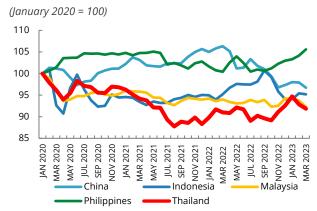
 $^{^3\ \}underline{\text{https://www.economist.com/graphic-detail/2022/09/30/global-shipping-costs-are-plunging-as-the-world-economy-slows}$

Figure 13: The REER and NEER appreciated since late 2022 supported by the stronger economic outlook



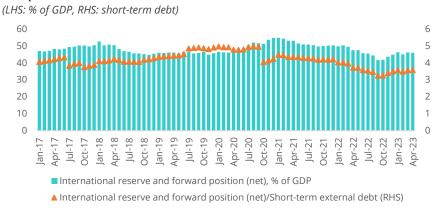
Source: Bank of Thailand; World Bank staff calculations.

Figure 14: the REER for Thai baht and Philippine peso appreciated.



Source: Bank for International Settlements (BIS).

Figure 15: Thailand's international reserves and forward position remain adequate at over thrice the level of external debt.



Source: Bank of Thailand; World Bank staff calculations.

iv. Inflation Fell Back Into the Target Range but Underlying Pressures Remain

Inflation slowed to an 18-month low due to broad-based price deceleration.

Headline inflation slowed to 2.7 percent (year-on-year) in April, having remained within the Bank of Thailand's target range of 1-3 percent for the third consecutive month amid declines in core and raw food inflation (Figure 16). Energy price inflation rose slightly from 2.4 percent to 3.2 percent, as domestic gasoline price deceleration slowed. Following the fall in global oil prices, the diesel price cap was reduced for the fifth time since February, by THB 2.5 per liter, to THB 32.5 per liter. The government continued to impose caps on other energy prices, including electricity and cooking gas, which also helped contain inflation pressure.

Core inflation has slowed but remained elevated.

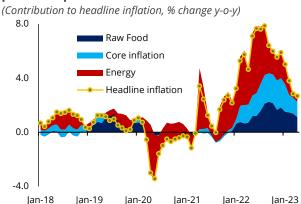
Core and raw food inflation continued to wane, reaching 1.8 percent and 1.1 percent, respectively. Core inflation also declined, reaching 1.8 percent (Figure 17), but remained higher than its pre-pandemic average of 0.7 percent over 2016-2019. However, strengthening domestic consumption and a strong pick-up in producer prices since 2022 may exert more pressure on consumer prices. Price

pressures in items and services not associated with energy and food prices are emerging (Figure 18).

maintained gradual monetary policy normalization.

The Bank of Thailand In light of underlying inflationary pressure, the central bank raised the policy rate by 25 basis points to 2.00 percent while extending its SME soft loan facility by one more year until April 2024 to support economic recovery. In light of the improving macro-economic fundamentals, anchored inflation expectations (Figure 19) and rising demand driven-inflation pressures, the policy rate is expected to gradually normalize to its estimated neutral rate of 2.5 percent, as the output gap closes in 2024.4

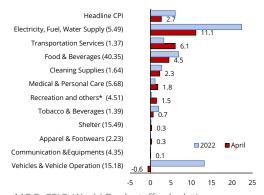
Figure 16: Headline inflation has slowed amid easing energy prices but underlying price pressures persist.



Note: Headline inflation includes raw food and energy. Source: CEIC: World Bank staff calculations.

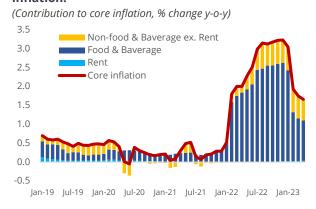
Figure 18: Price pressures eased mainly due to falling oil prices.

(Percent year-on-year)



Source: MOC; CEIC; World Bank staff calculations.

Figure 17: Falling prepared food and beverage prices contributed to slowing, but still high, core inflation.

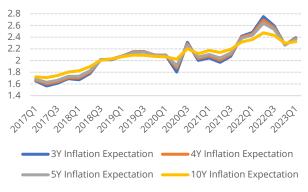


Note: Core inflation includes prepared food and excludes raw rood and energy.

Source: Haver Analytics; World Bank staff calculations.

Figure 19: Long-term inflation expectations remain within the inflation target range.

(Expectations inflation index-linked bonds, percent year-on-year)



Source: Puey Ungphakorn Institute for Economic Research, Bank of Thailand.

⁴ The estimation is based on a standard Taylor rule that relates the central bank policy rate to inflation expectations, deviations from target, and output deviations from potential output. Potential output is derived from a Cobb-Douglas production function, with calibration of the function's parameters.

v. Thailand's Financial System Remained Stable amid Improving Profitability

The Thai banking system remains resilient with a robust level of capital and strong asset quality. As of 2022 Q4, the tier-1 capital adequacy ratio for Thai banks was 15.9 percent (Figure 20), above both the minimum regulatory requirement and the Basel III minimum requirement of 10.5 percent. This capital adequacy ratio is comparable to Thailand's regional peers such as Malaysia and Philippines. Gross non-performing loan (NPL) ratio declined to 2.8 percent as of 2022 Q4 (Figure 20), which is comparable to regional peers and reflects the continued support of banks for their borrowers through debt restructuring and loan profile management. Banks also maintained an adequate level of provisions with an NPL coverage ratio of 171.9 percent in 2022 Q4. However, it is important to note that authorities have continued the relaxation of loan classification norms to support borrowers, which may increase the risk of a further deterioration of balance sheets and lead to an increase in NPLs. Special mention loans stood at 6.1 percent of total loans, though lower than the peak of 7.7 percent during pandemic, remains significantly higher than the pre-pandemic levels of 2.8 percent in December 2019.

The Thai banking sector has demonstrated improved profitability while maintaining adequate liquidity.

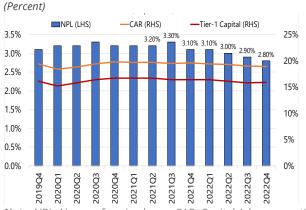
Liquidity assets to short-term liabilities was 32.4 percent in 2022 Q4, higher than some peer countries such as Indonesia, but lower than Malaysia and Philippines. The loan-to-deposit ratio has remained stable at 108 percent in 2022 Q4 (Figure 21). Liquidity coverage ratio was 197.3 percent in 2022 Q4, well above the minimum regulatory requirement of 100 percent. Profitability showed signs of improvement and stabilized at below pre-pandemic levels with Return on Assets (ROA) at 1.05 percent and Return on Equity (ROE) at 7.85 percent. These figures are higher compared to the same period in 2020 and 2021, but still lower than several regional peers such as Malaysia. Net Interest Margin stood at 2.9 percent, the highest level since the start of the pandemic. The rise of profitability is mainly driven by loan expansion that led to an increase in net interest income, paired with lower provisioning expenses.

Relatively high household indebtedness remains a source of vulnerability for the financial sector. Household debt in Thailand has historically been high (80.3 percent of GDP in 2019 Q4 according to the Institute of International Finance (IIF)) due to a variety of structural reasons related to lending practices, borrower financial literacy and discipline, and debt mediation and bankruptcy process. It has been exacerbated by the COVID-19 crisis due to pandemic-related policy measures and monetary easing, and now stands at elevated level even compared with advanced economies: at 85.7 percent of GDP as of 2022 Q4, household debt in Thailand is higher than most periods (except for the several quarters during the pandemic) in terms of both the USD amount and as a percent of GDP. The composition of household debt in Thailand warrants attention due to a large share of uncollateralized lending (44 percent of GDP), notably higher than say China (28 percent of GDP). The difference is due to the prevalence of uncollateralized lending, including personal loans (19 percent), credit card loans (4 percent), agricultural loans (7 percent) among others. These lending were in part encouraged by COVID-related relief measures which were introduced in 2020

⁵ Credit to households expanded rapidly over the last decade, rising from 59.3 percent of GDP in 2010 to over 80 percent in 2019, driven by not only personal loan but also auto and housing loans, which the government incentivized by offering one-off first-car and first-home tax rebates. The growth of credit to households slowed to approximately 3 percent per year during the pandemic and borrowing likely helped smooth consumption among liquidity-constrained households.

and extended once in 2022. Expiration of these measures may reveal underlying bank asset quality issues, as households have difficulty repaying these loans and banks do not hold collaterals against these parts of their portfolio. The extent of such impacts will likely be contained since NPLs and special mention loans account for a small portion of housing loans and credit card loans (3.3 percent), although the fraction is higher for personal loans (7.5 percent).

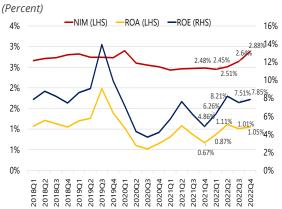
Figure 20: The banking system remains resilient with sufficient capital and liquidity buffers



Note: NPL: Non-performing loans, CAR: Capital Adequacy ratio Data reported is for domestically incorporated commercial banks

Source: Bank of Thailand

Figure 21: Banking sector profitability has stabilized



Note: NIM: Net Interest Margin, ROA: Return on Assets, ROE: Return on Equity.

Source: Bank of Thailand

vi. Fiscal Responses to High Energy Price have Slowed the Path to Consolidation, while the Political Transition will Slow Public Investment Disbursement in Early FY 2024

The fiscal deficit has narrowed as spending needs for COVID-19 relief waned. The central government's deficit narrowed in first half of FY23 (Oct 2022- Mar 2023) to 6.7 percent of GDP from 9.6 percent the same period last year (Figure 22). A smaller deficit reflected the falling government expenditures to 22.8 percent of GDP, down from 25.8 percent last year as spending need for COVID relief waned. As of January 2023, 96.4 percent of the THB 1.5 trillion emergency borrowing for COVID-19 responses had already been disbursed, with the remainder available for disbursement in 2023. Despite recent economic recovery, revenue collection has remained relatively low at 15.8 percent in the same period (Figure 25).

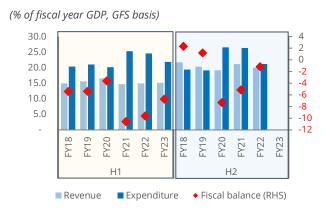
The authorities have maintained measures to mitigate high prices, thereby slowing fiscal consolidation. These measures, including extended cost-of-living support measures through social benefits, subsidies, and price controls have constrained fiscal consolidation and maintained fiscal deficit at above the 2019 pre-pandemic level. While off-budget spending for Covid-19 relief declined, spending on subsidies and social benefits remained substantially higher than the pre-pandemic level (Figure 23).

While price controls and subsidies can be effective in reducing Though some measures target vulnerable households, many measures including caps on electricity and cooking gas prices and the excise tax cut on diesel are not targeted, costly, and regressive. The State Oil Fund remained in deficit by THB

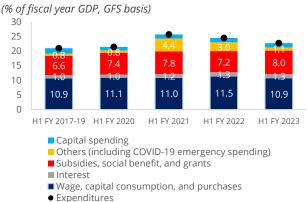
inflation and alleviating poverty, they can be fiscally costly, especially if not well calibrated.

83 billion (0.6 percent of GDP) due to the funding for cooking gas price subsidy (Figure 24). The government has borrowed THB 30 billion in December 2022 (0.2 percent of GDP) to replenish the fund (Table 1), The excise tax reduction on diesel is estimated to have incurred a fiscal cost of 0.4 percent to GDP from February to December 2022.

Figure 22: The central government's fiscal deficit narrowed Figure 23: Central government expenditures dropped in in the first half of FY23 (Oct 2022 to Mar 2023)



the first half of FY 23, except for subsidies and social benefits



Source: Fiscal Policy Office, Ministry of Finance.

Source: Fiscal Policy Office, Ministry of Finance, NESDC.

been subsidized by the State Oil Fund

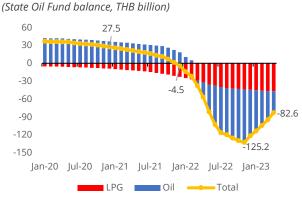
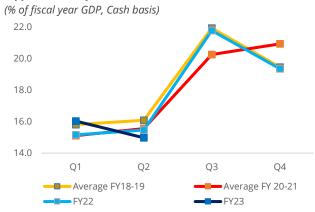


Figure 24: Caps on diesel price and cooking gas price have Figure 25: Revenue collection from January to March dipped to a six-year low



Source: Oil Fuel Fund Office: World Bank staff calculations.

Source: Fiscal Policy Office, Ministry of Finance, NESDC

Capital budget disbursement increased in response to the government's efforts boost investment but delayed process of forming new government poses

Investment spending in the first half of FY23 improved, based on the cash-based government budget, as budget disbursement rose to its highest rate in six years (Figure 26). Investments from both the central government budget and State-Owned Enterprises (SOEs)'s pipeline projects contributed to higher public investment growth. The government accelerated public expenditure disbursement before the cabinet was dissolved in March 2023, with estimated disbursement for the top 10 projects disbursement at THB 83.95 billion (0.5 percent of GDP), including investments in the transport sector, energy sector, commerce and services sector, and public utility sector. However, slow process to form a new government will delay capital budget spending for FY 2024 as the year.

risk for the next fiscal new government will likely need time to review and revise the previous cabinet's budget plan (Box 1)

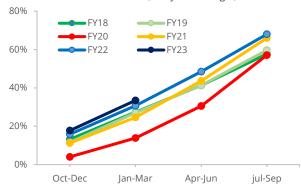
A delayed budget process is likely to slow disbursement of the capital expenditure more than current spending.

The new investment projects proposed and planned for launch in FY2024 will be most impacted. These projects will be subject to review and reprioritization based on the new government's priorities. Historical data indicates that the fiscal year after the election show significantly low capital disbursement rate. Four general elections held over 2007-2019 saw low capital average disbursement rate at 62 percent in the following fiscal year as illustrated (Figure 27). In order to avoid substantial disruption to the public expenditure disbursement, the government can use the FY2023 budget during the interim⁶. Most of the current budget expenditures which are repetitive in nature as well as on-going multi-year investment projects are less likely to be impacted by the slow process.

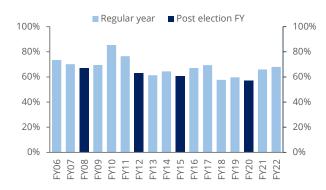
2018

Figure 26: Disbursement of capital budget peaked since FY Figure 27: Capital expenditure disbursement were usually low in fiscal years following an election

Public investment disbursement, % of total budget, cash basis



Public investment disbursement, % of total budget, cash basis



Source: Fiscal Policy Office, Ministry of Finance, NESDC; World Source: Fiscal Policy Office, Ministry of Finance; World Bank Bank staff calculations.

staff calculations.

Public debt remains sustainable due to low external debt and prudent fiscal management.

Public debt rose to 61.2 percent of GDP at the end of March 2023, 20 percentage points higher than the pre-pandemic period (Figure 28). Despite the increase, public debt remains fiscally sustainable with low level of foreign currency denominated debt at 1.6 percent of total debt and relatively low cost of funding. The 10-year Thai government bond yield declined from 3.0 percent at the end of FY22 to 2.4 percent in March 2023 and remains the lowest among ASEAN peers (Figure 29). The government plans to reduce fiscal deficit below 3 percent of GDP over the medium term (FY2024-2027), according to the medium-term fiscal framework.

⁶ Budgetary Procedures Act, B.E. 2561 (2018) Section 12 states that "in the case where an Annual Appropriations Act is unable to be timely enacted for a new budget year, the preceding annual appropriations may be used for the time being, in accordance with the rules and conditions prescribed by the Budget Director with the approval of the Prime Minister."

Table 1: Key fiscal-responsibility indicators remain well within their established parameters.

Key fiscal responsibility, % or otherwise specified	Ceiling (%)	FY20	FY21	FY22	H1 FY23
Public Debt / GDP	70	49.5	58.4	60.5	61.2
Government Debt Service / Revenue	35	6.5	8.6	8.1	7.9
External Debt / Public Debt	10	1.8	1.8	1.7	1.6
External Debt Service / Exports	5	0.07	0.08	0.15	0.07
Principal repayment / Annual budget expenditure	1.5-3.5	1.1	2.1	2.1	1.9
Average Time to Maturity		9 years 10 months	9 years 1 month	8 years 9 moths	8 years 9 moths
10-year government bond yields		1.4	1.7	3.0	2.4

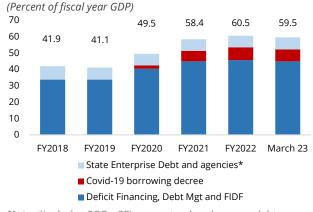
Source: Public Debt Management Office, Ministry of Finance; World Bank staff calculations.

Table 2: Fiscal surplus/deficit and budget under medium term fiscal framework (FY 2024-2070).

(% of GDP)		Act	ual		Bud	get	Medium Term Fiscal Framewo t 2024-2070)			
(4 54 524)	FY 19	FY 20	FY 21	FY 22	FY22	FY 23	FY 24	FY 25	FY 26	FY 27
Net revenue	15.1	14.8	15.3	14.9	13.7	13.3	13.9	13.8	13.5	13.2
Fiscal budget expenditure	18.1	20.0	20.1	18.4	17.7	17.0	16.9	16.6	16.3	16.0
of which: Capital	2.3	2.3	2.7	2.4	3.5	3.7	3.5	n.a.	n.a.	n.a.
Fiscal budget balance	-2.99	-5.19	-4.77	-3.47	-4.0	-3.70	-3.00	-2.84	-2.81	-2.79
Outstanding public debt	41.06	49.47	58.38	60.54	62.70	60.64	61.35	61.78	61.69	61.25

Source: Fiscal policy office; Ministry of Finance; World Bank staff calculations.

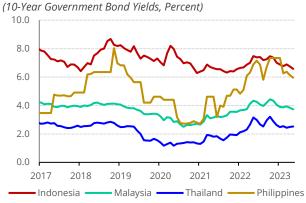
Figure 28: Public debt remains sustainable



Note: *includes SOEs, SFI guaranteed and agency debt.

Source: PDMO

Figure 29: Government bond yield remains the lowest among ASEAN peers



Source: CEIC, World Bank staff calculation.

Box 1: Public Investment and Large Pipeline Projects amid Political Transition

The slow formation of a new government will likely delay capital budget spending for FY 2024 by 3 to 6 months. The Election Commission certified the results of the May 14th general elections on June 19th and the first parliament meeting must be convened within 15 days. The appointment of the new Prime Minister and cabinet could therefore be finalized by as late as August 2023. This increases the risk of a delayed budget process for FY 2024. As the regular 2024 fiscal year starts on October 1, 2023, the slow process of forming a new government could effectively delay FY2024 by 3 to 6 months depending on the budget allocation priorities of the new government. If the new government adheres to the original budget allocation priorities, less time will be taken on the appraisal and approval process. However, if the new government has significantly different priorities, capital spending will be delayed.

Table B. 1: Top ten state-owned enterprises investment projects of 2023

Unit: million baht

				O	FY 2023			
	Project	SOEs	Sector	Operational approval limit	Estimated Disbursement	Actual disbursement rate (% YTD)		
1	The first phase of the Thai-Sino high-speed rail linking Bangkok and Nong Khai Bangkok-Nakhon Ratchasima	SRT	transport	143,281	18,138	60		
2	The MRT purple line project: Tao Pun - Rat Burana	MRT	transport	91,974	10,647	74		
3	Transmission system and distribution system development project, phase 2	PEA	energy	28,586	10,552	13		
4	The expressway linking Rama III Road-Dao Khanong and the western Outer Ring Road	EXAT	transport	20,767	8,608	44		
5	Railway construction project: Ban Phai - Maha Sarakham - Roi Et - Mukdahan - Nakhon Phanom	SRT	transport	61,273	7,499	7		
6	The government complex: Zone C area	DAD	commerce and services	17,344	6,129	14		
7	The twelfth power distribution system improvement and expansion plan, Year 2017 - 2021	MEA	energy	15,494	5,864	12		
8	Railway construction project: Den Chai - Chiang Rai - Chiang Khong	SRT	transport	76,369	5,753	20		
9	The 9th waterworks improvement master plan	MWA	public utility	28,143	5,460	41		
10	Mae Moh power plant units 8-9 replacement project	EGAT	energy	42,557	5,296	0		
	Total 10 projects			525,788	83,945	35		

Source: NESDC.

The incoming government can prioritize the disbursement of committed projects and accelerate the investment projects that have already been approved to ensure timely implementation and smooth transition. Public investment in large projects are taking a crucial role for boosting growth in 2023 and enhancing productivity. To sustain this momentum, it is vital to closely monitor various factors. These include the disbursement of the government's capital budget, the effective implementation and disbursement of the capital budget in major investment projects by state-owned enterprises, and the promotion of Public-Private Partnership (PPP) initiatives. By focusing on these key areas, public

investment can remain a significant driver of the economy throughout the year, despite late government formation.

The ten largest pipeline projects, which can be prioritized, have high potential to connect lagging regions and improve household access to water and energy. For the fiscal year 2023, the total public investment budget amounts to THB 1,242 billion (6.7 percent of GDP), marking a significant 3.5 percent increase from the previous fiscal year (Table B. 1). Of this amount, state-owned enterprises are expected to be allocated a total investment budget of THB 443.35 billion. Out of the 65 significant projects slated for disbursement, the top 10 projects will receive the lion's share of the allocation, with an estimated disbursement of THB 83.95 billion (0.5 percent of GDP or 59.5 percent of the total disbursement). These top 10 projects encompass investments in the transport sector (5 projects), energy sector (3 projects), commerce and services sector (1 project), and public utility sector (1 project). As of the second quarter of FY 2023 (January-March), the disbursement of the top 10 projects already reached THB 24.94 billion, accounting for 29.71 percent of the total budget. Hence, the accumulated disbursement (Q1+Q2) of FY2023 amounted to THB 29.44 billion (0.2 percent of GDP or 35.07 percent of the total budget).

vii. Poverty Declined in 2022, Underpinned by Labor Market Recovery and Social Assistance

Non-farm employment has continued its upward trend, led by job creation in the hospitality and trade sectors. In Q1 2023, non-farm employment increased by 730,000 year-on-year and 670,000 quarter-on-quarter. Employment in trade and hospitality continued to trend up supported by a strong rebound in tourism. Manufacturing employment remained relatively stable, despite a decline in manufacturing exports for two consecutive quarters. The unemployment rate stood at 1.1 percent, down from 1.5 percent in the same quarter last year and almost returning to its pre-pandemic level at 1.0 percent in Q1 2020 (Figure 30). Underemployment or employed workers who work less than four hours per day also declined, driven by strong labor demand in the non-farm sector. The underemployment rate stood at 8.4 percent of the labor force in Q1 2023, falling to below the pre-pandemic level of 9.5 percent in Q1 2020 (Figure 31).

Wage growth moderated in the second half of 2022.

Despite the minimum wage increase effective in October, nominal wage growth fell from 3.4 percent in the first half of 2022 to 0.1 percent in the second half. With year-on-year inflation reaching 5.9 percent in December 2022, the average real wage dropped by 2.4 percent. However, a few sectors saw their nominal wage gains outpacing inflation, including construction, hospitality, as well as administrative, entertainment and recreation services, thanks to a rebound in service-related economic activities. However, professional services, education and finances registered significant losses in real wages.

Poverty is expected to have declined in 2022, underpinned by the labor market recovery. Average consumption per capita rose by 8.1 percent in 2022, and 9.7 percent for low-income households in the bottom quintile of the consumption distribution.⁸ An increase in household consumption was likely underpinned by a continued recovery in the labor market and agricultural output as some of the COVID-19 relief measures and stimulus packages were discontinued. Some stimulus programs such as the half-half program and social assistance programs such as

⁷ Thailand National Statistics Office (2023). Labor force survey 2023 Q1, www.nso.go.th

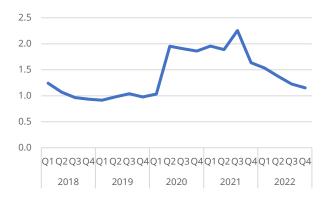
⁸ Thailand NSO. (2023) The household Socio-economic survey 2022. Retrieved from www.nso.go.th

Part 1. Recent Economic Developments and Outlook

the state welfare card and old age allowance remained in place to support low-income households. Poverty is estimated to have declined to 11.5 percent in 2022 (measured at the upper-middle-income poverty line of \$6.85 a day in 2017 PPP) Inequality is expected to have improved, with low-income households experiencing a larger increase (in percent) in consumption per capita than better-off households. Despite declining poverty, low-income households, particularly in rural areas, face long-standing challenges and risk falling back in poverty (see Box 2: Farmers, rural households, poverty and water).

Figure 30: The unemployment rate declined from its pandemic high

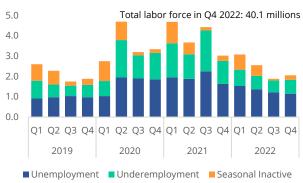
(Percent of labor force aged 15 and over)



Source: National Statistical Office of Thailand.

Figure 31: Underemployed and unemployed persons have declined

(Percent of labor force aged 15 and over)



Source: Bank of Thailand.

Note: Underemployment is defined as working less than 35 hours per week and available for additional work.

Box 2: Farmers, Rural Households, Poverty and Water^{B.1}

Poverty is concentrated in rural areas, and the rural poor depend largely on agriculture. The rural sector is home to 60 percent of the poor. Farm households, of which all members work in agriculture, constitute 35 percent of households in rural areas, with the rate increasing to 40 percent in the North and 53 percent in the Northeast. They are the poorest and have the lowest level of education. The poverty rate among farm households is over 11 percent, compared to 6 percent for non-farm households. Over 80 percent of household heads have primary education or less. Moreover, farm households tend to have a higher risk of falling (deeper) into poverty as they face greater income volatility than non-farm households.

Low agricultural productivity and a persistent decline in net farm incomes lower the chances of escaping poverty for Thai farmers. While agriculture accounts for only eight percent of GDP, it employs around one-third of the workforce and more than half of the rural population. However, when value added per worker in manufacturing and services registered a steady increase over the past two decades, the progress was minimal in agriculture. Farm income has persistently decreased since 2011, due to a decline in global agricultural commodity prices and destructive climatic events (see Chapter 2: Coping with Floods and Droughts). As Thailand is a key supplier of agricultural products to the world market, this admirable performance at a global level conceals several challenges that local farmers face across the country, especially in the North and Northeast regions.

Several factors contribute to low agricultural productivity including limited and unequal access to water and irrigated land. Farm households are mostly smallholders, lacking crop diversification and secure land tenure. They also have a high debt burden and limited access to agriculture services and markets. High exposure to climate shocks as well as limited and unequal access to water and irrigated land also pose additional challenges. Only 42 percent of farm households can access water resources and 26 percent have access to irrigation systems. This constraint is most severe in the Northeast and the South. Although over 60 percent of household heads in these regions are employed in agriculture, only 10 percent of farm households in the South and 13 percent in the Northeast have access to irrigation systems (Attavanich et al. 2019). The lack of access to irrigation water severely constrains utilization of farmland for dry-season farming, growing higher value crops, and diversifying crops. This has constrained farmers' opportunities to generate more income and make them more vulnerable to price shocks and climate variability.

Improving access to irrigation water will boost farm productivity and allow farmers to diversify to more water-intensive and high-value crops. Irrigation water is an important factor in increasing agricultural productivity and crop diversification. In Thailand, high investment costs have prevented development of large- and medium-scale irrigation systems, which can provide greater access to irrigation water to a larger number of farmers who currently rely on dryland agriculture. Farm households without access to irrigation water grow crops only in the rainy season and leave their farmland fallow during the dry season. Improved access to irrigation systems offers opportunities for farmers to cultivate year-round, increase their crop yields, and diversify to horticulture and other high value crops. This would help raise farm productivity and income, increasing the chances of escaping poverty for Thai farmers.

Note: B.1/ This section draws on "World Bank Group. 2022. *Thailand Rural Income Diagnostic: Challenges and Opportunities for Rural farmers.* World Bank, Bangkok." The poverty rate is measured at the upper middle-income class poverty line of \$5.50 a day in 2011 PPP.



2. Outlook: Recovery amid Global Headwinds

i. The Economy is Projected to Recover Faster Than Expected in 2023 but Global Headwinds and Political Uncertainty Weigh on the Outlook

Growth is projected to accelerate in 2023 boosted by tourism, while goods exports will contract. Growth is projected to accelerate from 2.6 percent in 2022 to 3.9 percent in 2023, about 0.3 percentage points higher than was expected in April 2023 (East Asia and Pacific Economic Update April 2023) (Figure 32). The upward revision reflects mainly stronger-than-expected growth in China, and tourism recovery. Although private consumption growth will slow from 2022, it will remain a solid contributor of overall growth, supported by the ongoing recovery, with improved labor market and strong pent-up demand from China. While inflation pressure will continue to affect living costs and weigh on consumer confidence, overall pressure has lessened as energy prices eased. Goods export growth will contract this year, reflecting the global growth slowdown, but the magnitude is expected to be smaller than previously projected. Private investment is expected to slow as business sentiment has been hit by contraction in goods exports. Public investment will remain weak with slow budget disbursement due to the protracted government formation timeline (Table 3).

Growth will continue to expand in 2024 and 2025, but slightly weaker than previously projected due to the dimmer global outlook. Growth in 2024 and 2025 are expected to expand at 3.6 percent and 3.4 percent, respectively, with tourism sector recovery and private consumption remaining the major drivers of growth (Figure 33).9 Over the medium term, we project the contribution of private consumption to be a solid 1.9 percent, close to the 2.1 percent historically observed in economic upturns. However, the projections were revised down mainly due to the downward revision of global demand.

⁹ See Box 1: "Economic cycles: has Thailand entered a downturn?" WB Thailand Economic Monitor, January 2020.

Table 3: The pace of recovery is expected to continue

	Share of GDP		Forecast		Contribution growt				
Percentage change	(2022)	2022	2023F	2024F	2025F		2023F	2024F	2025F
GDP	100%	2.6	3.9	3.6	3.4		3.9	3.6	3.4
Private Consumption	56%	6.3	3.8	3.4	3.0		2.1	1.9	1.7
Government Consumption	16%	0.2	-2.6	1.1	2.5		-0.4	0.2	0.4
Fixed Investment	24%	2.3	2.1	2.1	3.7		0.5	0.5	0.9
GFCF-Private	18%	5.1	2.2	2.4	3.4		0.4	0.4	0.6
GFCF-Public	6%	-4.9	1.9	1.0	4.6		0.1	0.1	0.3
Exports of Goods and Services	69%	6.8	7.3	6.4	4.3		5.0	4.6	3.2
Exports of Goods	61%	2.5	-1.3	2.8	3.5		-0.8	1.6	2.0
Exports of Services	9%	52.8	68.1	21.6	7.3		5.8	3.0	1.2
Imports of Goods and Services	69%	4.1	1.5	4.2	4.0		1.1	2.8	2.7
Import of Goods	59%	5.3	1.3	4.5	4.2		0.8	2.5	2.3
Imports of Services	10%	-1.2	2.5	2.7	3.6		0.3	0.3	0.5
Net Export of Goods and Services							4.0	1.7	0.4
Change in Inventories*							-2.3	-0.7	0.0
		2022	2023F	2024F	2025F				
Exports of Goods, USD term		5.5	-0.7	2.1	4.0				

	2022	2023F	2024F	2025F
Exports of Goods, USD term	5.5	-0.7	2.1	4.0
Imports of Goods, USD term	15.3	-1.4	2.7	4.1
Goods trade Balance, USD Billion	10.8	12.8	11.6	11.7
Current Account Balance, USD Billion	-17.2	14.3	26.9	31.8
Current Account Balance (% of GDP)	-3.5	2.5	4.4	4.9
Headline CPI	6.1	2.0	1.9	1.3

Note: *including statistical discrepancies.

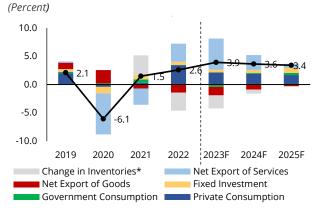
Source: NESDC, Haver Analytics; World Bank staff calculations.

Figure 32: Growth projections were revised upward for 2023 but reduced for 2024



Source: World Bank staff projections.

Figure 33: Output will be supported by private consumption and exports of services



Note: *including statistical discrepancy. **Source:** World Bank staff projections.

Goods exports are expected to contract in 2023 as global growth is projected to slow significantly amid high inflation, tight monetary policy, and more restrictive credit conditions.

Exports of goods are expected to contract by 0.7 percent (US dollar terms), significantly slower than 5.5 percent expansion in the previous year. However, the contraction was smaller than the previous projection of 1.8 percent due to a better Chinese economic outlook. Activity in China is projected to rebound sharply to 5.6 percent in 2023, from 3 percent in 2022 and up 0.5 percentage points from the previous projection in April, following the economy's swift reopening. Stronger China growth is estimated to boost Thailand's growth by about 0.3 ppts (Figure 34). In contrast, advanced-economy growth is projected to slow in 2023, largely reflecting the continued effect of considerable central bank policy rate hikes since early 2022. Growth in the US and Europe are projected to slow to 1.1 percent and 0.4 percent in 2023. The manufacturing purchasing index in major trading partners indicates a persistent decline in activity, albeit at a slower pace than in previous periods (Figure 35).

higher projection in 2023

(Impact of a 1 percentage point China GDP shock on EAP real GDP (peak response), percentage points)

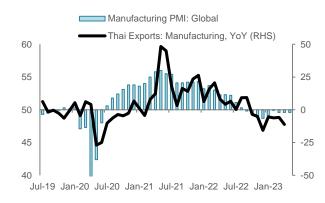
1.2 1.0 0.8 0.6 0.4 0.2 0.0 MYS PHI IDN

Source: EAP update April 2023.

Note: Estimates based on Bayesian VAR model, using data from 2000Q1to 2022Q4, except in Malaysia for which data starts in 2005Q1.

Figure 34: Improved China outlook contributed to a Figure 35: The manufacturing purchasing index continued to contract but points to a recovery

(Diffusion Index)



Source: CEIC; S&P Global; Ministry of Commerce, World Bank staff calculation.

The return of tourists, particularly from China, has strengthened the tourism outlook.

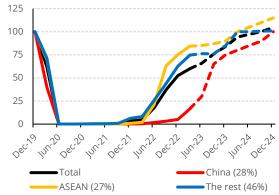
As a result, the current account balance is expected to return to surplus in 2023 and support external stability.

Tourist arrivals are expected to be slightly higher than previously projected after incorporating strong inflows of Chinese tourists in Q1. The Chinese tourists are projected to surge in the rest of 2023, following the path of tourist inflows from ASEAN last year (Figure 36). The number of arrivals is projected to reach 28.5 million (84 percent of pre-pandemic 2019 level), up from 27.1 million in the previous projection. The recovery is expected to continue into next year which will boost the number of arrivals to achieve the pre-pandemic level by the second half of 2024.

The current account balance is expected to reverse from its deep deficit of the past 2 years and return to positive territory in 2023 at 2.5 percent of GDP due to both goods and services trade (Figure 37). Although the goods export outlook remains weak, the lower import bills amid easing global oil prices will contribute to a stronger trade surplus. The tourism sector recovery and the normalization of shipping costs will also help widen the current account surplus.

Figure 36: Tourism is expected to reach prepandemic levels in 2024

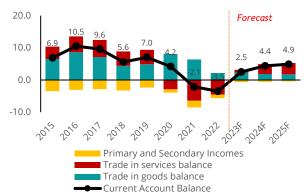
(Percent of pre-pandemic level in 2019)



Note: Share of total as of 2019 in parenthesis. **Source:** World Bank staff projections.

Figure 37: The current account balance is expected to return to surplus

(Percent of GDP)

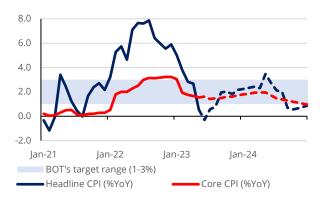


Source: CEIC; World Bank staff projection.

Projected inflation has been revised downward, reflecting the lowered global oil price projection and the contained pressure on core inflation. Headline inflation is projected to decline to 2.0 percent in 2023, down from 6.1 percent in 2022 the previous year, mainly reflecting the lowered energy price inflation, which is projected to fall from 25 percent in 2022 to 0.5 percent (Figure 38). The recent World Bank *Commodity Market Outlook*¹⁰ downgraded energy price forecasts sharply. Brent crude oil prices are forecasted to average USD 84 per barrel in 2023. Weaker global demand has already caused these prices to drop 15 percent below the 2022 average, and they are projected to remain at that level through the end of 2024. The government's continued caps on energy prices, including electricity and cooking gas, helped contain inflation pressure and relieve pressure on household living costs. Raw food price inflation is expected to moderate in 2023. Consequently, inflation is expected to decline close to the lowest among emerging markets (Figure 39).

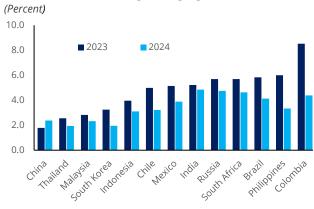
Figure 38: Headline inflation is projected to return to the BOT's target range from 2023 onwards

(Percent year-on-year)



Source: CEIC; World Bank staff projections.

Figure 39: Markets expect inflation to fall close to the lowest level among emerging markets



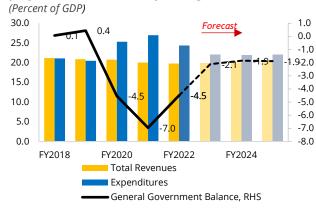
Source: Consensus forecast (May 2023); World Bank forecast for Thailand.

¹⁰ https://openknowledge.worldbank.org/server/api/core/bitstreams/6864d537-d407-4cab-8ef1-868dbf7e07e2/content

The fiscal deficit is projected to narrow in FY23 and lower pressure on the public debt, but delays in the budget process poses risks to the spending outlook for FY24

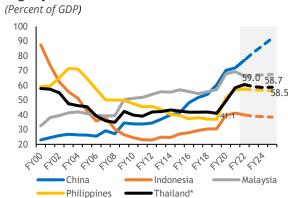
The fiscal deficit is projected to narrow from an estimated 4.5 percent of GDP in FY22 to 2.1 percent in FY23, largely on account of reduced Covid-related spending, while revenue is projected to remain relatively stable (Figure 40). However, the path of fiscal consolidation will remain slow, owing to the government's energy subsidies, excise tax cut on diesel, and relief measures to mitigate the cost-of-living crisis, such as targeted cash transfers for low-income households, and targeted subsidies on electricity and cooking gas. While price controls and subsidies can be effective in reducing inflation and alleviating poverty, they can be fiscally costly, especially if not well-calibrated. In contrast, public spending is projected to be lower than previously expected due to the potential delays in the budget approval process in the post-election period. The new government is expected to be appointed at the beginning of August under the baseline. This means that the budget process will be delayed, and the budget disbursement may not be able to begin in the first quarter of FY 2024 (October to December 2023). The public debt is projected to decline slightly from 60.5 percent of GDP in FY 2022 to 59 percent in FY 2023 (Figure 41).

Figure 40: The general government deficit is projected to narrow as spending wanes...



Source: FPO; World Bank staff projections.

Figure 41: ... and public debt is projected to decline slightly



Source: IMF WEO; World Bank staff projections.

Over the longer term, maintaining fiscal sustainability will require actions on the targeting and efficiency of spending. The recent surge of public debt, resulting from the fiscal response to the COVID-19 pandemic and the Russia's invasion of Ukraine, necessitates the need for fiscal consolidation over the medium term. At the same time, fiscal policy will face the pressure to enhance potential growth, build climate resilience, and ensure the adequacy of social protection. Aging will also directly contribute to increased spending requirements, including rising public pension, including Old Age Allowance (OAA) and civil service, and healthcare expenses. Fiscal policy needs to strike a right balance between higher pressures and maintaining fiscal sustainability. To create the required fiscal space for additional spending in these priority areas, the policies should focus on a more targeted social assistance and transfers, while also implementing reforms to improve efficiency of public spending, such as on healthcare and education (World Bank PRSA 2023).

The more targeted social assistance will improve spending efficiency while also ensure adequate social supports.

Tax revenues in Thailand are low and significant reforms are needed to create more fiscal space for inclusive and climate resilient growth. By implementing all reform priorities, which include (i) higher education spending at the pre-primary and secondary level; (ii) a permanent increase in the Old Age Allowance to the poverty line¹¹ and other social welfare benefits; (iii) higher investment in climate adaptation by improving water resource management, protecting against flood damage in Bangkok, and increasing the climate resilience of transport and other public infrastructure, public debt could reach its ceiling of 70 percent to GDP by 2028 (orange line in Figure 42). However, if a more targeted policy is implemented by raising OAA to THB 2,000 per month for the poorest beneficiaries, with the amount of the allowance tapering or being left unchanged for higher income recipients, the fiscal cost would be lower with positive progressive impact¹² (blue line). In addition, if the government can successfully raise tax collection through reforms, public debt will substantially decline, instead of rising (green line).

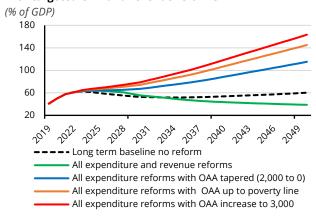
Tax revenues (averaging around 16 percent of GDP) are relatively low over the past two decades by the standards of upper-middle-income countries, as well as regional and OECD comparators and tax efficiency score¹³ staying below that of countries with similar levels of income (Figure 43). Enhanced revenue mobilization efforts, especially in the areas where the collection remain substantially lower than its potential, such as raising VAT rate to 10 percent and adjust exemptions, broadening the personal income tax base and streamlining allowances, and expanding property tax collections could raise overall collection by 3.5 percentage points to GDP and reduce overall spending constraints. Thailand has made efforts to implement tax reforms, such as reforms on property tax and financial transaction tax. However, implementation of the latter has been delayed and requires further considerations due to concerns about its potential impact on the liquidity of the stock market.

 $^{^{11}}$ Currently the OAA ranges between THB 600 and THB 1000 per month (increasing by beneficiary age) and has not been adjusted for over a decade. A benefit of THB 2000 per month is equivalent to around 86 percent of the THB 2,329 per month poverty line, based on the USD5.5/day (2011 PPP) benchmark

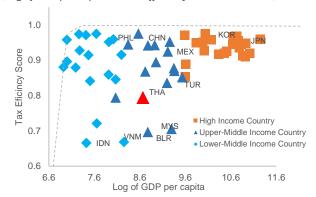
¹² The annual fiscal cost of OAA to GDP is estimated to remain low at 0.6 percent in 2025 if no reform is implemented, but the cost will rise to 2.0 percent and 2.6 percent if the OAA benefit is raised to poverty line and 3,000 per month, respectively. However, the fiscal cost will drop to 1.1 percent of GDP with tapering OAA from THB 2000 to 0 per month.

¹³ An efficiency score of between 0 and 1 is assigned to each country based on the distance between actual tax collections and estimated tax potential. A higher number indicates higher efficiency/tax effort.

Figure 42: Public debt is projected to decline under a scenario Figure 43: Thailand has low tax efficiency score compared with targeted OAA and revenue reforms



to middle-income countries (Log of GDP per capita vs. Tax efficiency score, 2014-latest)



Source: WB analysis, data from ICTD and WDI.

Note: World Bank staff estimates.

ii. Risk to Growth Remains on the Downside amid Global Economic Slowdown, Uncertain Political Outlook, and Prolonged Weak Economic Growth

Weaker-thanexpected global growth and political uncertainty are key challenges to the near-term outlook.

First, a sharper-than-expected global slowdown could occur due to monetary tightening in advanced economies and geopolitical uncertainty. The growth slowdown and the effects of more restrictive global financial conditions in advanced economies could deepen Thailand's current account deficit and weigh on portfolio capital flows. Recent events, including the failures of certain industrial country banks, Silicon Valley Bank, Signature Bank, and Credit Suisse, have raised concerns about potential spillovers to Emerging markets and Developing Economies (EMDEs), including Thailand (EAP Economic Update April 2023). While Thailand's banking sector has not so far been impacted, there are potential risks through indirect exposure to losses. Second, political uncertainty also poses risks to growth, particularly if the formation of a new government faces significant delays. Such a scenario will see further setback to budget disbursement, especially public investment in FY2024, than estimated under the baseline. In the worse-case scenario, it is estimated that a 5 ppts decline in capital budget disbursement could cut GDP growth by 0.3 ppts.

Over the long term, despite recent resurgent growth, the growth path is expected to remain well below the prepandemic trend unless productivity growth is revitalized.

The output level is unlikely to return to the pre-pandemic path and is expected to remain below its potential level until 2025, despite recent resurgent growth (Figure 44). This path could be dampened further by the difficult external environment and possible re-escalation of energy prices. Structural challenges, such as an aging population, climate change, low capital investment accumulation, declining export competitiveness, and high household debt14, may further limit potential growth. The region, including Thailand, is exposed to climate risks (Figure 45), particularly floods and droughts, in part because of the high density of population and economic activity along the coasts (see part 2 on

¹⁴ High household debt, in excess of 60 percent of GDP, is associated with misallocation of resources and lower productivity growth (Lombardi 2017 The real effects of household debt in the short and long run BIS working paper #217)

Coping with Floods and Droughts). ¹⁵ To support Thailand's long-term growth potential, it is essential to take the following steps: (1) enhance productivity and foster technological innovations, complemented by investment in education and human capital; (2) ensure sufficient social protection, human development spending, and public spending, while also improving spending efficiency in several areas including better targeting of social assistance, improving reforms on healthcare and education, and removing constraints on public investment; (3) strengthen efforts towards fiscal consolidation and raising revenue to create fiscal space to meet the additional spending needs such as investments in climate adaptation, and establish a fiscal buffer to tackle future shocks.

Figure 44: Output will remain below its potential level until 2025

(World Bank GDP forecast, THB million)

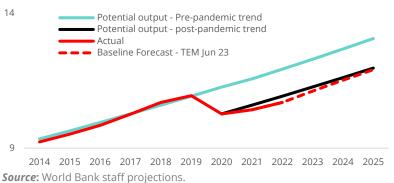
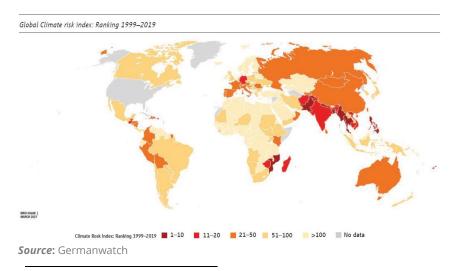


Figure 45: East Asian Economies, including Thailand, are Highly Exposed to Climate Change Impacts



¹⁵ EAP stands out as the region with the highest urban growth rate and the largest proportion of settlements in the highest flood risk category (inundation depth over 1.5 meters) (Rentschler et al., 2022). The World Bank *Country Climate and Development Reports* (www.worldbank.org/en/publication/country-climate-development-reports), give an idea of the economic and social dimensions of climate risks in EAP. In a +2°C world, EAP would see an additional 50 million people regularly exposed to coastal flooding by 2100. Without major adaptation efforts, coastal, river, and chronic flooding alone could lead to GDP losses of 5–20 percent by 2100 in Indonesia, Vietnam, the Philippines, and China (World Bank and Vivid Economics, 2019).



Part 2. Coping with Floods and Droughts in Thailand

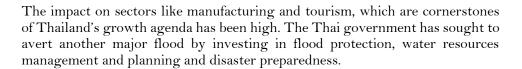
1. Introduction and Context

Thailand is vulnerable to the effects of climate change because of its long coastlines, fragile agriculture system and susceptibility to storms, floods, and droughts.

Inland flooding is by far the greatest natural hazard facing Thailand in terms of economic and human impacts, followed by droughts. Climate change and variability is already causing severe impacts on Thailand's economy and jeopardizing Thailand's transition to a high-income economy. Estimates of the damage to the economy by mid-century range from 1 percent of GDP to 44 percent of GDP (compared to a scenario with no climate impacts), indicating the high level of uncertainty around future climate impacts. The World Bank's recent *Thailand Public Revenue and Spending Assessment* (2023) suggested that climate change could reduce GDP in Thailand by 10-20 percent by 2050. This chapter aims to provide a focused analysis of inland flooding, specifically riverine and other forms of inland flooding, without encompassing sea level rise or coastal flooding.

The 2011 floods caused 680 deaths, affected nearly 13 million people and resulted in damages and losses to the economy worth an estimated THB 1.43 trillion (USD 46.5 billion)¹ equivalent to 12.6 per cent of GDP at the time. Bangkok remains especially vulnerable to flooding, having suffered six other major flooding events since 1980, despite the introduction of flood control measures. The manufacturing of goods for exports is concentrated in and around Bangkok and accounted for 70 per cent of all damages and losses in 2011. Changes in weather patterns resulting from climate change are increasing the frequency of droughts and water shortages, which particularly affects the agricultural sector.

¹⁶ See www.worldbank.org/en/country/thailand/publication/th-prsa



2. Climate Change and the Projected Impact of Floods and Droughts

i. Thailand's Climate and Climate Variability

Thailand is largely classified as a 'tropical savanna climate' whereas the southern part has a tropical monsoon and in parts a tropical rainforest climate.

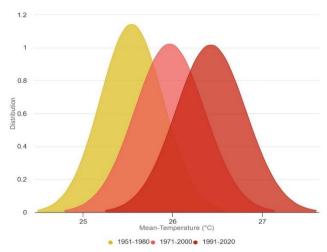
The climate is influenced by seasonal monsoon winds, which are commonly used to describe a seasonal change in the atmospheric circulation and precipitation related to the oscillation of the Inter-Tropical Convergence Zone (ITCZ). The southwest monsoon in May brings warm moist air from the Indian Ocean leading to abundant rain, notably in the mountainous regions. It is further amplified by tropical cyclones. The northeast monsoon, which starts in October, brings cold and dry air from the anticyclone in China over major parts of Thailand, especially the northern and northeastern parts. In the south, the monsoon causes milder weather and abundant rain along the eastern coast. The highest rainfall is in September and October, with approximately 255 mm recorded during these months. The country receives a mean annual rainfall of 1,200 mm to 1,600 mm. Southern Thailand is characterized by mild weather year-round with less diurnal and seasonal variations due to maritime influences. The hottest months in Thailand are April and May and the mean annual temperature is 26.3 degrees Celsius.

Climate variability: Data show temperature increases since the middle of the 20th century while precipitation events have been less frequent but more intense. Studies have noted a temperature increase across Thailand since the middle of the 20th century. Manton et al. (2001) report "a significant increase in minimum temperatures at meteorological stations located in Thailand between 1961–1998, as well as an increase in the number of warm nights". Studies observe an increase in annual precipitation, mostly during the wet season between July and October. Variability of precipitation in Thailand in recent decades has been driven particularly by El Niño Southern Oscillation (ENSO), with years of strong El Niño correlated with moderate and severe drought. La Niña has the opposite effect of El Niño. Thailand was affected by a long-lasting La Niña from September 2020 to February 2023. With the projected El Niño impacts for 2023, the government has already started advocating water saving measures and put its contingency plans on alert17. The 20th session of the ASEAN Climate Outlook Forum (ASEANCOF-20) in May, 2023 underscored that an El Niño is highly likely to become established during June-July-August (JJA) 2023 period, with conditions prevailing until the end of the year, whereas the strengths of the El Niño remains uncertain (some models predicting it to be moderate to strong). Accordingly, for the JJA period a mix of near to above normal rainfall is predicted over large parts of the northern ASEAN region (ASMC and WMO, 2023). A 2016 study found that, while precipitation events have been less frequent across the country, they have intensified. Figure 46 illustrates the increased mean temperature between 1951 and 2020. Figure 47 depicts the long-term trend in average annual mean temperature between 1901 and 2021 for Thailand; for most

¹⁷ Bangkok Post, April 14, 2023

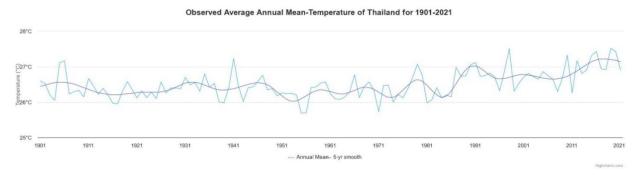
of the period average temperatures did not change, but there has been an increase since the early 1990s (World Bank, 2023). Figure 48 highlights the observed rainfall anomaly for Thailand between 1981 and 2021 (HII, 2019).

Figure 46: Change in Distribution of mean temperature in Thailand for the periods 1951 to 1980, 1971 to 2000 and 1991 to 2020



Source: World Bank, 2023; Climate Change Knowledge Portal.

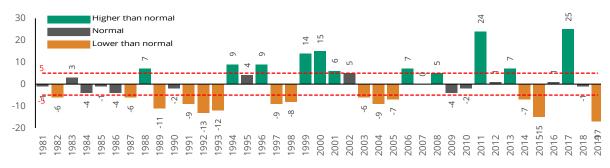
Figure 47: Observed Average Annual Mean Temperature of Thailand for 1901 to 2021



Source: World Bank, 2023; Climate Change Knowledge Portal.

Figure 48: Observed Rainfall Anomalies in Thailand for 1981 to 2019

Percentage of Rainfall Anomalies in Thailand (mm.)



Source: HII, 2019: Thailand Water Situation 2019 (ThaiWater.net).

ii. Climate Change Projections

Under different emission pathways average daily temperature may increase by 1.8°C by mid-century. There have been different attempts to project the ongoing trends in and effects of climate change in Thailand. Based on the comparison of different models in the IPCC's 5th Assessment Report of IPCC, four different pathways, based on varying emission levels, were created. Figure 49 illustrates the projected changes in the mean temperature in Thailand for each pathway up to 2100, compared to the reference period from 1995 to 2014. Under the highest emission pathway, average daily temperatures may increase up to 1.8°C and 3.8°C in the periods from 2040-2059 and 2080-2099, respectively (Figure 50).

Figure 49: Projected mean temperature for Thailand

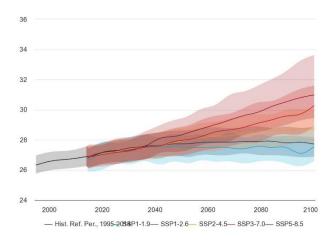


Figure 50: Projected precipitation anomaly for 2040 to 2059; (reference period 1995 to 2014) SSP1-1.9 multi-model ensemble



Source: World Bank, 2023; Climate Change Knowledge Portal.

-1000 -800 -600 -400 -200 0 200 400 600 800 1000 **Source:** World Bank, 2023; Climate Change Knowledge

The same projections also confirm an increase in annual precipitation rates, albeit with uncertainty between models.

There are however only a few studies that conduct a downscaling to different areas or river basins in Thailand that can provide more detailed insights on climate impacts. "Downscaling studies in the upper Ping River Basin in the north of the country estimate rainfall extent and frequency to vary across the catchment, with wet days increasing in frequency and extent during the wet season for some areas, and in the dry season for the central areas of the catchment. For the Bangkok region, one study suggests an increase in precipitation during the rainy season by 2100" (ADB and World Bank, 2021).

PRECIPITATION (MM)

Generally, model projections for Thailand suggest increased flood risks during the wet season and more severe water shortages Due to Thailand's location in the tropics, its agricultural productivity is particularly vulnerable to temperature rises. Higher potential evapotranspiration could also lead to increased water demand in irrigated agriculture. Thailand is furthermore affected by sea-level rise and saline intrusion in coastal areas. "Climate change and vulnerabilities are risks to Thailand's future growth and shared prosperity, and climate-related risks are expected to affect the poor and bottom 40 percent disproportionately strongly" (World Bank, 2018).

during the dry season.

iii. Disaster and Flood-Related Exposure of Thailand

Thailand faces a high exposure to natural hazard risks and is ranked high on different natural hazard risk indices.

The INFORM Risk Index, which is a global, open-source risk assessment for humanitarian crisis and disasters (Marin-Ferrer et al., 2017), ranks Thailand 74th out of 191 countries (Table 4). However, regarding flood risk exposure, Thailand is ranked 9th, below Myanmar, Vietnam and Cambodia, underscoring its very high exposure to floods in terms of frequency and impact. The table below summarizes the hazard-specific risk scores of the INFORM Risk Index (ADB and World Bank, 2021).

Table 4: Selected indicators from the INFORM Risk Index for risk management for Thailand.

(For the sub-categories of risk higher scores represent greater risks. Global average scores are shown in brackets.)

Flood (0-10)	Tropical Cyclone (0-10)	Drought (0-10)	Vulnerability (0–10)	Lack of Coping Capacity (0-10)	Overall Inform Risk Level (0–10)	Rank (1–191)
8.8 [4.5]	4.9 [1.7]	5.7 [3.2]	3.1 [3.6]	3.9 [4.5]	4.1 [3.8]	81

Source: ADB and World Bank, 2021.

in Thailand on the economy and livelihoods are immense.

The impacts of floods In 2011, Thailand was affected by its worst floods in more than 50 years. "Caused by excessive and continuous rainfall from successive monsoons and subsequent, numerous dam breaches, the floods inundated more than six million hectares of land in 66 of the country's 77 provinces across the Chao Phraya and Mekong River basins and affected more than 13 million people from July through December 2011. The 2011 floods caused USD 46.5 billion of damages" (World Bank, 2012). More than 5.5 percent of Thailand's land mass was under water at the time. In 2011, the flooding in Bangkok was compounded from simultaneous: (i) high discharges upstream, (ii) large releases from reservoirs, i.e. Bhumibol and Sirikit dams (iii) high sea water levels in the Gulf of Thailand and (iv) heavy rainfall in the city (World Bank, 2012). Figure 51 illustrates the areas flooded in 2011 and the areas with a low, medium, and high flood risk according to LDD (2022).

The risks from floods are concentrated geographically, with the concentration of assets in these regions adding to risk.

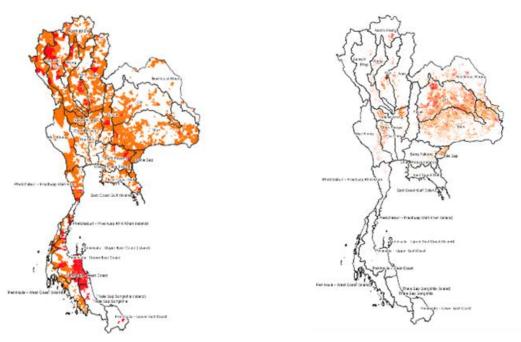
Six of Thailand's 22 river basins have more than 40 per cent of the area with a moderate and high flood exposure. Nine of the 22 river basins have a medium to high exposure to drought. The Chao-Phraya, Tha-Chin, Chi, Sakae Krang, and Phetchaburi-Prachuap Khiri Khan River basins have the highest combined drought and flood exposure. When combining flood and drought exposure with population, Gross Provincial Product, poverty and the adaptive capacity¹⁸ of the province the following 1019 provinces were found to be most at risk of floods and droughts: Nakhon Ratchasima, Bangkok, Nakhon Sawan, Chaiyaphum, Sukhothai, Roi Et, Khon Kaen, Pichit, Pathum Thani, and Si Sa Ket. During the 2011 floods, the provinces of Bangkok, Nakhon Sawan, and Pathum Thani were among the top five provinces most affected by impacts on industry and manufacturing (World Bank, 2012). The concentration of assets in vulnerable

 $^{^{18}}$ The budget allocation related to flood and drought management interventions for the period 2017 to 2022 in each province were used as a proxy for the adaptive capacity of the province.

¹⁹ The result of this analysis is a normalized, weighted score on flood and drought risk for each province.

areas make these provinces particularly vulnerable to the impacts of droughts and floods.

Figure 51: (left) Exposure to floods by DDPM (2022; (right) Exposure to drought by LDD (2022)



Source: Geospatial analysis based on data from DDPM (2022) and LDD (2022) Note: DDPM data from 2009 to 2019, LDD data from 2009 to 2019

The Northeast region has traditionally higher rates of poverty and less favorable conditions for both rainfed and irrigated agriculture, resulting in a higher prevalence of drought.

The 2015-2016 drought resulted in losses exceeding USD 2.5 billion. Thailand is affected by meteorological (precipitation deficit), hydrological (deficit in surface and subsurface water flow), and agricultural droughts (related to local soil and land management practices). According to ONEP (2021) "Thailand has experienced water shortage problems, which have been compounded by a number of droughts, hugely impacting farmers' incomes and the country's economic output. Severe droughts that occurred in the years 1979, 1994 and 1999 affected almost every part of the country and there have been an increasing number of recurring droughts over the course of the last 10 years, which have affected a total area of around 42,280 km²". Sakae Krang River Basin has 54.3 per cent medium and 8.5 per cent high exposure to drought. Phetchaburi-Prachuap Khiri Khan River Basin has 37.2 per cent medium and 41.5 per cent high exposure to drought.

UNDRR (2020) estimates that the 2015-2016 drought was one of the worst in the last 20 years and resulted in losses exceeding USD 2.5 billion. Widespread droughts in Southeast Asia occurred in 2020, 2018, 2016, 2005, 1997 and 1998 (ESCAP and ASEAN, 2021). In 2019, it was reported that the government provided THB 25 billion (0.15 percent of GDP) to farmers to compensate directly for damage to crops from drought and flooding.² Further measures to support affected farmers were also announced with a cost of THB 60 billion (0.36 percent of GDP). Future costs to the government in providing compensation (mainly to farmers) are expected to increase over time.

South-East-Asia is likely to experience

El Niño-related droughts have become more frequent in Southeast Asia and are likely to increase under all future emissions pathways. Currently Thailand faces

more prolonged periods of drought due to climate change. an annual median probability of severe meteorological drought, something that, although uncertain, is projected to severely increase by 2080–2099 under the two higher emission pathways in Figure 4 (ADB and World Bank, 2021). In the absence of drought research for Thailand, it is worth noting that droughts globally tend to be of longer duration and with larger economic consequences than floods. Globally, droughts not only lead to crop loss but also result in deforestation as farmers expand into nearby forests due to reduced rainfall. This deforestation further reduces water supply and worsens climate change. The economic costs of droughts are calculated to be four times higher than those of floods, with a single water outage in an urban firm causing a revenue reduction of over 8 percent.²⁰

iv. A Repeat of the 2011 Floods in the Early 2030s Could Cost 10-15 Percent of GDP

Since 1990, seven floods have affected more than 20 percent of Thailand's land mass with the floods of 2011 being the most severe. Floods in sparsely populated areas may have limited economic costs, but production losses can mount quickly if high-value sectors are impacted. As noted above, the 2011 floods caused damages worth 12.6 per cent of GDP and at the time 8.5 per cent of Thailand's farmland was submerged²¹ (Table 5). However, 70 per cent of the recorded damages and losses were attributed to the manufacturing sector, mainly from flooding in industrial estates in Ayutthaya and Pathum Thani²². Of the overall cost, 90 per cent fell on the private sector. The Thai government lost an estimated 3.7 percent of tax revenues in 2011 and 2.6 percent of revenues in 2012 because of the flooding. The public sector faced THB 141 billions in losses to property and an estimated reconstruction bill of THB 388 billion (3.4 percent of GDP).

Table 5: Impacts of large floods

Year	Duration (days)	People affected, mln (% of population)	Economic impact (\$ million)		
1995	100	4.3 (7%)	269.8		
1996	114	5.0 (8%)	0.9		
2000	6	2.5 (4%)	86.7		
2002	6	3.3 (5%)	58.3		
2006	115	2.2 (3%)	14.4		
2010	61	9.0 (13%)	445.6		
2011	152	9.5 (14%)	52,041.6 ²³		
2013	14	3.5 (5%)	605.5		
2017	28	1.0 (1%)	366.5		
2017	30	1.8 (3%)	1 193.9		

Notes: Table shows floods with more than 1m people affected in Thailand since 1990.

Source: EM-DAT database.

^{20 &}quot;Damania, Richard; Desbureaux, Sébastien; Hyland, Marie; Islam, Asif; Moore, Scott; Rodella, Aude-Sophie; Russ, Jason; Zaveri, Esha. 2017. Uncharted Waters: The New Economics of Water Scarcity and Variability. © World Bank, Washington, DC. http://hdl.handle.net/10986/28096

²¹ From Thailand's Meteorological Department (http://www.tmd.go.th/en/event/flood_in_2011.pdf)

²² World Bank (2012) 'Rapid Assessment for Resilient Recovery and Reconstruction Planning'.

²³ The 2011 PDNA recorded USD 46.5 billion of damages and losses.

As the intensity and frequency of floods increases, economic costs will also grow. Studies suggest flooding incidence across Thailand is likely to increase because of climate change, with higher frequency of intense rainfall events contributing to riverbank overflow, flash floods in urban areas and landslides and flash floods in mountain areas. Model-based predictions for large-scale river flooding (WRI, 2022; Ward et al, 2020) estimate that the population annually affected by river floods is 1.1 million with an average annual damage of USD 1.6 billion in the reference year of 2010. The Table 6 below provides an overview of the population exposed to extreme river floods for the reference period of 1971 to 2004 and the projections for 2035 to 2044 based on the average of the four emission pathways in Figure 49. Compared to 2010, climate change may increase the number of people affected by floods by a factor of 2.5 for the period 2035 to 2044. Current estimates suggest that, under a high-emission scenario, the economic impact of a 1-in-50-year flood (as a share of GDP) in the early 2030s would be double that of the 2011 floods²⁴ (Figure 52). Such a flood could impact 500,000 people and the additional urban damage alone could be USD 6.9 billion²⁵.

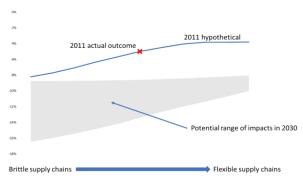
Table 6: Estimated number of people in Thailand affected by an extreme river flood

(Extreme flood is defined as being in the 90th percentile in terms of numbers of people affected) for 1971–2004 and for the future period 2035–2044 (ADB and World Bank, 2021)

Estimate	Population Exposed to Extreme Flood (1971–2004)	Population Exposed to Extreme Flood (2035–2044)	Increase in Affected Population
16.7 Percentile	312,568	1,194,555	881,987
Median	886,335	3,177,190	2,290,855
83.3 Percentile	2,184,124	4,941,744	2,757,620

Source: ADB and World Bank, 2021.

Figure 52: Potential loss of GDP from future floods (%)



Source: Staff calculations based on MINDSET model data.

Notes: Supply chain flexibility is measured as length of time companies can keep production uninterrupted in the event of disruption. The range on the chart's x-axis is zero to six weeks.

The analysis suggests that production losses from a 1-in-50 year flood in the early 2030s would Figure 52 presents the potential loss of GDP for a 1-in-50 year flood in the early 2030s, compared to that which occurred in 2011. The grey area represents uncertainty in future flood length; production losses are larger if either flood the lasts longer or it takes longer to restart production because of repair work. Increasing supply-chain flexibility (moving from left to right on the chart) could

²⁴ https://www.wri.org/aqueduct

²⁵ The World Bank (2021) 'Climate Risk Country Profile: Thailand.'

likely exceed 10 percent of GDP.

The costs of future floods could be magnified by supplychain impacts. offset some of the worst potential impacts. More than 10 percent of annual production is likely to be lost. It is possible that losses could be as high as 15 percent. The value of asset damages could be equally as big.

The Bank of Thailand (BoT) found that, in 2011, 95 percent of businesses were impacted by the floods²⁶. The impacts of floods are therefore not limited to companies that are directly affected. Other companies along the supply chain will be disrupted, especially if there is damage to transport networks²⁷. Loss of income will also reduce demand for some products. The net impact of future floods will thus depend on supply chain resilience, for example the ability of companies to switch suppliers at short notice or hold stocks of critical inputs to production (notable examples include back-up energy supplies in case of widespread power failures). There is a recognized trade-off between maintaining resilient supply chains and optimizing production processes (World Development Report 2020: Trading for Development in the Age of Global Value Chains).

There are limits to how much businesses can prepare; publicly funded adaptation measures are required. Nevertheless, a reduction of more than 10 percent of GDP is likely in this scenario. Actions by businesses alone will not be sufficient to avoid these negative impacts. There are, however, possible climate adaptation measures that the national government could take to reduce the impacts of future floods.

3. Climate Adaptation Measures to Reduce the Impacts of Floods and Droughts

There has been a global shift towards integrated management of flood and drought risks, aiming to maximize productivity and minimize the impact on livelihoods.

Risk-informed decision making, transparent risk estimation processes, and stakeholder consensus are key components of reducing flood risk. Successful strategies should be built on a shared vision for development and consider a multi-sector perspective. Browder et al. (2020) highlight four elements for robust flood management: an enabling environment, prioritized risk mitigation planning, investment in water resources infrastructure, and controlling land and water use. WMO and GWP (2017) recommend a cascading series of measures to reduce flood hazards, protect against floods, regulate land use, raise awareness, and mitigate risk. Nature-based solutions and a circular economy approach are also important. Nature-based solutions involve actions that effectively address social, economic, and environmental challenges while providing benefits to human well-being and biodiversity (UN, 2022).

Public spending on climate adaptation measures will place a burden on public budgets but should provide a strong The analysis in this chapter has shown that there should be a priority on investment that reduces the impacts of climate change. If these investments were able to halve overall damages from climate change they would generate benefits of three to six times their costs (based on a rough estimate of damages). They would also reduce the risk of extreme high-cost outcomes, particularly relating to the Greater Bangkok area. Many adaptation investments are public goods and would therefore require public support. Costs could be minimized if steps are

²⁶ Bank of Thailand (2012) 'Thailand Floods 2011. Impact and Recovery from Business Survey'.

²⁷ The analysis builds on recent academic work. See Tanoe and others (2020) 'Estimation of Direct and Indirect Economic Losses Caused by a Flood With Long-Lasting Inundation: Application to the 2011 Thailand Flood'; Colon (2020) 'Criticality analysis of a country's transport network via an agent-based supply chain model.'

return on initial investments.

taken to identify vulnerable infrastructure and carrying out this exercise should be regarded as a priority. Some measures, including flood prevention around Bangkok, may return immediate benefits and could be prioritized. Finally, softer measures, including building early warning and community-based systems, could provide benefits with smaller public costs.

i. Institutional and Policy Aspects, and Progress Since the 2011 Flood

Progress has been made on stronger water resources management policies and institutions following the establishment of the Office of National Water Resources (ONWR).

With the adoption of the Water Resources Act in 2018 and the creation of ONWR in 2017, the Government of Thailand implemented long-standing policy recommendations aimed at increasing coordination among ministries and departments responsible for water resources management. Prior to the establishment of ONWR, Thailand lacked an effective policy coordination and oversight body that would guide the water resources management. This has often resulted in a series of sector plans or fragmented strategies without effective coordination (ADB, 2015). More than 30 ministries and departments are responsible for water resources management, leading to a scattered institutional landscape remains, unclear mandates and overlapping responsibilities. Institutions like TMD, RID, HII, DWR, and ONWR play key roles in providing climatological, meteorological, and hydrological information. More specifically, DWR summarizes the water level information for rivers and location specific forecast on a dedicated website (http://ews.dwr.go.th). While ONWR summarizes water hazard related information on another dedicated website (https://nationalthaiwater.onwr.go.th). In addition, provides a new early warning and hazard monitoring system on behalf of the national government. However, challenges remain in terms of standardized risk assessments and the use of consistent hazard maps, which are being addressed to improve communication and coordination.

Since the establishment of ONWR, the coordination of the different entities involved in flood and drought management has substantially improved and ONWR has increasingly supported the planning of flood and drought mitigation measures. The Water Resources Act B.E. 2561 outlines the involvement of water user organizations, river basin committees, and the National Water Resources Committee (NWRC) in water resources management. In line with the Act, ONWR prioritizes training for water user associations and advocates for equitable sharing of benefits across sectors, especially during droughts. ONWR also focuses on collecting and analyzing flood-drought statistics, developing short and long-term action plans, and promoting other measures such as ecosystem-based adaptation and community initiatives among others. The Table 7 below provides an overview of the flood preparedness and response actions taken in 2022 coordinated by ONWR.

Table 7: Flood preparedness and response actions planned for the wet season 2022, coordinated by ONWR.

Action	Timeframe	Involved entities
Forecasting and identifying areas at risk of floods and reduced rainfall	From March 2022	TMD, BMA, HII, ONWR
Managing lowland areas for flood retention	By August 2022	MOA, MOI, RID, DWR, DAE, BMA

Part 2. Coping with Floods and Droughts in Thailand

	Action	Timeframe	Involved entities
3.	Reviewing and adjusting water management criteria for medium and large reservoirs and diversion dams	By April 2022	RID, DWR, EGAT, DAEDE, DOF
4.	Repairing and maintaining hydraulic structures, drainage systems and telemetric stations	By July 2022	RID, DWR, EGAT, DAEDE, DLA, DOF, TMD, HII, BMA
5.	Renovating and repairing water obstacles	By July 2022	RID, DWR, DLA, BMA, DORR, DOH, MD), SRT
6.	Dredging canals and removing water hyacinths	By July 2022	RID, MD, DWR, DPW, DLA, BMA, Thailand Institute of Science and Technology Research, ONWR, GISDA
7.	Preparing and planning of machinery and equipment for the risk areas of flood and less rainfall	By July 2022	DWR, RID, DGR, BMA, DOH, DORR, Royal Thai Armed Forces, Royal Thai Police, Department of Royal Rainmaking and Agricultural Aviation, DDPM, DLA, GISDA
8.	Increasing water efficiency and improving water distribution process	Before and through-out the wet season	RID, EGAT, DWR, DGR, MWA, PWA, DLA
9.	Checking the security of the levees, dams, dykes,	Before and through-out the wet season	DLA, DOH, DPW, RID, DORR, ONWR, MD
10.	Preparing evacuation areas and practicing the Incident Action Plan	By May 2022	MOI, DDPM, ONWR. related agencies
11.	Establishing the Incident Command Post before disaster	Throughout the wet season	ONWR, NBTC, MOI, related agencies
12.	Raising awareness and public relations	Before and through-out the wet season	MOI, Government Public Relations Department, ONWR, related agencies
13.	Monitoring, evaluating and adjusting the countermeasures in accordance with the disaster	Throughout the wet season	ONWR, related agencies

Some of the recommendations from the 2011 Floods Post-Disaster Needs Assessment have not yet been addressed. Key issues that are yet to be addressed include (i) strengthening of early warning communication with the public and affected communities, (ii) enhancing coordination among government departments in the context of preparedness and response, (iii) strengthening land management and flood zoning, (iv) preparing comprehensive risk reduction and contingency planning tools, (v) strengthening hydraulic modelling, data management, and data integration, (vi) dissemination of risk information, and (vii) enabling community driven disaster prevention. An overview of the long-term recommendations for relevant sectors in available in the Table 8 below.

Table 8: Implementation status of selected medium- and long-term recommendations for strengthen flood management following the 2011 floods (World Bank, 2012).

Recommendations highlighted in bold have largely been implemented based on available data and expert judgement

Sector	Policy and institutional recommendations (non-structural)	Infrastructure and operational recommendations (structural)
Agriculture	 Enhance the national and local governance systems that address land management. Ensure IWRM in river basin. Promote crop diversity. 	 Promote alternative (paddy rice) cropping and production systems, which are less vulnerable to flooding.

Sector	Policy and institutional recommendations (non-structural)	Infrastructure and operational recommendations (structural)			
	 Prepare department specific DRR plans and strengthen relevant policies. Involvement of GISDA and promote GIS and RS for disaster planning. 	 Establish effective weather forecasting and early warning systems. Promote agricultural insurance systems and ensure good statistics, which could form the basis for future assessments. 			
Industry and manufacturing	 Improve land use management to ensure that flood plains are kept free of further industrial development. 	 Comprehensive flood protection systems to be constructed around industrial estates. Invest in comp. water mgt. systems. 			
Tourism	 Review and update zoning and land use regulations to ensure that flood affected areas are kept free of further tourism development; 	, g			
Flood control and drainage	 Conduct a detailed, model-based analysis Develop an overview of dikes at risk of breaching and conduct a safety audit of dams and water reservoirs. Review land use policies to ensure that areas at risk of flooding are not developed. Promote strong data management systems focusing on hydrological data 	 Immediate rehabilitation of hydraulic assets (including King's and Ring dike) and an increase in drainage capacity. Increase retention and reservoir capacity. Allow more space for water and rivers to expand during peak water periods. Investments in small- and mediumsized water reservoirs upstream and implementing community watershed management programs. 			
Water resources management, water supply and sanitation	 Identify a "champion" for effectively coordinating water resources management. Finalize the Water Resources Management Act Formulate utility-based disaster prevention plans, so-called Water Safety Plans. Increase monitoring and maintenance. Establish SOP and Business Continuity Plans for the water utilities 	Increase the water treatment facilities and ensure that the existing water treatment facilities are protected from flooding, focusing on the smaller WSS facilities.			
Housing	Strengthening building codes, land use planning, coordination with the RID and others on local flood mitigation measures.	Promote community led reconstruction and recovery.			
Education	Strengthening building codes.Promote flood awareness education.				

Sector	Policy and institutional recommendations (non-structural)	Infrastructure and operational recommendations (structural)
Environment, including waste management	Strengthen water quality monitoring.	 Strengthen waste collection, recycling and the circular economy as an est. 40% of municipal waste is recyclable. Ensure climate proofing of industrial waste management facilities. Promote afforestation.
Disaster Risk Management	 Establish a comprehensive multi- hazard early warning system that brings information to a joint platform accessible widely. 	
	 Strengthen collaboration between different actors, including grassroot organizations and civil-defense collaboration 	
	 Strengthen data mgt and sharing. Conduct a risk assessment that also includes climate change projections. 	
	 Strengthen community-based DRM and enable local communities to play a stronger role in disaster response. 	
	 Mainstream DRR in plans and policies. Clarify institutional roles and 	
	responsibilities. • Develop a flood insurance program	

ii. Flood and Drought Management Infrastructure

Historically, the development of flood management infrastructure in the Chao-Phraya River system has been closely linked to the development of irrigation systems.

The same dams, barrages, channels, and levees constructed primarily for irrigation also serve as flood protection infrastructure, including the Bhumibol and Sirikit dams. These two dams withhold flood waters for an area of 1.2 million hectares in the lower part of the basin and together they control 22 per cent of the runoff from the entire basin. In 1984, a masterplan for flood protection was prepared leading to the construction of a 74 km long "King's dike" around Bangkok, along with pumping stations regulators and a drainage network in the Bangkok metropolitan area. In the 1990s, the overbank flow protection scheme was implemented with the construction of 300km of dikes along the Chao-Phraya River to protect agricultural land, while at the same time the "King's dike" was heightened. Figure 53 illustrates the main dams and hydraulic infrastructure in the Chao-Phraya River basin, while Figure 54 illustrates it for the Chi and Mun Rivers (Friend and Thinphanga, 2018).

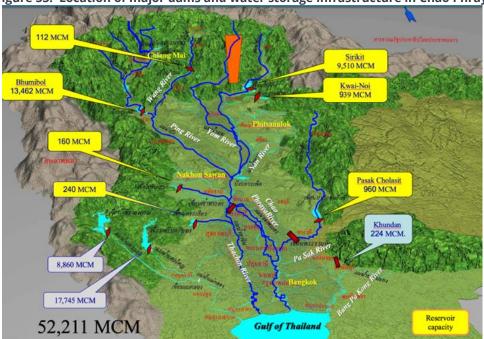


Figure 53: Location of major dams and water storage infrastructure in Chao Phraya River system

Source: Based on RID (2019).

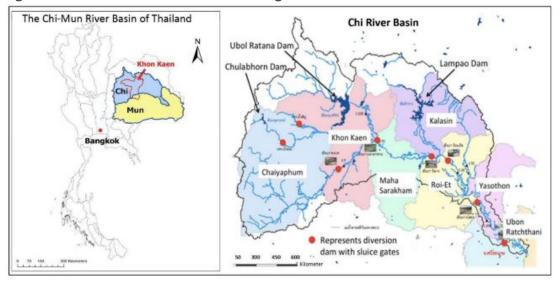


Figure 54: Overview of water resources management infrastructure in the Chi River basin

Source: Friend and Thinphanga, 2018 based on information of RID.

There is a need to conduct a design review and safety audit of critical flood protection infrastructure and invest in the extension of the infrastructure.

The 2011 PDNA identified the combination of aging infrastructure and deferred maintenance of the hydraulic infrastructure as the primary reason for the structural failure and breaches of the flood protection embankments along the Chao-Phraya River. A complete redesign and reconstruction of the dikes was therefore recommended (estimated at THB 15 billion), which should ideally be combined with upstream measures for the retention of flood water and informed by basin-wide modelling and a safety audit. In conjunction, systems should be established to ensure regular review of the critical flood control infrastructure status, both by the operator and by independent review panels, to examine problems relating to sustainable operations and maintenance (World Bank, 2012). The Table 9 below provides an overview of the flood protection works for the 10 provinces with the highest flood and drought risk scores²⁸ for the period 2017 to 2022. It shows that so far the budget and interventions have been selective with potentially large gaps remaining to achieve robust levels of flood protection (as for example in the Greater Bangkok area) In addition, only half of these provinces have contingency plans which are critical for minimizing economic losses and loss of life when a flood occurs.

Table 9: Overview of flood protection works in the 10 provinces with the highest flood and drought risk scores²⁹ and budget for the period 2017-2022.

TISK SCOTES									
Province	Flood	Allocated	Urba	Urban flood protection			Pumping	g station	Contingency
	medium	budget	Projects	Protected	protected	Length	Station	Benefit	plan
	and	(ТНВ		area	household			area	preparation
	high risk	millions)	(no)	(km²)		(m)		(km²)	
	(km²)[1]	[2]							
Nakhon	14.73	1,548	2	4	2,244	5,349	32	129	yes
Ratchasima									
Bangkok	2.51	16,818	16	198	-	n/a	5	29	-
Nakhon	8.80	2,227	6	22	9,829	11,473	7	11	yes
Sawan									
Chaiyaphum	5.53	2,424	1	4	5,174	11,062	5	11	-
Sukhothai	4.43	1,645	3	13	11,560	6,120	5	12	yes
Roi Et	9.01	1,708	-	-	-	5,871	15	349	yes
Khon Kaen	8.81	1,169	4	23	10,065	9,071	2	11	-
Phichit	6.20	694	-	-	-	2,839	4	5	-
Pathum Thani	2.42	865	-	-	-	7,060	3	16	-
Si Sa Ket	9.02	772	-	-	-	5,473	5	4	yes

Source:. Compiled by the World Bank based on information from DDPM [1] and Bureau of Budget, 2022 [2]

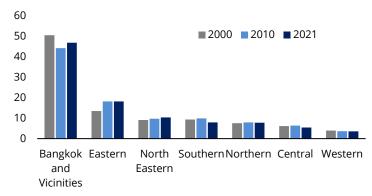
Increased protection of the greater Bangkok area is warranted. Over 14 million people (about 22 percent of the total population) live within the Greater Bangkok area³⁰ at the last census. The area also hosts important historical and cultural assets and contributes close to 50 percent of total annual GDP thus making it by far the most important to Thailand's socio-economy (Figure 55). Since the 2011 floods, several plans have been drafted to protect

²⁸ The score was determined considering areas exposed to floods and droughts, Gross Provincial Product, poverty and budget allocated for flood management in the province with the aim to identify priority areas for interventions.

³⁰ The NESDC classifies the greater Bangkok area as Bangkok, Nonthaburi, Nakon Pathom, Pathum Thani, Samut Prakan and Samut Sakhon.

this Region including new upstream water retention, the Ayutthaya bypass, Bangkok outer ring road diversion, raising of dikes, and river improvement works, among others. RID currently proposes an investment with "nine plans" for an estimated cost of USD 9.4 billion, to achieve flood protection for a 1 in 50-year flood event. Further technical and cost-benefit analysis should be prioritized for financing this investment in the short-term.

Figure 55: GDP in Thailand by region (%)



Source: NESDC

Another key measure is to climate-proof and strengthen operations of key water storage infrastructure. Since much of the infrastructure was built 40-60 years ago, efforts to sustain operations and undertake major maintenance are increasingly challenging. At the same time, climate change demands that operating rules need to change and supplementary measures and investments may also be needed in certain cases. But only about 4 percent of the water resources budget is used for maintenance of infrastructure. Sedimentation, in part driven by deforestation and land use changes over the years in the upstream areas of the catchments, has reduced the storage capacity of existing dams, which were mainly constructed in the 1960s to 1980s. Major dams like the Bhumipol Dam, Sirikit Dam, and Vajiralongkorn Dam have sedimentation rates of about 30 per cent, substantially reducing their storage capacity. A concerted review and update of the operational rules of the major dams together with a sound decision support system was recommended after the 2011 floods because uncoordinated releases from dams was a major contributing factor to the magnitude of the flooding.

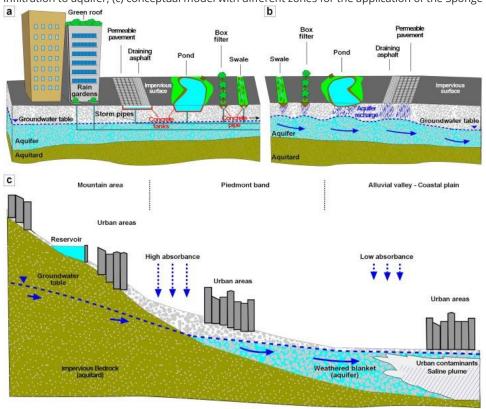
Water storage needs should be considered on a provincial basis. Currently, Thailand has a total reservoir capacity estimated at 76,002 MCM. With an estimated reservoir storage capacity of 1,006 m³/capita, Thailand leads its neighbors such as Malaysia (710 m³/capita), Indonesia (71 m³/capita), Vietnam (310 m³/capita), Japan (228 m³/capita), and India (190 m³/capita), but is behind countries like USA with 6,158 m³/ capita and China with 2,486 m³/ capita (World Bank, 2023). Thailand's water storage is also unevenly distributed, with most storage in the North-Central and Western Regions (the sub-basins of the Chao Phraya River system) than the North-East region. Furthermore, irrigation infrastructure is more developed in the sub-basins of the Chao Phraya River system. Water storage planning should be approached from an integrated perspective, considering the demands for water resources at a system scale. It is crucial to also assess the exposure and vulnerability to floods and droughts of the population, including those

affected by poverty, to ensure equitable and sustainable access to adequate water resources. Given these factors, it may be necessary to give greater attention to the North East with regard to future storage planning initiatives.

Opportunities for nature-based solutions (NbS) should be explored. The literature on climate change adaptation shows that conventional approaches relying primarily on large scale 'gray' infrastructure alone are no longer sufficient to manage the impacts of climate change. Even though some ecosystem-based practices are in limited application for specific cases in Thailand such as "monkey cheeks", better hydrologically engineered and more widespread application of NbS and integrated gray-green infrastructure options is not considered. Examples from China's Sponge City Initiative (USD 985 million) across 16 cities showcases how NbS can be part of the solution for both mitigating surface water flooding and enhancing water conservation. Knowledge-building of the NbS concept and the development of local and sector specific solutions should be promoted. Building capacity pertaining to the selection of potential NbS interventions, standards for assessing benefits and costs, building guidelines for integrated grey-green infrastructure and norms for designing NbS would be important. Figure 56 provides a conceptual drawing of the Sponge City.

Figure 56: **Application** of the Sponge City concept at the site scale and at the catchment scale in Southern China.

(a) classic sponge facilities with pipes and tanks to collect the water; (b) suggested sponge facilities characterized by infiltration to aquifer; (c) conceptual model with different zones for the application of the Sponge City concept.



Source: Journal of Hydrology, Regional Studies, Volume 28, April 2020, 100679

Support climate adaptation through simultaneous policy measures and infrastructure investments. Browder et al. (2020) highlights four basic elements that would need to converge for robust and successful flood and drought risk management. "An enabling environment of policies, laws, agencies, strategic plans, and information; planning at all levels to prioritize risk mitigation measures; investing in watersheds and water resources infrastructure; controlling the use of land and water resources to reduce exposures and vulnerabilities; and responding better to extreme events." Similarly, WMO and GWP (2018) recommend a cascading series of infrastructure investments with corresponding policy measures that would (a) reduce the hazard, (b) control and protect against the hazard, (c) regulate and adapt land use, (d) raise awareness to and increase preparedness, and (e) mitigate risk.

Box 3: Key policy and infrastructure recommendations to better cope with floods and drought

- The institutional reform process that started in 2017 with the establishment of ONWR needs to be further advanced, including considering the designation of a lead agency for flood and drought management. Building upon the coordinating role of ONWR, more clearly defined roles and responsibilities among the related agencies regarding operation of infrastructure, data integration, communication, planning and response are critical.
- More systematic analysis of the economic impacts of recurrent flood and drought events should be undertaken to analyse and compare the economic efficiency and flexibility of different risk management strategies and interventions. Alternatives, such as nature-based solutions (NbS), that would complement traditional grey infrastructure, should be carefully considered in this analysis.
- Investments for increasing the water storage capacity should be carefully assessed and prioritized, especially in the Northeast, while maintaining and retrofitting the existing storage infrastructure. This should include addressing sedimentation through afforestation in upstream areas, where this is feasible and restoring full operating capacity of reservoirs.
- NbS can also play an important role and should be considered alongside with traditional grey infrastructure. The familiar concept of "Monkey Cheeks" should be re-evaluated and better engineered for flood attenuation.
- While Thailand has robust hydrometeorological services, the communication with stakeholders and affected communities when a flood event is expected needs enhancement. Flood early warning systems are widely recognized to be cost effective solutions for reducing the impact on lives and livelihoods with benefits of USD4 to USD10 for every USD1 invested in early warning systems. Strengthening early warning systems based on robust hydrological-hydraulic modelling and effective communication is important to help save lives and economic losses.
- Risk financing and risk insurance are important elements for managing the residual risks of natural disasters. Probabilistic risk models can not only inform decision making on climate risks, but also inform decision making on the best possible solution regarding parametric risk insurance, contingent credit lines and catastrophic bonds.

Part 2. Coping with Floods and Droughts in Thailand

Climate change impacts need to be better integrated into water resources management and the broader economic outlook. To date, climate change issues remain largely addressed through separate climate strategies, such as the National Adaptation Plan and not well integrated into the broader national economic plans nor related sector specific plans such as the 20-year Water Resources Management Master Plan (WRMP) for the period 2017 to 2036. A rigorous climate change assessment of the WRMP with sector specific impacts under different climate change scenarios is needed. The assessment should also consider different policy and investment scenarios towards informing the most effective measures for coping with floods and droughts and minimizing the impacts for the population and the economy.

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